SCE Charge Ready Light Duty Program

2024 Evaluation Report

June 30, 2025

Contents

TABLES & FIGURES

1. Executive Summary

On August 27, 2020, the California Public Utilities Commission (CPUC or Commission) issued Decision (D.) 20-08-045 (the Decision) authorizing Southern California Edison Company's (SCE) Charge Ready 2 Infrastructure and Market Education Programs, also known as SCE's Charge Ready Light Duty (CRLD) Program. The CRLD Program is an extension of the Charge Ready and Market Ready Phase 1 Pilot (Phase 1 Pilot).[1] The CRLD Program supports California's greenhouse gas (GHG) emissions reduction goals by adopting transportation electrification (TE). This report provides the annual update for the CRLD Program, covering program activities between January 2024 and December 2024, as well as the standard reporting requirements outlined in Senate Bill (SB) 350 TE Program. Additionally, where applicable, this report provides cumulative updates on the CRLD Program from the start of the program through the end of 2024.

SCE's goals are to install approximately 30,000 EV charging ports through the CRLD Program. Further, SCE has specific minimum adoption targets for charging ports installed in disadvantaged communities (DACs) and MUDs. The CRLD Program is expected to be open to applications through December 31, 2026, with installations through 2028[2]. Since CRLD Program launch in July 2021, SCE has accepted applications for Level (L) 2 charging stations. In November 2023, the CPUC approved a Direct Current Fast Charging (DCFC) Program offering, which provides financial incentives for L3 charging stations (i.e., DC fast charging stations). Beginning in April 2024, SCE started accepting applications for the DCFC Program. Please note that this report only covers CRLD Program activity in 2024.

Under the CRLD umbrella, the CRLD Program has multiple offerings that support light-duty passenger EVs. In 2024, the CRLD Program included the following active program offerings available to SCE customer applicants:

- **Charge Ready Make Ready (Make Ready) Expansion Program**, including the Charging Infrastructure and Rebate (CIR) Program, where SCE provides make-ready infrastructure on both the utility- and customer-side of the meter up to a stub-out or connection point for the charging station, and may offer charging station installation rebates for public, workplace, multifamily, and fleet charging. Make Ready also includes the Customer-Side Make Ready Rebate (CSMR) Program, where SCE provides the utility-side of the meter infrastructure, and the participant designs and installs the customer-side. CSMR rebates offset up to 80% of the costs SCE would otherwise incur for performing the work or 80% of what the customer spent, whichever is less. Like CIR, the CSMR Program may also offer eligible participants a rebate to offset the costs associated with the purchase and installation of SCE-approved charging equipment. In 2022, SCE made the decision to sunset charging station rebates due to limited remaining funds designated for rebates; as such, not all CIR and CSMR applications are eligible for charging equipment rebates. Another Make Ready offering is Charge Ready Own and Operate (Turn-key), where SCE will install, own, and operate charging stations for existing MUDs located in DACs or offer a Maintenance and Networking Rebate to qualified customers who choose to own and operate the stations themselves. The last Make Ready offering is the Small Site Rebate

[1] A one-year pilot deploying charging stations and complementary marketing, education, and outreach in support of electric transportation.
[2] SCE submitted an extension of the application acceptance. AL 5334E was filed on July 12, 2024, approved on September 13, 2024, and effective as of July 12, 2024.

(SSR) Program, which provides rebates to MUD, public sector, and commercial sites choosing to install four or fewer L2 charging station ports. The SSR rebate option is available to participants who design, purchase, and install the customer-side of the meter infrastructure work. The SSR Program offering was formally launched in the first quarter of 2023, and SCE has allocated an internal budget of approximately $1.6 million to this offering.

- **Make Ready Direct Current Fast Charging (DCFC) Program**, where SCE provides the utility-side of the meter infrastructure and the customer designs and installs the customer-side of the meter infrastructure. The DCFC Program provides financial incentives for Level 3 (L3) charging stations. This program additionally provides incentives to offset the cost of customer-side infrastructure work and requires a minimum of 2 ports. In April of 2024, SCE began accepting applications for their Direct Current Fast Charging (DCFC) Program.
- **Charge Ready New Construction Rebate (NCR) Program**, a CRLD Program that provides rebates to new construction MUD sites that exceed the current mandatory CALGreen code or relevant local requirements by installing charging stations.
- **Transportation Electrification Advisory Services (TEAS) Program**, where SCE provides extra support and education to customers interested in TE. These services provide customers with a no-cost consultation with an SCE TE advisor who provides information on site planning, parking lot considerations, electric vehicle supply equipment (EVSE) infrastructure, rates, managed charging, and more. These consultations are designed to help customers make informed decisions related to their transportation electrification projects.

The total approved budget for the CRLD Program is $436 million. From its launch in 2021 through the end of 2024, the CRLD Program received 4,301 applications with 86,800 ports requested, completed 235 projects, and installed 4,088 ports across CRLD Programs. Since its launch, the Make-Ready portion of the CRLD Program has benefited from consistently high market demand for charging infrastructure. In response to this high demand, SCE created a waitlist for non-DAC applications for the Make Ready Expansion Program that began in September 2022. This waitlist was created to ensure the CRLD Program met its DAC port installation targets and to curb the number of non-DAC applications. The waitlist succeeded in prioritizing DAC sites, and in early 2024, SCE was on track to meet its program goals, so it removed the waitlist for non-DAC applications. SCE continues to prioritize DAC sites even after the removal of the waitlist.

1.1 Key Findings

- **The CRLD Program has facilitated the commitment of 20,330 electric charging ports in SCE's service territory from the program's start in 2021 through 2024.** The largest share of the committed ports under the Make Ready Program are associated with MUDs (7,237 or 44% of total committed ports). Additionally, more than half of the ports committed through the Make Ready Program (53%), and nearly a quarter of those committed through the NCR Program (22%) will be in DACs.
- **Over the three—and-a-half calendar year period that the CRLD period has been active, CRLD charging stations have helped to avoid an estimated 3,367 metric tons of carbon dioxide equivalents (MT CO2e).** By increasing access to electric vehicle charging infrastructure, the CRLD Programs helped to avoid an estimated 2,740 metric tons of carbon emissions in 2024 (3,367 MT CO_2e across all program years) that would have been emitted by traditional internal combustion engine vehicles.

Shifting energy consumption times when carbon intensity is low (i.e., the fuel contributing to the energy on the grid is comprised of more renewable energy), such as between 8 a.m. and 4 p.m., and away from periods with higher CIs, such as 5 p.m. to 11 p.m., can reduce the CI of the electricity used to charge vehicles (see Section 4.5). This change will further increase the GHGs avoided due to the CRLD charging activity.

- **AMI data revealed steep increases in daily consumption for CRLD chargers in operation in 2024, which signals increasing utilization of new and existing sites. This may put downward pressure on rates.** The average daily consumption per energized application nearly doubled from 2023 to 2024, increasing from 41 kWh to 74 kWh. This increase in average daily consumption may be due to increased usage of existing charging stations or the installation and energization of additional charging stations with high usage. Further, the highest daily consumption in 2024 (14,772 kWh) nearly tripled the 2023 maximum, and the lowest daily consumption recorded in 2024 (1,989 kWh) was nearly 22 times the minimum daily demand recorded in 2023.
- **While customers commonly cite a lack of public charging availability as a main barrier to EV adoption, adding more charging infrastructure is unlikely to lead to immediate or localized EV adoption.** In the end-user survey, 83% of respondents mentioned insufficient charging locations in their communities. However, our market characterization literature review revealed that while the widespread presence of highly visible charging infrastructure is one critical prerequisite to broader EV adoption, other factors, such as perceptions of EV technology, play a key role. Even when public chargers are available, adoption may not rise unless paired with efforts to engage and educate consumers, especially those not already interested in EVs. To effectively overcome barriers like concerns about EV reliability and availability, public charging expansion must be complemented by campaigns that improve consumer perceptions of EV technology which are beyond the scope of the CRLD Program.

2. Program Description and Background

This report covers the 2024 program year (January 2024–December 2024) of SCE's CRLD Program, as required by the CPUC D.20-08-045 and to meet standard reporting requirements for SB 350 TE Programs. It also reports cumulative program participation and charging activity, as charging projects typically span multiple program years. SCE's CRLD Program helps further California's goal of attaining a 40% reduction of GHG emissions from 1990 levels by 2030 and an 80% reduction in emissions by 2050. This evaluation report presents the results of CRLD Program activity in 2024 and since its inception in 2021.

2.1 Program Description

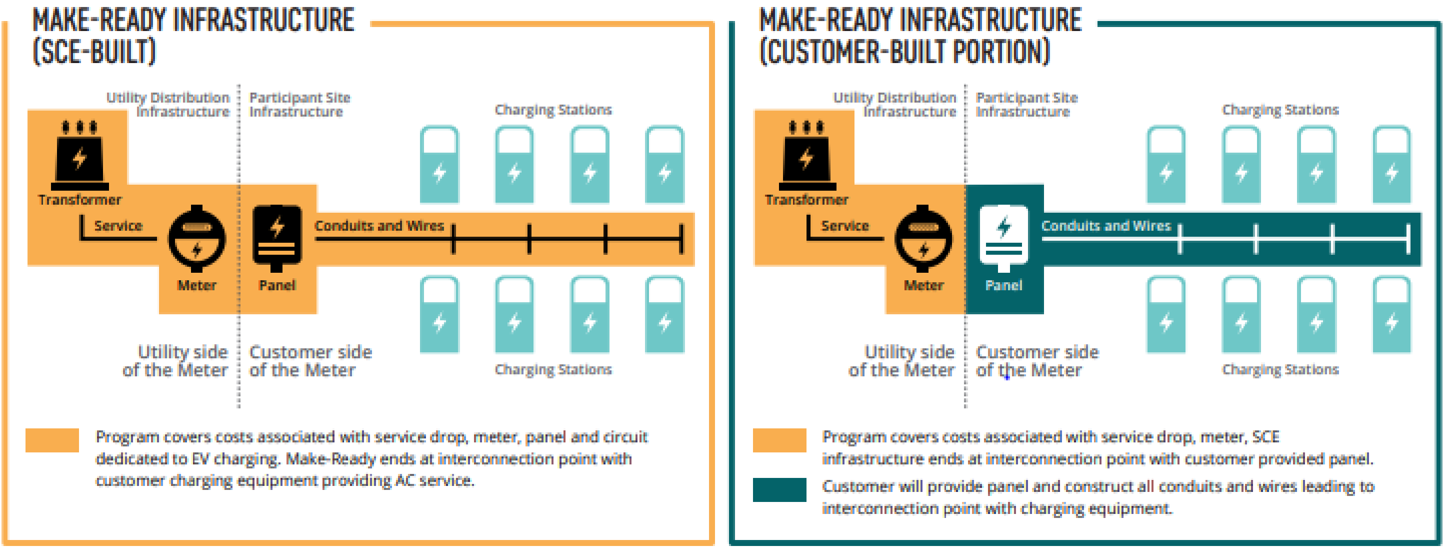
In October 2014, SCE filed its Phase 1 Pilot. SCE proposed a two-phase program in the Phase 1 Pilot application: (1) a one-year pilot to deploy up to 1,500 charging stations and complementary marketing, education, and outreach in support of electric transportation (Phase 1); and (2) a four-year deployment of the remaining charging stations, more than 30,000, and broader EV education and outreach (Phase 2).[3] The CRLD Program is the extension of the Phase 1 Pilot and a key component of SCE's efforts to encourage EV adoption by supporting the installation of charging infrastructure, emphasizing historically underserved customers living in MUDs and within designated DACs. The CRLD Program includes the Make Ready Expansion Program, the DCFC Program, the Charge Ready NCR Program, and the TEAS Program, which, combined, aim to support the installation of approximately 30,000 EV charging ports in SCE territory. This goal includes installations from Phase 1 Pilot applications and schools and parks[4].

- **Make Ready Expansion Program**. SCE provides options for financial support with the utility side and customer side of the meter-supporting infrastructure (also called Make Ready), and rebates for charging equipment for public, workplace, MUDs, and fleet charging. SCE offers four different participation options under this component. The first two are as follows:
  - **CIR Program**. SCE provides both the utility side and customer side of the meter-supporting infrastructure. CIR may also offer eligible participants a rebate to offset the purchase and installation costs of SCE-approved charging equipment. Note that not all CIR applications are eligible for charging equipment rebates because, starting in 2022, CRLD Program staff prioritized the funding of infrastructure work and technical assistance.
  - **CSMR Program.** SCE provides the utility side of the meter-supporting infrastructure, and the participant designs and installs the customer side of the meter-supporting infrastructure. CSMR rebates offset up to 80% of the costs SCE would otherwise incur for performing the customer-side infrastructure work or 80% of the customer's actual cost, whichever is less. CSMR may also offer eligible participants a rebate to offset the costs associated with the purchase and installation of SCE-approved charging equipment. Similar to the CIR Program, not all CSMR applications are eligible for charging equipment rebates because, starting in 2022, CRLD Program staff prioritized the funding of infrastructure work and technical assistance.

[3] D. 16-01-023 at 2; Application (A.) 14-10-014 at 1 to 2.
[4] D. 19-11-017.

SCE's CRLD Program Guidelines illustrate the CIR and CSMR program options (Figure 1). If the customer chooses to self-install the infrastructure on the customer side of the meter (CSMR) (as shown in the graphic on the right in GREEN), they will qualify for the CSMR rebate.

Figure 1. CRLD Infrastructure Program Option Delineation



Source: SCE CRLD Program Guidelines

- **Turn-key.** SCE will install, own, and operate up to 2,500 charging stations for existing MUDs located in DACs where the cost would be a barrier to installation. There is also a maintenance and networking rebate option under the Turn-key Program. This rebate option is only available to MUDs in DACs that choose not to participate in the Turn-key option and prefer to own and operate the charging stations. These participants would enroll in CIR or CSMR and receive this one-time rebate to offset the maintenance and networking fees associated with owning and operating L2 charging equipment.
- **SSR Program.** This CRLD Program offering provides rebates to MUD, public sector, and commercial sites choosing to install four or fewer L2 charging station ports. This rebate option is available to participants who design, purchase, and install the customer side of the meter infrastructure work. The SSR Program provides participants with a fixed rebate of up to $10,000 per port.

- **Make-Ready DCFC Program.** In April 2024, SCE began accepting applications for the DCFC Program, which provides financial incentives for Level 3 (L3) charging stations (i.e., DC fast charging stations). This program installs the utility-side of the meter infrastructure and additionally provides incentives for customer-side of the meter infrastructure work and requires a minimum of 2 ports. The DCFC Program has limited availability, and the program team has a goal to install 205 DCFC ports during the program cycle.
- **New Construction Rebate Program.** This CRLD Program offers rebates to SCE customers building new MUD sites that exceed the current mandatory CALGreen EV Capable code requirements or

relevant local requirements by installing charging stations above what is required in the code.[5] The program provides rebates of up to $3,500 per port for the installation of the customer-side make-ready electrical infrastructure work and L2 charging stations that go above and beyond the CalGreen code requirements. The New Construction Rebate Program will begin phasing out of the portfolio in the coming years and will accept applications through July 12, 2025.

- **TEAS Program.** The TEAS Program provides support and education to customers interested in TE. These services provide customers with a no-cost consultation with an SCE TE advisor who provides information on site planning, parking considerations, EV funding, EVSE infrastructure, rates, managed charging, and more. These consultations aim to help customers build a business case that supports an electrification investment in infrastructure. In addition to tailored consultations, the Program offers webinars and self-service online tools. The program specifically supports commercial EV customers, including small and medium businesses, school and municipal government fleets, and multifamily property owners.

All charging station equipment must be listed on SCE's approved product list and networked, and the participant must maintain the equipment for ten years. Participants are required to send utilization and pricing data to SCE for ten years. Additionally, participants in any CRLD Program offering are required to enroll in an applicable time-of-use (TOU) rate and demand response (DR) program.

2.2 Key Program Changes

Much of the CRLD Program design remained the same during the 2024 program year, with the exception of introducing the DCFC Program in April of 2024. Two other minor changes were made to the application processes to help streamline the application process for customers and staff. The first, specifically for the SSR and CSMR rebate programs, requires tax documentation to be submitted earlier in the application process. This change reduces the timeline for processing during the incentive request stage. The second change involves how the program handles sites located in parking garages. The CRLD Program now requires additional information, such as as-builts, for parking garages to determine site feasibility. Further, the program no longer allows underground parking garage installations due to constructability challenges, specifically the limited space for electrical equipment.

2.3 Budget and Goals

The total budget for the program is $436 million, which includes approximately $417.5 million for charging infrastructure.[6] SCE designed the CRLD program to support California's goal of reducing GHG emissions and criteria pollutants by expanding EV charging infrastructure. This includes increasing the availability of charging stations at workplaces, destination centers, fleet parking locations, DACs, and MUDs. Table 1 shows the percentage of ports SCE is targeting to install in DACs and MUDs by the end of the CRLD Program cycle in 2028.

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[5] The CALGreen code is formally known as the California Green Building Standards Code, Title 24, Part 11, California Code of Regulations.

[6] D.20-08-045 p. 2

Table 1. Program Port Targets

	DACs	MUDs
Make Ready: CIR & CSMR & SSR	50%	30%
Make Ready: Turn-key	100%	100%
Make Ready: DCFC	30%	25%[7]
NCR	50%	100%

2.4 Procedural History

On October 30, 2014, SCE filed Application (A.) 14-10-014[8] for the Charge Ready Pilot Program, the first phase of TE Programs, and the predecessor to Charge Ready 2 (the subject of this evaluation report). The CPUC approved the Pilot Program in Decision (D.) 16-01-023 in 2016.[9] On March 5, 2018, SCE filed a petition for modification requesting an additional $22 million in bridge funding to avoid a gap in program availability between the Charge Ready Pilot Program and the future launch of Charge Ready 2. On December 21, 2018, the Commission issued D.18-12-006, which granted SCE's petition for modification, authorizing the additional funding for a Charge Ready Bridge Program.[10]

On August 27, 2020, the CPUC issued D. 20-08-045, *Decision Authorizing Southern California Edison Company's Charge Ready 2 Infrastructure and Market Education Programs*. This Decision approved SCE's Charge Ready 2 Program, also known as SCE's CRLD Program, which supports California's GHG emissions reduction goals by adopting TE. OP 30 of the Decision required SCE to file annual reports beginning one year after it was initially adopted (i.e., August 27, 2021).

As a subset of the Make Ready Expansion, D. 20-08-045 authorized SCE to offer a "low port rebate" to participants with sites installing four or fewer L2 ports. In response, SCE filed a Tier 2 Advice Letter (AL 4480-E)[11] on April 27, 2021, which sought approval of a proposed, one-time $5,000 per port rebate payable to customers that installed four or fewer charging stations. The CPUC approved the proposal, with modifications specified in Resolution E-5227[12], issued on October 20, 2022. According to the Resolution, SCE must "include customer and utility-side costs for participating sites as part of the originally allocated funds from the $333 million Commission-approved budget for the Make Ready Expansion Program and to maintain a $16,000 per port cap which includes customer and utility-side costs." This subset of the Make Ready Expansion Program, was renamed to the Small Site Rebate (SSR) Program, and launched in March 2023. According to SCE's website, the SSR Program provides a rebate to cover customer costs of up to

[7] For DCFC, the CPUC defined MUD-serving sites as being located within a two-mile radius of six or more residential MUDs.
[8] SCE, *Application 14-10-014, filed with the CPUC, October 30, 2014.*
[9] D. 16-01-023 p.2
[10] D. 18-12-006 p. 1
[11] SCE. *Advice Letter 4480E: Southern California Edison Company's Charge Ready 2 Low Port Rebate Program. October 28, 2022.*
[12] CPUC. *Resolution 5227: Approving Southern California Edison Company's Advice Letter 4480-E, Low Port Rebate Proposal for the Charge Ready 2 Program.* October 20, 2022.
https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M496/K876/496876103.PDF

$10,000 per port for approved sites that install up to four L2 ports, with the remaining $6,000 per port used to cover any utility-side upgrades if necessary.[13]

D. 20-08-045 also authorized SCE to offer a DCFC Program. In response, SCE submitted a Tier 3 Advice Letter (AL 4433-E)[14] on March 4, 2021, providing updated budget, port, and site counts. On March 31, 2023, SCE submitted a supplemental advice letter AL 4433-E-A[15]. In the original AL 4433-E, SCE discussed how customers may have limited interest in the site-host ownership option. However, in AL 4433-E-A, SCE stated that it reassessed the efficacy of offering a DCFC site-host ownership option and, upon launching the DCFC Program, would target the majority of the DCFC Program's projects to use this site-host ownership option. Moreover, in the supplemental advice letter, SCE provided estimated site and port counts and information regarding project cost-effectiveness in the section "The Number of Ports and Sites SCE will target through the DCFC component of the Make-Ready Expansion program."[16] Specifically, SCE stated, "due to the costly nature of infrastructure upgrades associated with higher-powered DCFC stations versus L2, it is likely that sites with 4 or more DCFC ports will be significantly more cost effective per port than 2-port sites where the cost is spread over fewer ports. It is likely that the program will install an estimated 50-60 sites as there will be fewer 2 port sites accepted into the program due to cost constraints and some participants may choose to install a greater number of ports, therefore reducing site counts." Moreover, SCE communicated that it does not anticipate installing more than 205 ports "due to limited funding and increased cost since SCE submitted the initial AL 4433-E on March 4, 2021." The CPUC approved AL 4433-E (as amended by AL 4433-E-A) with an effective date of November 2, 2023. Per the Decision[17], approximately $14 million has been allocated to the Program, comprising approximately $8.5 million for charging infrastructure and $5.5 million for charging station rebates.[18] SCE initially filed a request for an extension of the NCR Program in light of "external factors and delayed program uptake" on July 12, 2023 (AL 5073-E)[19], which was denied. SCE began accepting applications to the DCFC Program on April 1, 2024. On July 12th, 2024, SCE filed for an extension of application acceptance for SCE's Charge Ready 2 Infrastructure and Market Education Programs (AL 5334E).[20] SCE found that more time was needed for customer applications due to the introduction of the DCFC program and "several factors including market conditions, supply chain disruptions, and customer challenges." This request was approved on September 13, 2024, and the CRLD Program is expected to be open to receive applications through December 31, 2026, with installations through 2028.

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13 SCE. Small Site Rebate Program. https://www.sce.com/business/smart-energy-solar/charge-ready/small-site-rebate

14 SCE. *Advice Letter 4433E: Southern California Edison Company's Charge Ready 2 DCFC Site Prioritization Criteria, Updated Budget, Port and Site Count Targets.* March 4, 2021.

15 SCE. Advice Letter 4433E-A: *Southern California Edison Company's Charge Ready 2 DCFC Site Prioritization Criteria, Updated Budget, and Port and Site Count Targets.* November 14, 2023.

16 D. 20-08-045 directs SCE "to build at least 205 ports" with a minimum of 2 ports per site.

17 CPUC. *Resolution E-5290: Approving Southern California Edison's Plan for Site Prioritization, Budget, and Charging Port Targets for Direct Current Fast Charging Component of Charge Ready 2 Program.* November 2, 2023. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M520/K726/520726252.PDF

18 DCFC Program Guide, p.3

19 SCE. Advice Letter 5073-E*: Annual Charge Ready Report on the Effectiveness of the New Construction Rebate Program and Seeking a Program Extension Pursuant to Decision 20-08-04*. July 12, 2023.

20 SCE. Advice Letter 5334-E*: Notice of Timeline Extension Pursuant to Decision 22-11-040 Ordering Paragraph 2 for SCE's Infrastructure Programs Included in the Charge Ready 2 Infrastructure and Market Education Programs.* July 12, 2024.

2.4.1 Charging Station Requirements

In August 2022, the CPUC adopted EVSE communication protocols via D.22-08-024 as minimum qualification requirements for all EVSE installed via ratepayer funding or through an investor-owned utility (IOU)- administered program. Per this decision,[21] all EVSE deployed by July 1, 2023, must be capable of the following:[22]

- All alternating current (AC-) conductive EVSE for light-duty use cases must have an SAE J1772 connector.
- All direct current (DC-) conductive EVSE deployed for light-duty use cases must be equipped with a CCS connector.
- For all EVSE, communications and controls between a network service provider and the EVSE shall be capable of operating on OCA OCPP 1.6 or later.
- All EVSE must be International Organization for Standardization (ISO) 15118 ready and equipped with onboard hardware that enables high-level communications with the vehicle using ISO 15118. An ISO 15118-ready charger is capable of, at minimum, (1) a powerline carrier-based high-level communications as specified in ISO 15118-3; (2) secure management and storage of keys and certificates; (3) Transport Layer Security version 1.2, with additional support for Transport Layer Security 1.3 or subsequent versions recommended to prepare for future updates to the ISO 15118 standards; (4) receiving remote updates to activate or enable ISO 15118 use cases; (5) connection to a backend network; and (6) selecting the appropriate communication protocol used by the vehicle.

The CRLD Program cannot accept any customer Proof of Procurement documents for equipment procured on or after July 1, 2023, that is not ISO 15118-compliant. Any equipment procured by customers prior to July 1, 2023, does not need to be ISO 15118 compliant and is exempt from the D.22-08-024 minimum equipment qualifications for the CRLD Program.

2.5 Implementation Timeline

SCE launched the CRLD Program in July 2021 with a robust customer engagement effort. This effort included SCE account managers directly contacting customers about the CRLD Program, customer training sessions to introduce the CRLD Program to potential applicants, distributing marketing materials to SCE customers, and more. SCE also held mandatory live virtual training sessions for trade professionals who wanted to join the CRLD Program's Trade Professional Network and submit applications on behalf of customers.

From launch through 2024, the CRLD Program, particularly the Make Ready program options, has received consistently high market demand. This market demand remained high even after SCE sunset the charging station rebate offering in 2022 because the infrastructure coverage substantially reduces construction costs and is not typically covered by other EV charger incentive mechanisms in the market. In response to this high demand, SCE created an application waitlist for the Make Ready Expansion Program that was active from

[21] D. 22-08-024 p.45
[22] CPUC Vehicle-Grid Integration (VGI) Policy, Pilots, and Technology Enablement. https://www.cpuc.ca.gov/vgi/

September 2022 until early 2024. To ensure the CRLD Program met its DAC port installation targets, SCE only accepted applications from sites in DACs onto the Make Ready waitlist for the CIR, CSMR, and Turn-key Program offerings. Note that the SSR Program offering, a component of Make Ready, did not have an application waitlist and accepted both DAC and non-DAC applications. Additionally, the New Construction Rebate program has experienced less demand and will be phasing out of the portfolio in subsequent years, though will continue to accept applications through July 12 of 2025. During the 2024 program year, staff removed the waitlist and reopened applications to non-DAC sites. However, SCE continues to prioritize DAC sites in the application processes.

2.6 Application Pipeline

SCE removed the waitlist for the Make Ready Expansion Program in early 2024 and saw an increase in applications, particularly in the CSMR Program and the SSR Program, which was introduced in 2023. The DCFC Program, introduced in April 2024, received 218 applications through 2024. The DCFC Program used two application windows, open for two months each, rather than a rolling application basis, and received high interest with over 1,000 ports worth of applications. Applications for the CRLD program are given different statuses depending on the stage of the application process they are currently in. Each program has several tasks associated with the process and is further detailed in section 4.2. Please see the definitions of the several statuses that can describe CRLD applications. Several definitions vary slightly depending on the program and its associated sub-tasks.

- **Total applications:** Total applications include all applications that enter the pipeline, excluding applications that the customer has not formally submitted. The total application count includes active applications in the pipeline as well as rejected, withdrawn, or voided applications.
- **Number of ports requested**: The number of ports requested by the applicant in the initial application submission. The total number of ports requested is associated with the total number of applications submitted.
- **Active applications and ports**: Applications that are in the CRLD pipeline and have not been voided, rejected, or withdrawn, and the number of requested or committed ports (depending on the stage in the pipeline) associated with those applications.
- **Completed site**: A site is completed when it reaches a certain threshold in the application process that renders it “complete” from the program team's perspective. This threshold differs across the different program options since the structure of the application pipeline differs and does not necessarily indicate that a site is in operation.
    - **CIR/TK**: Applications pending installation and incentive request, or if the Commission Date field has been populated in the construction task.
    - **CSMR**: Applications pending installation and incentive request, or if the Energized Date field has been populated in the construction task.
    - **NCR**: If the Application Status is “Request payment” and the Form status is “Completed”
    - **SSR**: If it is an existing service, the Charger installation Completed Date is used. For new services, the electrical finish actual date is used.

- **DCFC**: Applications pending installation and incentive request, or if the Energized Date field has been populated in the construction task.

Committed ports: Committed ports are those for which a customer has signed a CRLD Program agreement, and SCE has reserved funds. The counts of committed ports do not include applications where the customer withdrew from the CRLD Program after signing the program agreement.

Table 2 summarizes program participation by CRLD Program offering. The table presents information on applications, sites, and ports moving through the application process for the various CRLD Programs. We provide counts of cumulative activity through both the 2023 and 2024 program years as applications typically span multiple program years.

Between 2023 and 2024, the CRLD Program saw steady streams of applications for its programs. Of all the programs in 2024, the CSMR Program received the highest number of applications, 317. The SSR rebate received the second-largest number of applications in 2024, with 264. The number of cumulative applications for SSR in 2023 compared to 2024 notably increased almost threefold, indicating a great increase in interest in this program. DCFC followed closely behind with 218 in 2024. The DCFC program saw 1,932 ports requested in 2024. The Turn-key program only saw 30 additional applications in 2024, including CIR and CSMR applications eligible for the maintenance and networking rebate. However, the number of ports in active applications more than quadrupled, from 437 cumulative in 2023 to 1,473 cumulative in 2024. No sites were completed for the DCFC program in 2024. The CIR Program completed the largest number of sites in 2024. From the beginning of the program to 2024, the CRLD Program has completed 235 sites.

Table 2. Cumulative Program Participation for Program Years 2023 & 2024

Program Option	Total Applications		Active Applications		Number of Applications Rejected / Withdrawn / Voided		Number of Completed Sites		Number of Requested Ports		Number of Ports in Active Applications	
	Cumulative 2023	Cumulative 2024	Cumulative 2023	Cumulative 2024	Cumulative 2023	Cumulative 2024	Cumulative 2023	Cumulative 2024	Cumulative 2023	Cumulative 2024	Cumulative 2023	Cumulative 2024
Make Ready: CIR	1,933	2,091	367	417	1,566	1,674	68	148	37,353	41,600	8,354	9,943
Make Ready: CSMR	1,061	1,378	340	549	721	829	17	43	26,195	34,942	10,449	15,871
Make Ready: Turn-key[a]	62	92	29	57	33	35	2	13	1,079	1,964	437	1,473
Make Ready: SSR[b]	139	403	120	234	19	169	0	6	520	1,492	449	869
Make Ready: DCFC	0	218	0	141	0	77	0	0	0	1,932	0	1,124
NCR	96	119	87	101	9	18	10	25	4,493	4,870	3,712	4,011
Totals	3,291	4,301	943	1,499	2,348	2,802	97	235	69,640	86,800	23,401	33,291

[a] Some applications and associated ports for Turnkey also include CIR or CSMR projects that are eligible for the maintenance and networking rebate.

[b] Please note that the definition of completed sites for the SSR sites and NCR sites slightly changed between 2023 and 2024.

Table 3 shows CRLD Program participation across CRLD Program offerings, DACs, and MUDs cumulatively (i.e., from the CRLD Program launch through the end of 2024). A key component of the CRLD Program's diversity and inclusion efforts is to ensure a level of participation from DACs and MUDs. Please note that some MUDs are in DACs; therefore, these categories are not mutually exclusive.

Table 3. SCE CRLD Applications, Completed Sites, and Number of Ports – Cumulative

Program Option	Total Applications			Active Applications			Number of Applications Rejected/ Withdrawn / Voided			Number of Completed Sites			Total Ports			Active Ports		
	DAC	MUD	Non-DAC/ MUD	DAC	MUD	Non-DAC/ MUD	DAC	MUD	Non-DAC/ MUD	DAC	MUD	Non-DAC /MUD	DAC	MUD	Non-DAC/ MUD	DAC	MUD	Non-DAC/ MUD
Make Ready: CIR	680	591	877	185	69	164	495	522	713	66	26	56	14,296	11,585	17,109	4,364	977	4,622
Make Ready: CSMR	357	943	309	194	455	53	163	488	256	3	29	11	9,969	25,372	5,735	5,676	12,742	1,306
Make Ready: Turn-key	92	92	0	57	57	0	35	35	0	13	13	0	1,964	1,964	0	1,473	1,473	0
Make Ready: SSR	107	182	135	65	90	94	42	92	41	2	1	3	400	672	498	245	334	348
Make Ready: DCFC[a]	94	0	124	66	0	75	28	0	49	0	0	0	952	0	980	606	0	518
NCR	30	119	0	26	101	0	4	18	0	9	25	0	1,135	4,870	0	874	4,011	0
Totals	**1,360**	**1,927**	**1,445**	**593**	**772**	**386**	**767**	**1,155**	**1,059**	**93**	**94**	**70**	**28,716**	**44,463**	**24,322**	**13,238**	**19,537**	**6,794**

Note: Some sites are qualified as DACs and MUDs; therefore, they are reported in columns for both market segments.

[a] SCE's DCFC Program has limited availability, and MUD customers are ineligible for the program because all chargers must be publicly accessible. As such, SCE has established criteria for acceptance into the program based on projected costs, location (i.e., DAC status), and proximity to MUDs, among other considerations to align with the goal of the program to provide access to fast charging to a higher concentration of residential customers who live and work in DACs and live in MUDs.

Table 4 displays the percentage of ports committed in 2024 in DACs and/or MUDs. In 2024, SCE prioritized applications for the Make Ready Program's CIR, CSMR, and Turn-key from sites located in a DAC. The share of DAC ports committed under the Make Ready offerings in 2024 was 62% (up from 60% in 2023). Table 5 shows the share of the 20,330 ports for the various CRLD Program offerings to date committed in DACs and associated with MUDs. Fifty-three percent of all ports committed through the Make Ready Program are in DACs (50% were located in DACs at the end of 2023). SCE also saw an increase in 2024 committed ports for the Make Ready offerings in MUDs as compared to 2023, which was 45%. In 2024, this rose to 71%, leading to the total of all committed ports expecting to surpass the program goal by the end of this program cycle.

In 2023, only 27% of the NCR Program's 2023 committed ports were in DACs. SCE markedly improved this trend in 2024, facilitating the commitment of 46% of the NCR Program ports in DACs. This has brought the total cumulative NCR ports committed in DACs up to 22%, indicating that SCE continues to work towards increasing DAC participation, but will ultimately fall short of the NCR Program offering's cumulative 50% DAC target.

As of the end of 2024, no DCFC applications had committed ports. Funds must be reserved via a signed program application to be considered a committed port, and no DCFC applications have funds reserved.

Table 4. Pipeline Charging Ports in DACs and MUDs (committed ports) – 2024

Program Option	2024 Committed Ports	
	DACs	MUDs
Make Ready: CIR & CSMR & SSR & Turn-key (N=3,425 ports)	62%	71%
CIR & CSMR (N=2,869 ports)	69%	76%
SSR (N=536 ports)	19%	38%
Turn-key (N=20 ports)	100%	100%
NCR (N=480 ports)	46%	100%

Table 5. Pipeline Charging Ports in DACs and MUDs (committed ports) – Cumulative

Program Option	Cumulative Committed Ports	
	DACs	MUDs
Make Ready: CIR & CSMR & SSR & Turn-key (N=16,319 ports)	53%	44%
CIR & CSMR (N=14,341 ports)	49%	39%
SSR (N=582 ports)	22%	36%
Turn-key (N=1,396 ports)	100%	100%
NCR (N=4,011 ports)	22%	100%

Table 6 Displays the cumulative counts of completed sites and installed ports by Program option from the launch of the CRLD Program in 2021 through 2024.

Table 6. Completed Sites & Port Installations – Cumulative

Program Option	Completed Sites	Installed Ports
Make Ready: CIR	148	2,672
Make Ready: CSMR	43	575
Make Ready: SSR	6	18
Make Ready: Turn-key	13	288
NCR	25	535

3. Marketing, Outreach, and Education Efforts

In March of 2024, the CRLD Program resumed marketing for the CRLD Program. Marketing methods included email campaigns and paid social media. These campaigns targeted customers in DACs, MUDs, and smaller commercial segments (including golf courses, churches, and small businesses). In addition to resuming marketing campaigns, SCE prioritized one-on-one customer engagement efforts through the development of a designated five-person team. This team focused on customers who fell within these prioritized market segments and did not have an assigned account manager. The goal of the one-on-one engagement was to increase touchpoints and to provide more assistance to customers navigating the application process while reaching program goals. In 2024, SCE received over 1,200 leads through these marketing efforts, and interest in the program continues to be high.

During the 2024 program year, CRLD program staff observed market-wide knowledge gaps among customers and other market actors about the complexities of EV infrastructure projects. Specifically, program staff reported that customers have unrealistic expectations of project costs, particularly those interested in the DCFC Program, as project costs tend to be much higher than those of L2 charging sites. Further, staff needed to provide a lot of support for customers unfamiliar with the technical requirements to install EV charging equipment, particularly those who own or operate MUDs. Finally, according to program staff, customers and market actors continued to have unrealistic expectations of the permitting process and the timeline it takes to complete EV infrastructure projects in 2024. CRLD staff attributed this lack of understanding to many applications and site plans that did not meet SCE's requirements, particularly for CSMR. SCE noted that more staff resources are required to fully support the MUD applications and the gaps in market knowledge.

SCE also maintains a qualified network of trade professionals (e.g., EV service providers, electricians, etc.). Qualified trade professionals work to assist customers through the application and installation process and can submit applications to the CRLD Program on behalf of the participant (i.e., their customers). Customers can also select to assign a rebate to their selected trade professionals directly. These trade professionals are responsible for bringing in the majority of applications to the CRLD Program. To ensure high-quality applications and maintain high interest in the program, a focus for the CRLD program team in 2024 was building upon the existing network of trade professionals. SCE held four training courses throughout the year for new trade professionals. These training courses aimed to educate trade professionals on program eligibility, requirements, and application processes.

Additional focused outreach and educational activities during the 2024 program year included:

- SCE collaborated with the Apartment Owners Association and attended their conferences to gain insights into multi-family outreach.
- SCE updated the CRLD website to reflect the most current program information and standardized language site-wide to make content more consistent and understandable to a broader audience.
- Through the TEAS Program, SCE offered Load Management Plans (LMP). These complementary analyses of customers' charging behavior provide tailored recommendations to help customers avoid costly on-peak charging, lower electricity bills, and minimize grid strain.

4. Program Metrics

This section presents the requirements for customers to qualify for the CRLD Program, the location of committed ports by industry sector, and metrics that demonstrate the performance of the CRLD Program.

4.1 Participant Selection Criteria

As noted in SCE's First Annual Charge Ready 2 Report, applications must meet several eligibility criteria to qualify for the CRLD Program:

- Be a non-residential SCE customer.
- Own, manage, lease, or be the customer of record of the property in SCE's service area where chargers are installed.
- Obtain consent to install chargers from the property owner if the applicant is not the property owner.
- Enroll in an applicable TOU rate plan and DR Program.
- Select, purchase, and install SCE-approved charging equipment (note that all charging stations are required to be networked).
- Operate and maintain charging equipment for a minimum of ten years.
- For the ten-year duration, provide data related to charging equipment usage to SCE (including prices charged to EV drivers using the charging stations).
- Provide a property easement for SCE's infrastructure.
- Agree to additional CRLD Program terms and conditions.

Participants must submit their applications for the CRLD Program through an online application portal. Applicants provide their name, site address, requested port count, proposed site layout, and other relevant information for a potential Charge Ready project. Each submission, excluding SSR and NCR applications, requires applicants to include at least four L2 charging ports or two L3 charging ports if applying for the DCFC program. No L1 chargers are on the Approved Product List due to not having the required networking capabilities. Applicants are removed from consideration if they do not meet the basic eligibility requirements. SCE account managers conduct individual customer consultations for each site to review the eligibility requirements, CRLD Program requirements, proposed site layout and port count, easement and agreement language, and electrification plans. SCE recommends that applicants review the approved product list early and discuss the potential equipment options and pricing with vendors before they sign an official CRLD Program agreement.

SCE also performs initial cost analysis, including potential construction costs and desktop and on-site assessments to review the project feasibility. SCE evaluates each application using several criteria and decides whether to approve it for inclusion in the CRLD Program. The critical information includes overall costs for the site, average per-port costs, CRLD Program objectives such as DAC and MUD goals, overall site viability, availability of charging in the region, and the level of remaining CRLD Program funds. SCE will also assess the applicant's ability to meet timing requirements for charging station procurement and installation, as well as post-installation CRLD Program terms.

4.2 Participation Process and Timeline

Table 7 outlines the stages of CIR and CSMR projects. Customers submit applications to the CRLD Program that include a high-level site plan and equipment layout. SCE's eMobility team conducts an initial screening to ensure the customer qualifies for the CRLD Program and that the application is complete. Following this, SCE conducts a consultation review to confirm application details, followed by a site assessment. As part of the site assessment, SCE's Transportation Electrification Project Management (TEPM) project manager uses Google Earth and internal mapping systems to identify existing infrastructure in the area that could potentially serve as a power source for the site. After this desktop review, if there are no initial issues with the site identified, an on-site assessment is typically required to confirm site conditions. The remaining steps include the customer signing an agreement to reserve funds, customer submission of proof that the customer has ordered the charging infrastructure equipment, final site design and permitting, and site construction. The CRLD Program conducts on-site inspections of all infrastructure and charging stations for proper installation specifications to ensure safety. The final stage is the payout of the incentive payment if the customer qualifies for one.

Table 7. High-Level Descriptions of CIR and CSMR Project Stages

Project Stage	Description
1. Customer Application Submission	Customer creates and submits an application. While the customer is creating the application, it is not active until the customer officially submits it. Then, it enters into the eMobility Application Screening.
2. eMobility Application Screening	SCE reviews the application for completeness. SCE determines the DAC status of the application. When the application is in this stage, it is considered active.
3. Customer Engagement Division (CED) Customer Consultation Review	The customer conducts a consultation review with their assigned account manager to discuss the program and verify that the information they submitted in the application is still accurate. Customers may change their application(s), including charging station location and port count requested.
4. TEPM Site Assessment	The field project manager completes a desktop review. The field project manager completes a site assessment if the desktop review does not disqualify the applicant; some sites are sent back to Task 3 for rejection or updating based on the desktop review. The field project manager creates the conceptual design and cost estimate for the site.
5. eMobility Review and Approval	The eMobility project management team reviews the application to see if it meets program cost thresholds. This stage involves the most site rejections due to the cost limitations of the CRLD program.
6. Awaiting Customer Approval of Conceptual Design (CIR Only)	The customer reviews the conceptual design. If accepted, the customer moves to the next stage. The customer has 10 days to accept the conceptual design.
7. Agreement Preparation	The eMobility project management team prepares and sends the program agreement.
8A. Awaiting Customer Agreement	SCE sends the program agreement to the customer. The customer has 30 days to accept the agreement.
9A. Funds Reserved	The customer signs the program agreement and reserves funds for their site's construction.

Project Stage	Description
8B. Waiting Proof of Procurement	A notice is sent to the customer to provide their proof of procurement for charging stations from SCE's approved product list. The customer has 45 days to provide a purchase order/receipt.
9B. CSMR Customer Site Plan Submission	CSMR Program customers must submit their site plan for the beyond-the-meter work they will complete.
10. TEPM Project Design	The project goes through the final design development.
11. Awaiting Customer Design Acceptance	The customer accepts the final design.
12. Project Requirements	After the final design is completed and approved by the customer, SCE requests necessary permits and sends easements to the property owner (who has 30 days to sign and return the easement).
13. Construction	Construction
14. Pending Installation and Incentive Request	The customer submits a request for incentive payment with supporting documentation, including purchase and installation invoice and any permitting and inspection documentation; the customer installs charging stations.
15. Incentive Site Review	SCE completes site inspection.
16. Incentive Review	SCE reviews the incentive request for completeness.
17. Incentive Payment	SCE issues payment for the incentive (if applicable).

Table 8, Table 9, and

Table 10 outline the stages of the NCR, SSR, and DCFC projects.

Table 8. High-Level Descriptions of the NCR Project Stages

Project Stage	Description
1. Project Submission	The customer creates and submits an application; SCE does not consider an application submitted until it reaches Reservation Review.
2. Reservation Review	SCE reviews the application for completeness; SCE confirms the DAC status of the application. If application meets the program requirements, funds are reserved.
3. Pending Installation and Incentive Request	The customer has 36-months to install the charging stations and request the incentive. Once chargers are installed and operational, the customer submits a request for incentive payment with supporting documentation, including purchase and installation invoices and any permitting and inspection documentation.
4. Incentive Site Review	SCE reviews requests for incentives for completeness and determines if a site inspection is required.
5. Incentive QA Review	SCE completes site inspection and determines if the installation has met all program requirements. If all program requirements are met, the applicant moves forward for incentive payment.
6. Incentive Payment Approval	SCE issues rebate payments to the customer.

Table 9. High-Level Descriptions of the SSR Project Stages

Project Stage	Description
1. Customer Application Submission	The customer completes and submits the online application, which is accessed through the online CRLD Program enrollment portal. The application must include a Site Plan with the preferred location(s) of the charging equipment. This is the project submission phase, also called the project funding request.
2. SCE Screens Application	SCE receives and screens applications to determine initial eligibility for SSR Program participation. The customer must respond to any application-related inquiries from SCE. Once the application is in this stage, it is considered active.
3. SCE Infrastructure Assessment & Site Evaluation	SCE performs a site evaluation to collect information needed to evaluate the project further and develop a conceptual infrastructure design for customers seeking the installation of new meter service & make-ready infrastructure.
4. SCE Reservation of Funds	SCE reserves project funds once program application criteria are met and the participant has executed the program agreement.
5. Existing Service Assessment	The customer must evaluate existing service capacity and organize any necessary upgrades to support EV charger installation (for applications using existing service only).
6. Complete Site Design & Purchase EV Chargers (Existing Service Connection Participants)	The customer completes site design and performs any required upgrades to support EV charger installation and purchases EV chargers listed on SCE's approved product list. The customer must also submit a copy of the purchase order, paid invoice, or sales receipt for charging equipment to SCE. The customer must also submit a verification of panel inspection from the local AHJ.

Project Stage	Description
7. Make-Ready Design & Build (New Service Connection Participants)	Customers seeking to install new meter service & make-ready infrastructure complete additional steps. These involve the customer completing a detailed make-ready infrastructure design, providing approval for SCE's utility-side infrastructure design, granting an easement to SCE, securing relevant permits, and managing the construction of the customer-side infrastructure. SCE simultaneously completes any necessary utility-side infrastructure work and energizes the new site once the participant has completed construction and received all necessary AHJ approvals.
8. Install Charging Equipment	The customer installs the EV charging equipment.
9. Incentive Request Submission	The customer initiates an incentive request through the enrollment portal and must submit the associated documentation. The required documents include the final equipment purchase invoice, final invoices for charger installation, verification of any applicable final inspections/permits, and a completed Charging Equipment Registration form.
10. Incentive QA Review & Equipment Installation Verification	SCE reviews the incentive request and associated documentation for completeness. If complete, SCE verifies that the new service account is activated (if applicable) and performs a final installation verification.
11. Incentive Payment	Following a final review of all required documentation and a site visit (if applicable), SCE initiates the rebate payment to the customer.

Table 10. High-Level Descriptions of the DCFC Project Stages

Project Stage	Description
1. Customer Application Submission	Customer creates and submits an application. While the customer is creating the application, it is not active until the customer officially submits it. Then, it enters into the eMobility Application Screening.
2. eMobility Application Screening	SCE reviews the application for completeness. SCE determines the DAC status and MF proximity of the application. Once the application is in this stage, it is considered active.
3. TEPM Desktop Review	The field project manager completes a desktop review. The field project manager moves the application to CED Consultation review if the desktop review does not disqualify the applicant; some sites are sent back to Task 2 for rejection or updating based on the desktop review.
4. Customer Engagement Division (CED) Customer Consultation Review	The customer conducts a consultation review with their assigned account manager to discuss the program and verify that the information they submitted in the application is still accurate.
5. TEPM Site Assessment	The field project manager continues the evaluation process by performing a physical site assessment. With the information collected during the site visit, the field project manager further evaluates the project feasibility and develops a conceptual infrastructure design (known as the T&D Narrative). An engineering capacity study is completed if needed (depending on the load request). The applicant cannot make any changes to the port count or site location after the site visit has been completed, unless instructed to do so by SCE.
6. Site Review & Agreement Preparation	The eMobility project management team reviews the application to see if it meets program cost thresholds and qualifies to move forward. If the project meets program criteria, cost thresholds, and other considerations, the eMobility project management team prepares and sends the program agreement along with the T&D narrative for the applicant to review. The Agreement outlines the Customer-Side Make-Ready infrastructure and Charging Station rebate amounts the applicant is eligible to receive.
7. Awaiting Customer Agreement & Proof of Procurement	The customer has 60 days to accept the agreement and provide their proof of procurement for charging stations from SCE's approved product list.
8. Funds Reserved	The customer signs the program agreement and submits their proof of procurement for charging stations. Once the agreement and proof of procurement is approved, eMobility project management team reserves funds for the project.
9. Customer Site Plan Submission	Program participant must develop and submit their site plan for the beyond-the-meter work they will complete.
10. Site Plan Review	SCE reviews the submitted site plan to ensure completeness.
11. TEPM Project Design	The project goes through the final design completion.
12. Awaiting Customer Design Acceptance	The customer accepts the final design.
13. Project Requirements & Construction	After the final design is complete and approved by the customer, SCE requests necessary permits and sends easements to the property owner (who has 30 days to sign and return the easement). Participant is then responsible for managing and coordinating all customer-side infrastructure related installation work and complying with labor and safety requirements. SCE is responsible for completing the utility-side infrastructure work.
14. Pending Installation and Incentive Request	The customer submits a request for incentive payment with supporting documentation, including purchase and installation invoice and any

Project Stage	Description
	permitting and inspection documentation; the customer installs charging stations.
15. Incentive Site Request	SCE completes site inspection.
16. Incentive Review & Payment	SCE reviews the incentive request for completeness. SCE issues payment for the incentive.

Figure 2 presents the distribution of active CIR, CSMR, and Turn-key Program applications that have been submitted to the CRLD Program and are moving through the application review process.

Figure 2. Active CIR, CSMR, & Turn-key Applications by Application Stage (Program Launch through 2024)

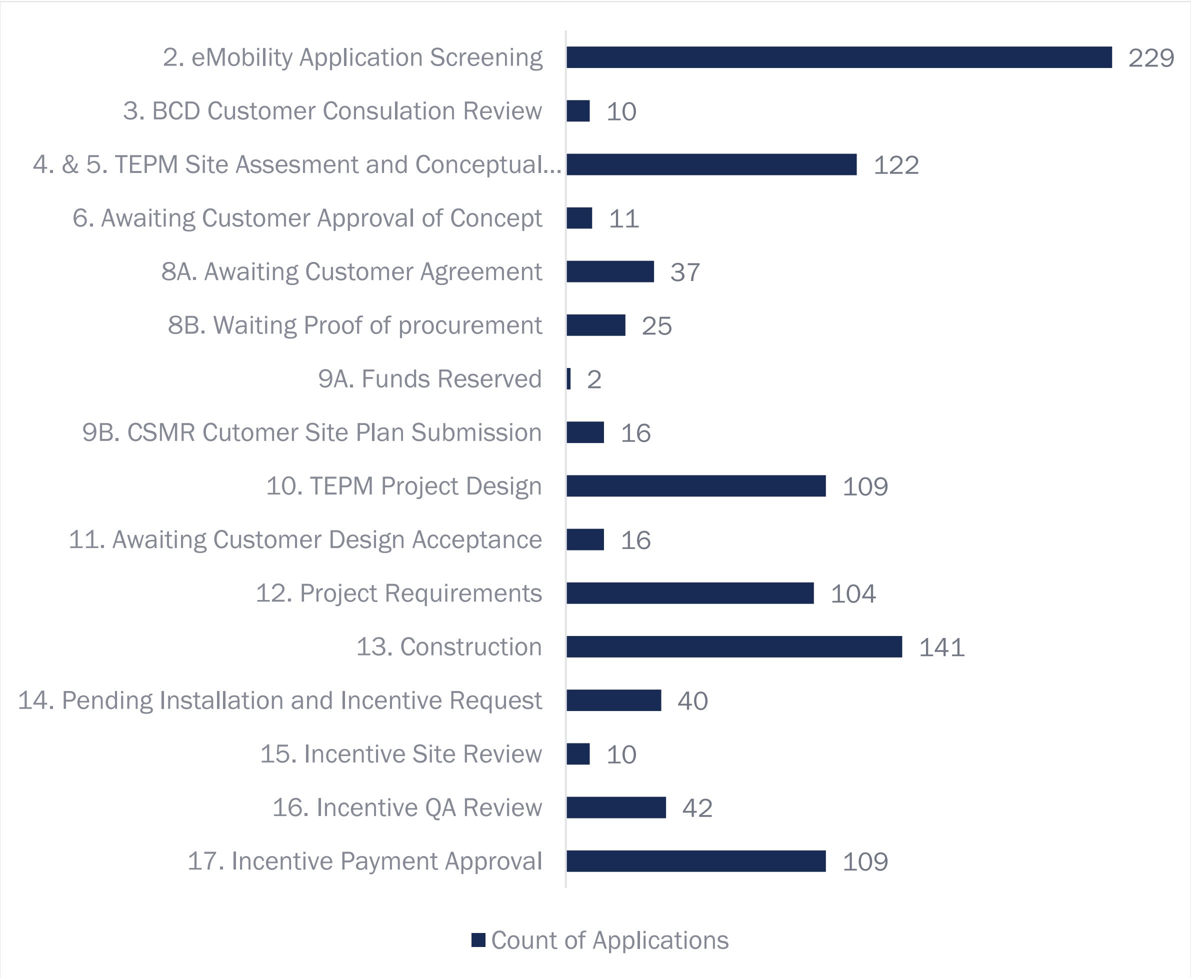


Figure 3 presents the distribution of active NCR applications that have been submitted to the CRLD Program and are moving through the review process. This figure shows that, at the end of 2024, all active NCR applications that have not been completed are in the “Pending Installation and Incentive Request” application stage.

Figure 3. Active NCR Applications by Application Stage (Program Launch through 2024)

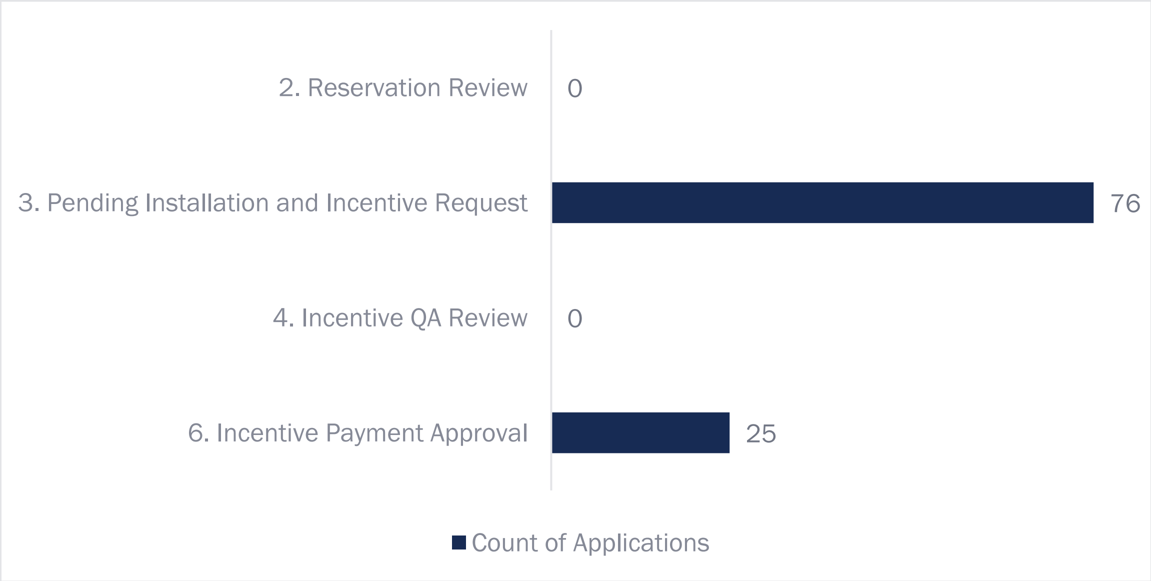


Figure 4 presents the distribution of active SSR applications that have been submitted to the CRLD Program and are moving through the review process.

Figure 4. Active SSR Applications by Application Stage (Program Launch through 2024)

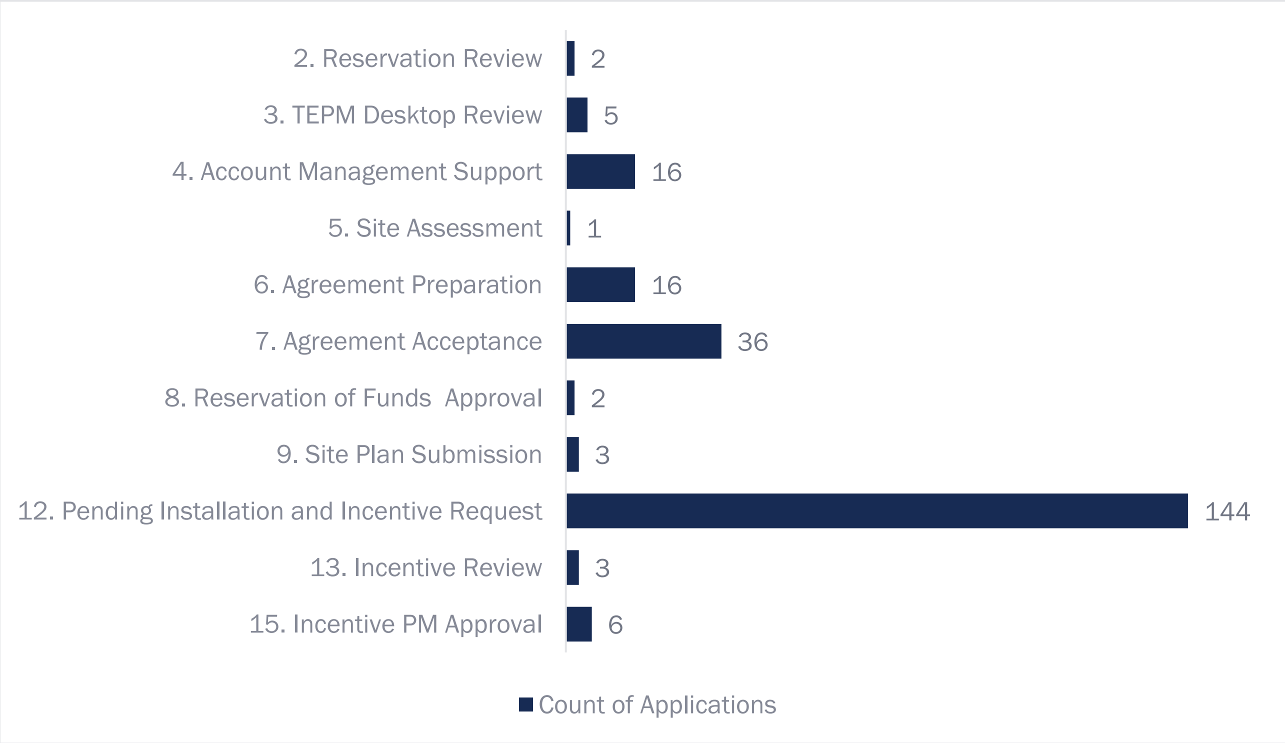
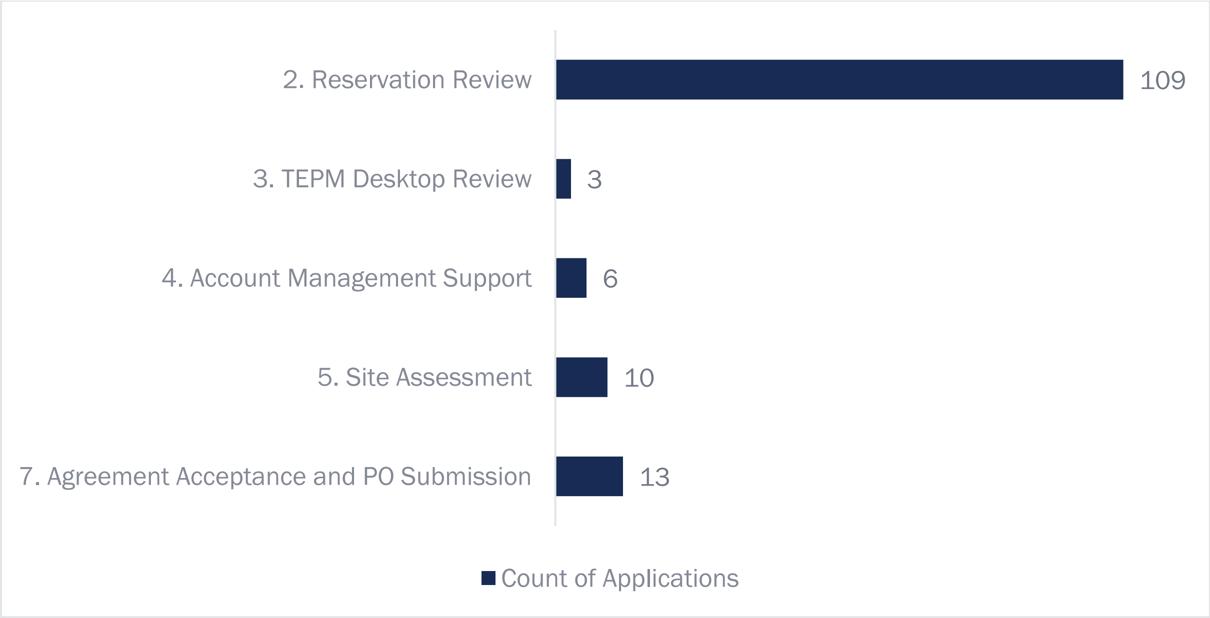


Figure 5 presents the distribution of active DCFC applications that have been submitted to the CRLD Program and are currently being reviewed. Due to limited DCFC program port availability (205 ports), many applications are on hold in 'Reservation Review' application stage, as the program processes 230 ports in application stage 3 and beyond.

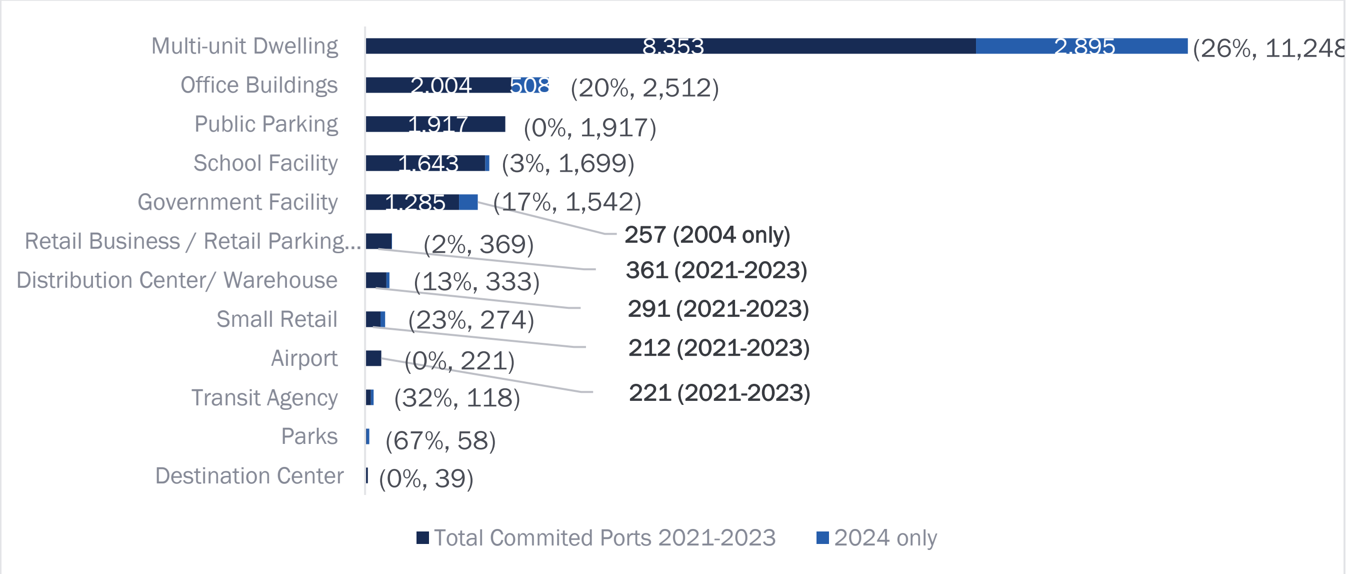
Figure 5. Active DCFC Applications by Application Stage (Program Launch through 2024)



4.3 Participant Market Segment

Figure 6 shows the breakdown of ports committed through the Make Ready Expansion and Turn-key Program options by market segment. Participants committed 3,905 total ports in 2024, about 19% of the ports committed to date. The three largest segments that committed ports through 2024 include MUDs (2,895), office buildings (508), and government facilities (257). Note that only MUD customers are eligible to apply for a New Construction Rebate, and, as such, we did not include ports committed through the NCR Program in the figure below.

Figure 6. Industry Breakdown of Committed Ports in 2024



4.4 Load Management & Grid Integration

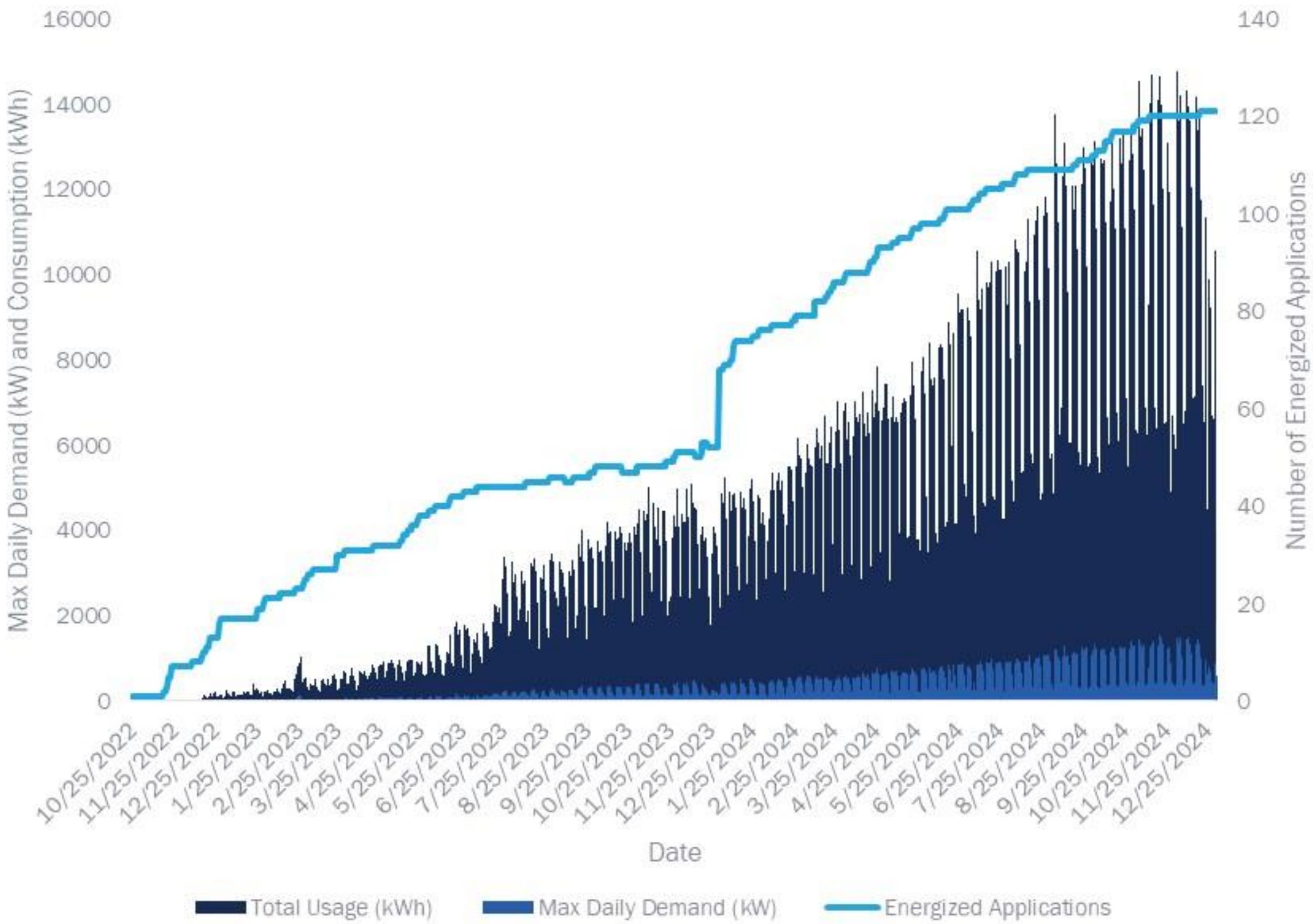
This subsection illustrates charging patterns of energized charging stations and how they differ across market sectors, times of day, weekdays versus weekends, and community types (DAC and non-DAC).[23] Advanced Metering Infrastructure (AMI) data are used for these analyses as they represent the most accurate and complete data source. In future evaluations, the evaluation team plans to leverage charger telematics data to provide more granular insights on charging ports and individual charging sessions.

Aggregated energy consumption generally increased from October 2022 to December 2024 as the number of energized applications also increased. Figure 7 shows total energy consumption, maximum daily demand, and the number of unique energized applications over time. As anticipated, the number of energized applications increased over time, and as more chargers became operational, total consumption rose. In 2023, the highest recorded daily consumption was 5,276 kWh, and the lowest was 91 kWh. In 2024, the highest daily consumption, 14,772 kWh, was recorded on December 2, nearly triple the 2023 maximum.

[23] Throughout this section, energized applications will refer to applications in which AMI data were available; it does not reflect the total number of completed applications.

The lowest daily consumption was recorded on January 27 at 1,989 kWh, nearly 22 times the minimum daily demand in 2023.

Figure 7. Total Energized Applications and Usage Over Time



A rise in average charging station usage may also contribute to this upward trend. For instance, the number of energized applications remained relatively stable from August to September 2024, while total usage gradually increased during that time, aligning with the overall trend. Furthermore, the average daily consumption per energized application nearly doubled from 2023 to 2024, increasing from 41 kWh to 74 kWh (Table 11).

Table 11. Average Daily Consumption per Energized Application by Year

Year	Average Consumption per day per energized application (kWh)[24]
2023	41

[24] Average consumption for 2021 and 2022 is not reported due to insufficient data.

Year	Average Consumption per day per energized application (kWh)[24]
2024	74

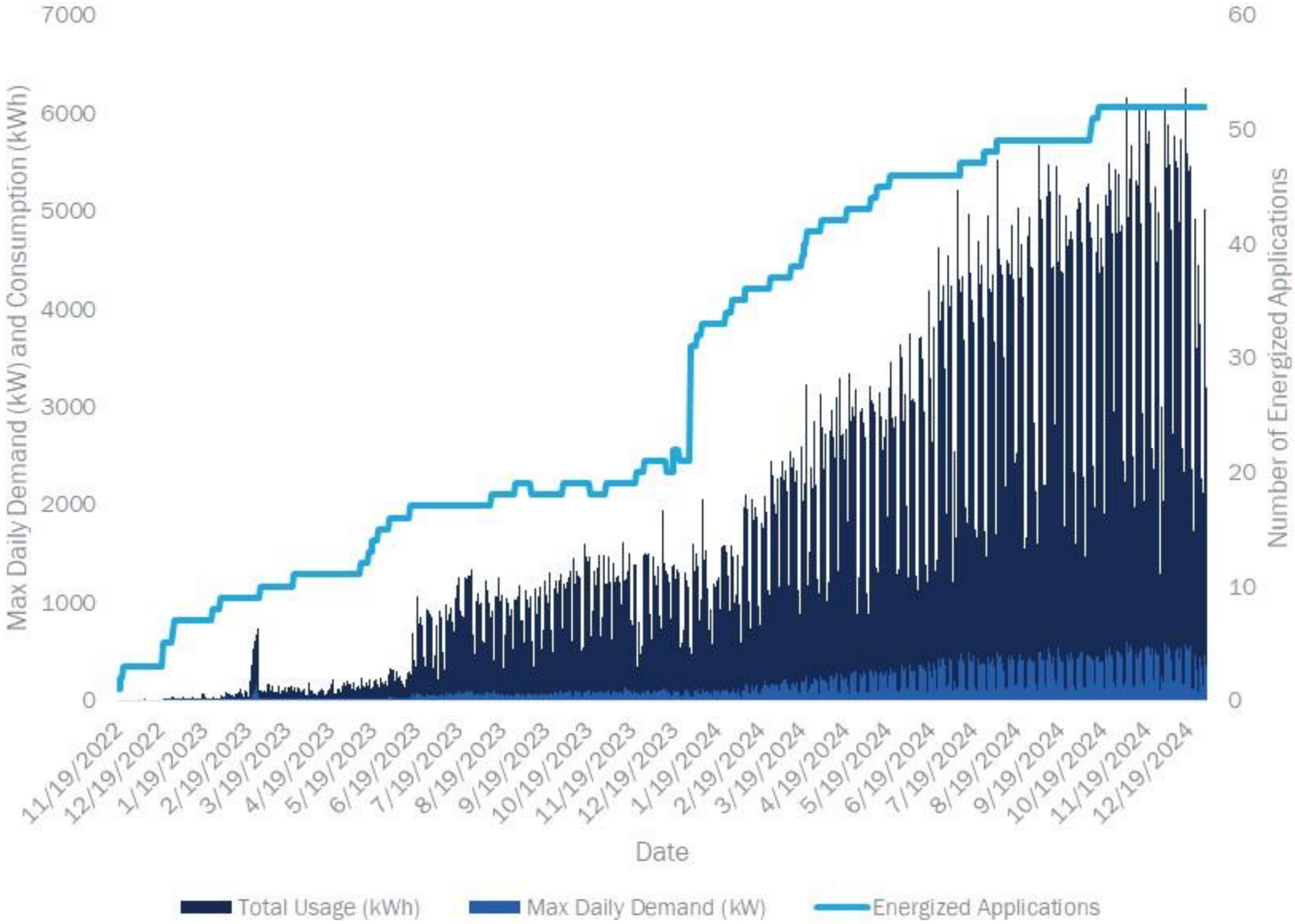
Of the energized applications contributing to overall consumption, just under half were in DACs. Compared to the number of applications, DAC applications constitute a slightly lower percentage of total usage, comprising 43% of all applications and 39% of total usage (Table 12). Non-DAC applications represent 57% of total applications but contribute 61% of total usage. This suggests that, on average, non-DAC sites have slightly higher usage per energized application than DAC sites. The following sections explore these differences in charging patterns in more detail.

Table 12. Average kWh and Percent Total Usage: DAC vs. Non-DAC

Group	Unique Energized Applications (121)	% Total Usage (3,419,004 kWh)
DAC	43%	39%
Non-DAC	57%	61%

The consumption trends observed in energized DAC applications mirror those in all energized applications. Figure 8 shows total energy consumption, maximum daily demand, and the number of unique energized applications in DACs over time. Like the overall trend for energized applications, there is a consistent increase in energy consumption over time. The highest daily consumption in 2024 occurred on December 16, 2024, totaling 6,251 kWh, whereas the lowest was recorded on January 1, at just 486 kWh. In previous years, fluctuations in usage at specific sites influenced overall consumption trends. However, as the number of operational chargers increased, the impact of site-specific fluctuations on total consumption diminished.

Figure 8. Total Energized Applications and Usage Over Time (DAC)



This rise in consumption follows an increase in energized applications; however, the increased use of charging stations may also contribute to this upward trend. From May 2024 to early July, the number of energized DAC applications remained constant, but the usage gradually increased. Additionally, as illustrated in all energized applications, the average daily consumption per energized DAC application nearly doubled from 2023 to 2024, increasing from 34 kWh to 65 kWh (Table 13).

Table 13. Average Daily Consumption per Energized DAC Application by Year

Year	Average Consumption per day per energized DAC application (kWh)
2023	34
2024	65

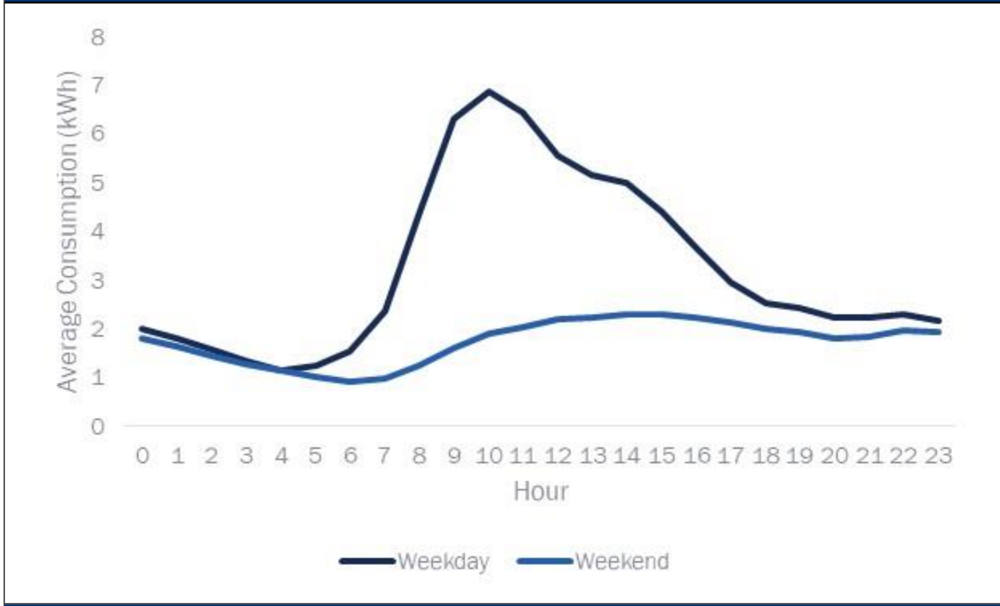
4.4.1 Charging Patterns

Across all energized applications, most charging load occurs during the middle of the day. The program-to-date average charging load for energized applications by day type and community type is plotted in Figure 9. The average weekday load is highest in the mid-morning hours, peaking around 10:00 a.m. and gradually decreasing throughout the day. Overnight charging loads are relatively low. In contrast, weekend charging loads are lower than those on weekdays, with a peak around 2:00 p.m. While the weekend charging load is consistently less than on weekdays, the loads are more similar during overnight and early morning hours.

Energized applications in DACs show the same general trends. However, there are slightly more significant differences in the load between weekdays and weekends during the overnight hours. These differences are minor and may be driven by different compositions of market sectors (explored in more detail below). They may also be impacted by individual, high-usage applications that drive overall trends.

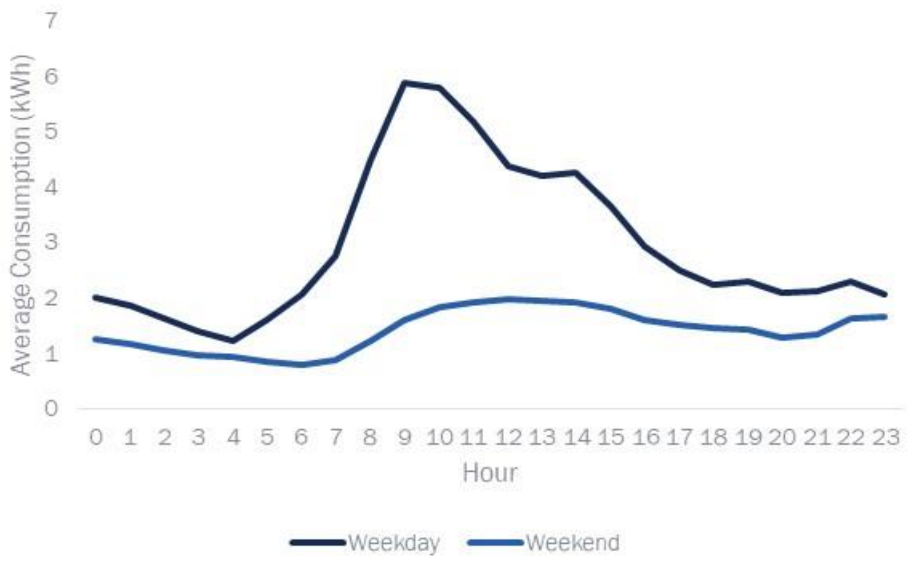
Figure 9. Program-to-Date Average Hourly Demand of Energized Applications by DAC Designation and Day Type

Overall (n = 121)



DAC (n = 52)

Overall (n = 121)



Note: Aside from minor variations in the average consumption levels, there are no significant differences between program-to-date load shape trends and 2024. Y-axes differ between graphs.

Table 14 provides a detailed breakdown of the percentage of energized applications and their usage by market sector, categorized by DAC and non-DAC. In both DACs and non-DACs, office buildings represent a larger share of total energy usage compared to their proportion of energized applications. Among the 52 energized applications in DACs, office buildings account for 33% of the applications and 43% of the total energy consumption. In non-DACs, office buildings make up only 23% of the 69 energized applications, yet they contribute to 51% of the energy usage.

Public parking and retail center energized applications account for a proportional share of total usage relative to their share of applications in both DACs and non-DACs. Public parking comprises 15% of energized applications in DACs and 13% of total usage, while retail centers account for 13% of energized applications and 8% of total usage. In non-DACs, public parking makes up 22% of energized applications and 22% of total usage, and retail centers represent 6% of energized applications and 3% of total usage. MUD applications account for a much smaller percentage of total usage compared to their share of energized applications. In DACs, MUDs account for 19% of energized applications and just 6% of the load; in non-DACs, they represent a third of energized applications but only 11% of the load. The percentage of energized applications in all other market sectors is slightly higher in DACs at 19% compared to 16% in non-DACs. However, applications in these sectors constitute a more significant percentage of total energy usage in DACs at 31%, while in non-DACs, they account for only 13%.

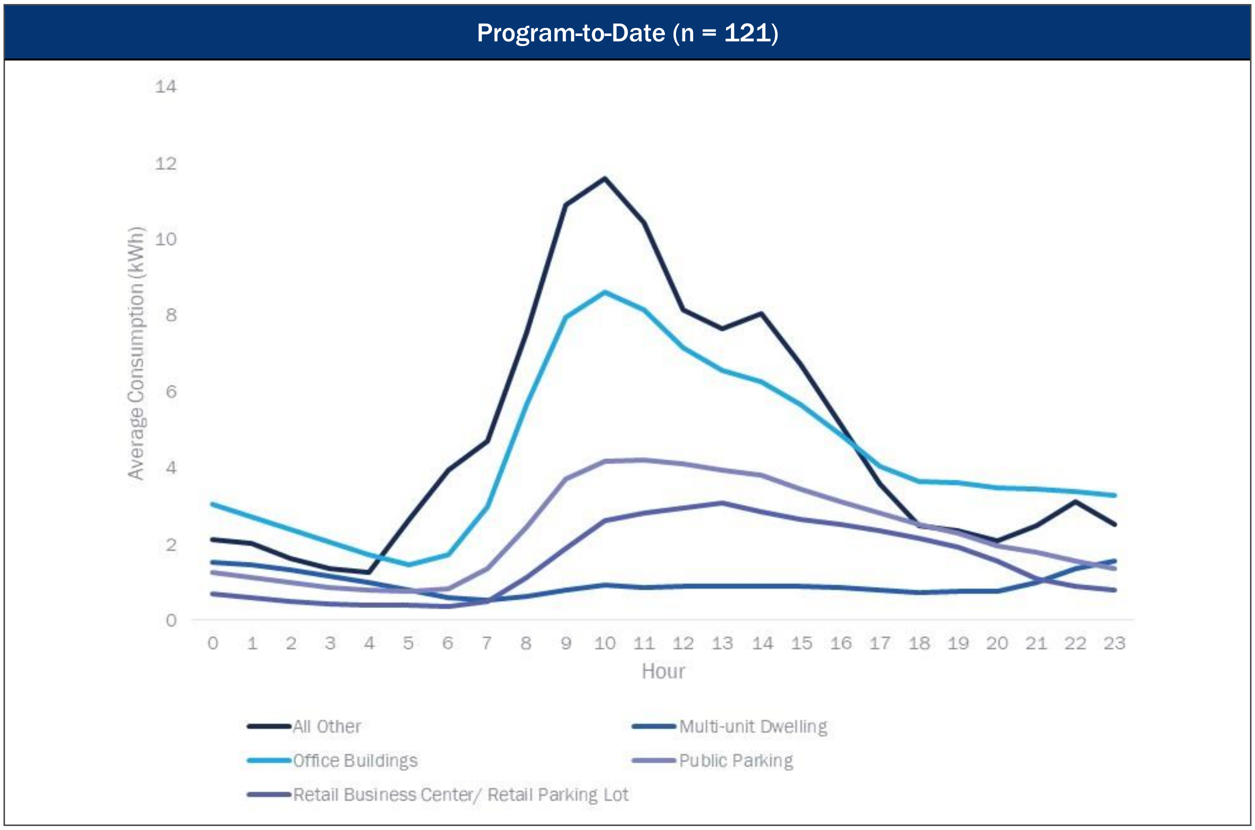
Table 14. DAC and Non-DAC Percent Energized Applications and Total Usage by Market Sector

Market Sector	DAC		Non-DAC	
	Percentage of Energized Applications (n=52)	Percentage of Total Usage (1,329,438 kWh)	Percentage of Energized Applications (n=69)	Percentage of Total Usage (2,089,566 kWh)
Office Buildings	33%	43%	23%	51%
Public Parking	15%	13%	22%	22%
MUD	19%	6%	33%	11%
Retail Business Center / Retail Parking Lot	13%	8%	6%	3%
All Other*	19%	31%	16%	13%

Note: Due to low counts, the following market sectors have been classified as other: Distribution Centers/Warehouses, Government Facilities, Airports, and School Facilities.

Figure 10 displays the 24-hour load shapes categorized by the market sector. Charging predominantly occurs during the daytime across most sectors, peaking in the mid-morning hours. The notable exception is MUDs, which experience more overnight load. Office buildings and the "all other" market sectors peak around 10:00 a.m., after which average demand decreases. All other sectors have a second, less distinct peak around 2:00 p.m., which is significantly lower than the morning peak. Public parking and retail centers follow a similar pattern, although their peaks are less pronounced. Conversely, MUDs peak around midnight and maintain a flat demand throughout the day, reflecting this sector's more prevalent overnight charging. The average load shapes per market sector are relatively consistent in 2024 compared to overall program-to-date trends.

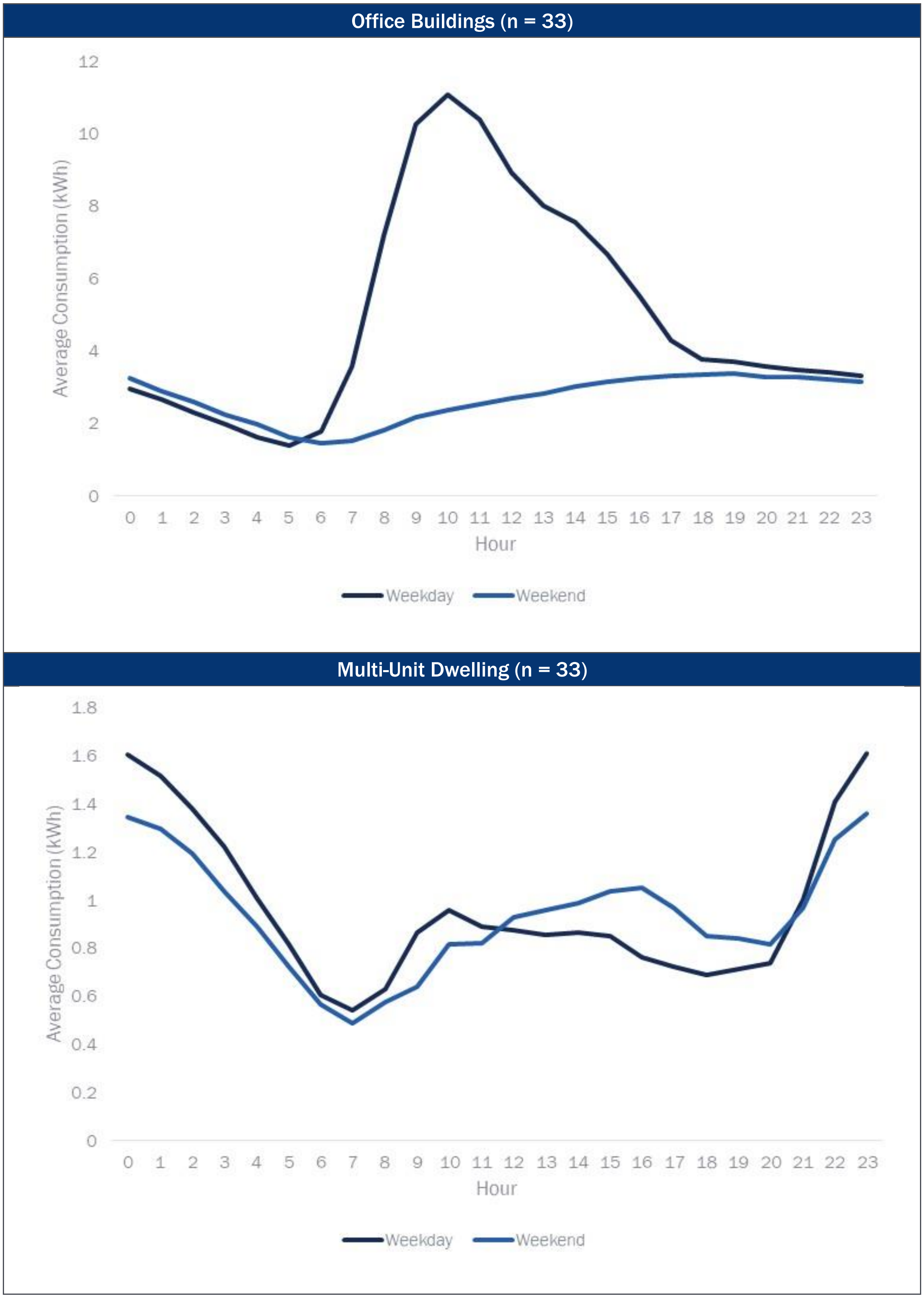
Figure 10. Program-to-Date Average Hourly Demand by Market Sector



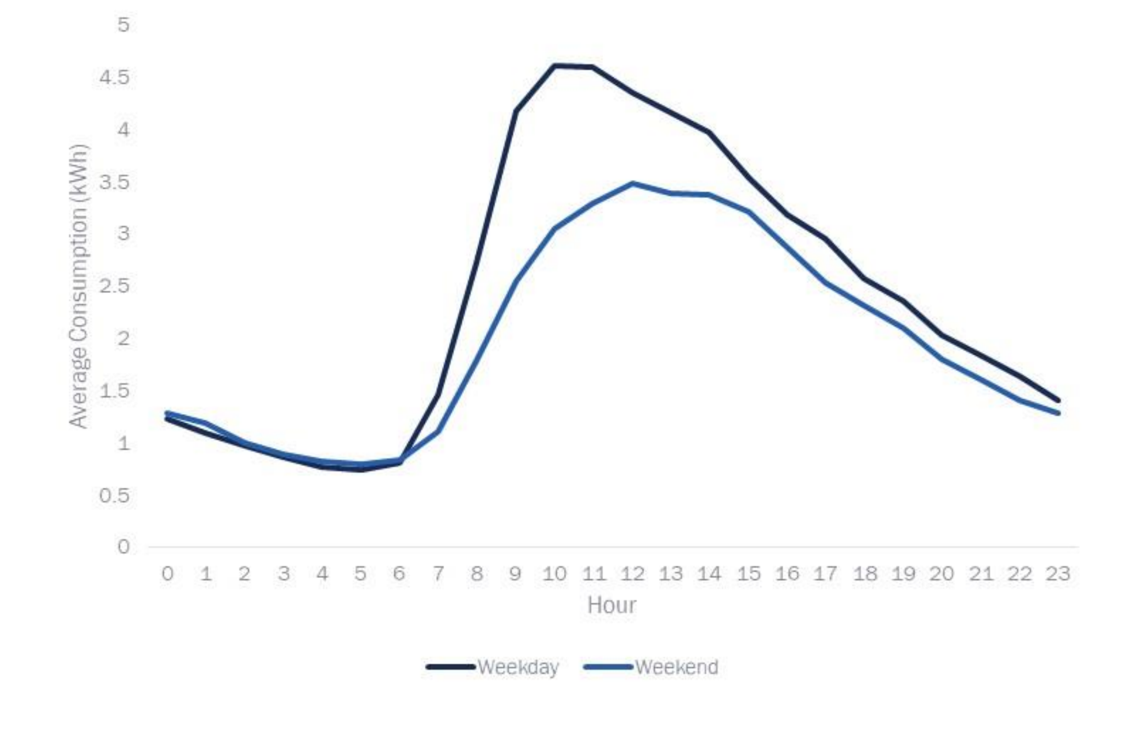
Note: Due to low counts, the following market sectors have been classified as “all other”: Distribution Centers/Warehouses, Government Facilities, Airports, and School Facilities. Aside from minor variations in the average consumption levels, there are no significant differences between program-to-date load shape trends and 2024.

Figure 11 compares charging patterns on weekdays versus weekends across the different market sectors. As expected, office buildings exhibit notably different average load shapes on weekdays compared to weekends. On weekdays, office building loads increase in the morning as employees arrive for work, reaching a peak in mid-morning before decreasing in the afternoon. In contrast, weekend loads are generally lower and more evenly distributed throughout the day. MUDs exhibit more consistent consumption patterns between weekdays and weekends, with peaks occurring overnight in both cases. Public parking and retail centers mainly experience charging during the daytime on weekdays and weekends. In these sectors, slightly higher consumption and an earlier peak are observed on weekdays compared to weekends. All other market sectors display a similar trend to office buildings, with minimal weekend load and significant weekday load that peaks in the mid-morning hours. Aside from minor variations in the average consumption levels, there are no significant differences between the program-to-date load shape trends and the trends observed in 2024

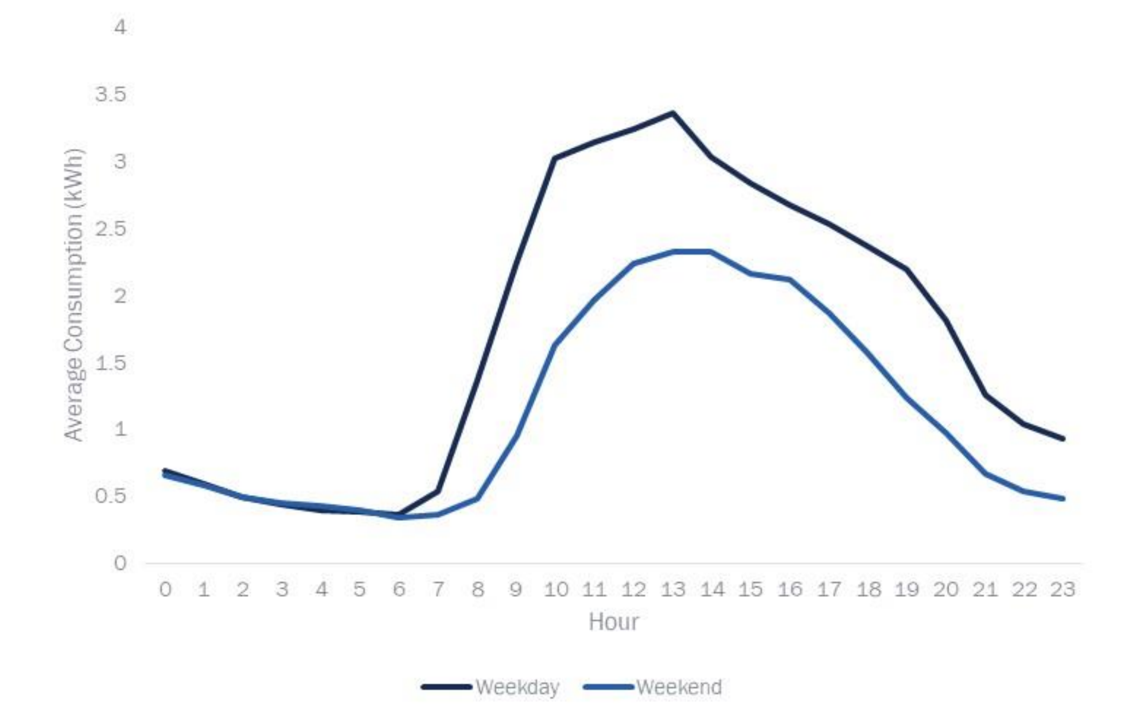
Figure 11. Program-to-Date Weekday vs. Weekend AMI Load Shapes by Market Sector



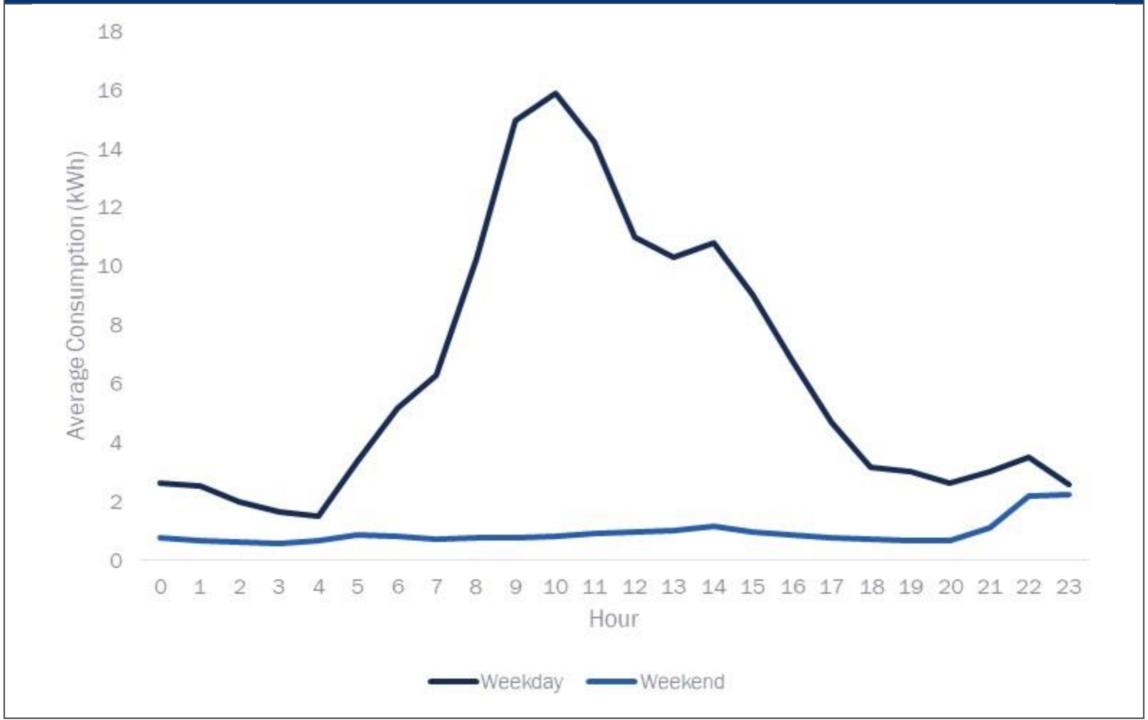
Public Parking (n = 23)



Retail Business Center / Retail Parking Lot (n = 11)



All Other (n = 21)



Note: Aside from minor variations in the average consumption levels, there are no significant differences between program-to-date load shape trends and 2024.

4.4.2 Peak Periods

Table 15 illustrates the on-peak charging consumption for each market sector. Charging is broken down by on-peak (weekdays, 4:00 p.m.–9:00 p.m.) and off-peak (weekdays, 9:00 p.m.–4:00 a.m. and weekends). Across all market sectors, 15% of total charging was conducted on-peak.

Retail center energized applications recorded the highest share of on-peak charging (22%) of any market sector. Public parking recorded the second-highest percentage of on-peak usage (17%). MUDs, office buildings, and all other market sectors recorded less than 15% charging on-peak. The percentage of charging that occurs on-peak is relatively consistent across years.

Table 15. Program-to-Date Total and On-Peak Usage Across Market Sectors

Market Sector	Unique Applications	Total Usage (kWh)	Total On-Peak Usage (kWh)	% On-Peak Usage
Office Buildings	33	1,639,465	235,166	14%
Public Parking	23	641,414	108,572	17%
MUD	33	296,480	33,416	11%
Retail Business Center / Retail Parking Lot	11	164,980	36,731	22%
All Other	21	676,666	85,715	13%
Total	**121**	**3,419,004**	**499,600**	**15%**

4.4.3 Maximum Demand

Table 16 and Table 17 present summaries of the grid impacts in 2024 by market sector, DAC designation, and overall. Including all 121 energized applications, a maximum demand of 1,555 kW occurred on November 19, 2024, at 10:00 a.m. Both energized DAC and non-DAC applications also have a maximum demand that occurs in the mid-morning hours, though the non-DAC maximum demand is almost double of the DAC maximum demand.

Office buildings, retail centers, and all other market segments recorded maximum demand in the late morning, while public parking sites and MUDs recorded maximum demand in the late morning/early afternoon. Since the maximum demand is cumulative across all energized applications, it is more likely to occur later in 2024 when more applications are energized.

Table 16. Program-to-Date Maximum Demand by DAC Status

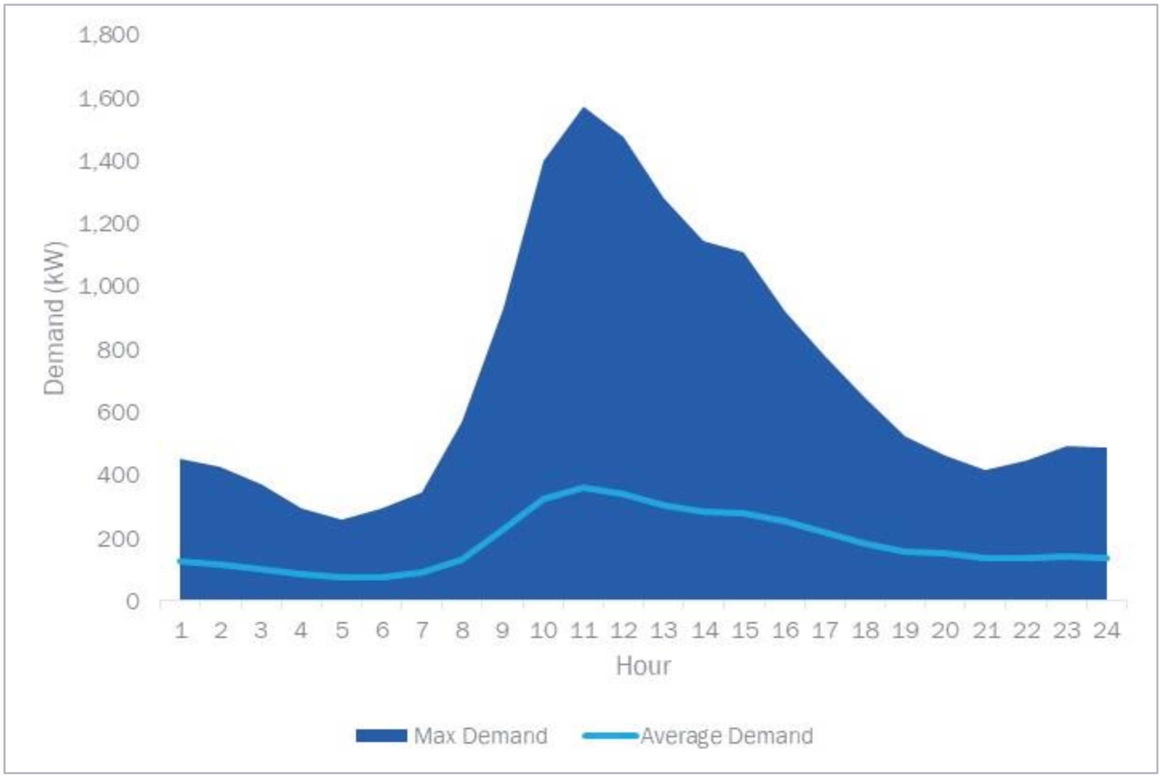
DAC Status	Unique Applications	Max Demand (kW)	Date of Max Demand	Hour of Max Demand
DAC	52	598.89	November 4, 2024	9
Non-DAC	69	998.43	December 5, 2024	10
Overall	**121**	**1,555.43**	**November 19, 2024**	**10**

Table 17. Program-to-Date Maximum Demand by Market Sector

Market Sector	Unique Applications	Max Demand (kW)	Date of Max Demand	Hour of Max Demand
Office Buildings	33	740.39	December 17, 2024	10
Public Parking	23	493.96	December 9, 2024	11
MUD	33	150.47	November 26, 2024	12
Retail Business Center / Retail Parking Lot	11	121.68	November 10, 2024	10
All Other	21	398.77	November 19, 2024	10
Overall	**121**	**1,555.43**	**November 19, 2024**	**10**

As seen in Figure 12, the maximum demand per hour is significantly higher than the average, although the load shapes are relatively similar. The peak maximum demand of all sites occurred at 10:00 a.m. with a demand of 1,555 kW. Despite overnight charging recording relatively low average demand, most hours have recorded a maximum demand higher than 300 kW.

Figure 12. Program-to-Date Overall Max Demand and Average Demand



4.5 Environmental Benefits

Opinion Dynamics estimated GHG emissions, in metric tons of carbon dioxide equivalents (MT CO_2e), pursuant to the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation guidance.[25] The reported GHG emission reductions in Table 18 are the direct reductions from the CRLD Program overall. The total avoided emissions for the 2022–2024 CRLD Program years is 3,367 MT CO_2e. Table 18 reports the avoided GHG emissions, 2024 accounts for 81% of total consumption and emission reductions.

[25] California Code of Regulations Title 17, Section 95480-95490

Table 18. Program-to-Date Environmental Benefits

Year	Total Consumption (kWh)	Avoided GHG Emissions (MT CO_2e)
2022	3,115	3
2023	650,245	624
2024	2,765,644	2,740
Total	**3,419,004**	**3,367**

Note: Values may differ from previous reports due to additional data provided for historical years and adjustments to the approach.

The evaluation team leveraged Equation 1 to calculate the GHG emission reductions.

Equation 1. Calculation of carbon credits using LCFS fuel pathways[26]

$$MT\ CO_2e = \left(CI_{gasoline} - \left(\frac{CI_{electricity}}{EER}\right)\right) \times E_{electricity} \times EER \times C$$

The total electricity delivered ($E_{electricity}$) to participating EVSE was 3,419 megawatt hours (MWh) over the 2022, 2023, and 2024 calendar years. This equates to 12,308,414 MJ of delivered electricity, using an energy density of 3.6 MJ/kWh.[27] The C term is a constant for converting gCO_2e to MT CO_2e and equals 1x10-6 MT CO_2e/gCO_2e.

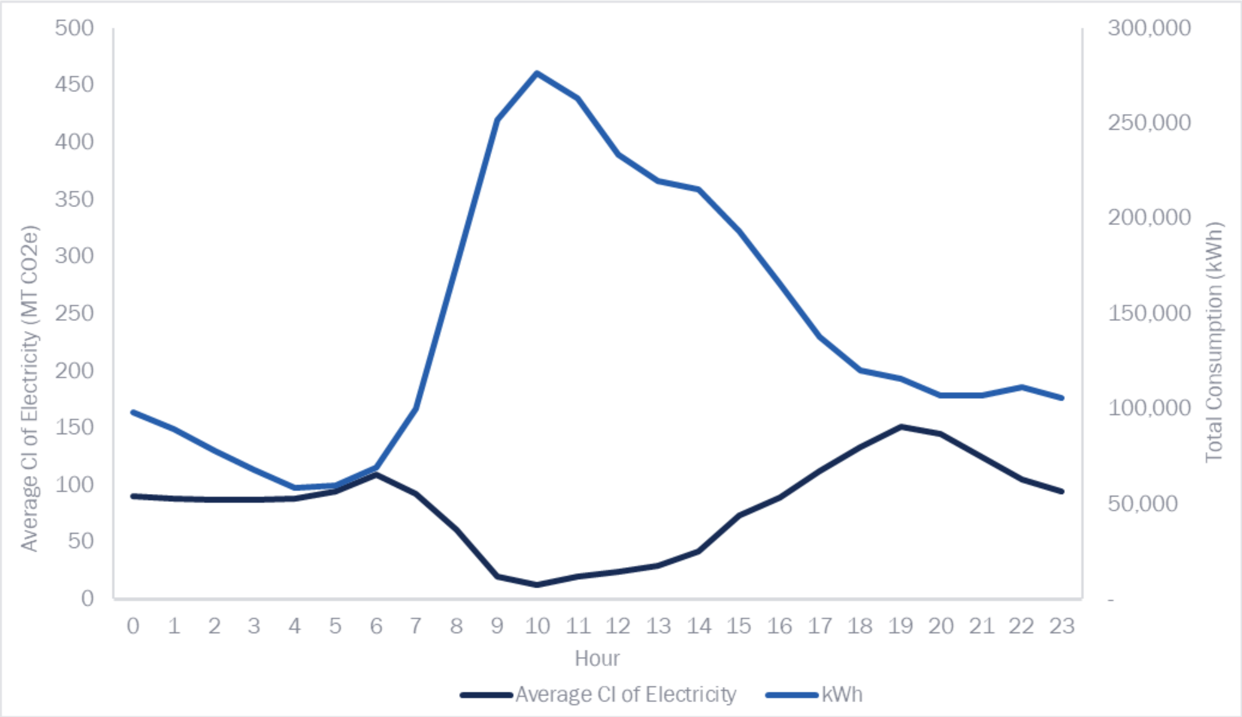
The Energy Economy Ratio (EER) is a dimensionless adjustment factor that accounts for the difference in the efficiency of a fuel, in this case electricity, used in a vehicle's powertrain compared to a reference fuel, gasoline. The LCFS guidelines stipulate using a 3.4 EER value for electricity displacing gasoline as a fuel in a light-duty vehicle.[28]

Fuel's carbon intensity (CI) represents the lifecycle mass of CO_2e released per unit of fuel energy, measured in grams of CO_2e per megajoule (gCO_2e/MJ). The CI of gasoline is 100.82, as reported in the LCFS Certified Fuel Pathway Table.[29] Due to the fluctuations in CI expected on the grid across hours, we applied a variable CI of electricity based on CARB's quarterly hourly LCFS.[30] Figure 13 illustrates the average hourly CI of electricity from 2022 through 2024 and the total consumption recorded per hour. Notably, over half of the total consumption (53%) occurs when the carbon intensity is low, specifically between 8 a.m. and 4 p.m. The low CI during these hours is likely attributed to the high levels of renewable energy, particularly solar power, available on the grid during these times. Shifting more energy consumption to these hours and away from periods with higher CIs, such as 5 p.m. to 11 p.m., which currently accounts for 20% of the load, can reduce

[26] California Code of Regulations Title 17, Section 95486.1.(a) General Calculation of Credits and Deficits Using Fuel Pathways.
[27] California Code of Regulations Title 17, Section 95486.(b) Table 4. Energy Densities and Conversion Factors for LCFS Fuels and Blendstocks.
[28] California Code of Regulations Title 17, Section 95486.1.(a) Table 5. EER Values for Fuels Used in Light- and Medium-Duty, and Heavy-Duty Applications.
[29] Opinion Dynamics applied the statewide CARBOB (Current Certified FPC: CBOB000L00072019) carbon intensity "based on the average crude oil supplied to California refineries and average California refinery efficiencies."
[30] 2025 Carbon Intensity Values for California Average Grid Electricity Used as a Transportation Fuel in California

the CI of the electricity used to charge vehicles. This change will further increase the GHGs avoided due to the CRLD Program.

Figure 13. Average CI of Electricity and Total Consumption per Hour



Applying quarter-hour variable CI values is a change from the GHG calculation methodology applied in previous annual reports. The evaluation team has historically sourced the CI of electricity from SCE's Sustainability Reports. These fixed annual values were applied to all consumption that occurred each year, regardless of the hour of the consumption, and are shown in the second column of Table 19.[31] Weighted by the consumption across the three years, the average CI of electricity using the sustainability reports was 47.13 gCO_2e/MJ.

The average CI of electricity of the CARB LCFC quarter-hourly values, weighted by charging consumption, is presented in the last column of Table 19. Across all three years, the weighted average CI of electricity was 69.23 gCO2e/MJ. The difference in average CI may be attributable to differences between California's overall grid generation resources and those specific to SCE. The evaluation team applied the CARB CI for electricity as it accounts for variability across hours. We recommend that SCE records CI at the quarterly hourly level in the future, as this information would enable a more detailed assessment of GHG impacts specific to SCE.

[31] SCE's *2023 Sustainability Report*

Table 19. CI of Electricity Sustainability Report and CARB Comparison

Year	SCE Sustainability Report CI of Electricity (gCO2e/MJ).	CARB Quarterly Hourly LCFC Weighted Average CI of Electricity (MT CO_2e)
2022	51.03	57.97
2023	47.12	76.34
2024	Not Available	67.57
Weighted Average	**47.13**	**69.23**

4.6 Cost Metrics

Opinion Dynamics explored cost metrics for CRLD (per SB350), including how CRLD costs compare to similar programs. We reviewed publicly available reports for incentive programs similar to CRLD across 18 utilities in 11 states. The total utility-side and customer-side costs per port for these programs ranged widely (between $5,391 and $28,050), depending on the program design, along with other factors. Average costs per port to operate the CRLD Programs fall within this range ($16,958 for CIR and $11,203 for CSMR). However, due to the relatively small number of public, workplace, or MUD charging programs like CRLD offered nationally and the differences in scale and design, it is difficult to draw accurate comparisons.

SCE provided Opinion Dynamics with summary-level cost information associated with each offering in the CRLD program, as seen in Table 20. SCE determines its budget forecast by determining how many sites it expects to install each month and estimating costs by type of program and the number of installation sites. SCE staff noted that forecasted costs aligned with their estimates. These costs, presented in nominal dollars, cover 104 financially closed-out sites, where financially closed-out sites are defined as sites that are completed and fully invoiced, all of the work orders have been closed out, and the rebates have been paid as of December 31st of 2024. Each program provides different offerings to the customers. Some programs, such as SSR and NCR, only provide rebates, so their costs are significantly lower than CIR, which incorporate behind-the-meter and to-the-meter infrastructure costs for all capital, direct and indirect labor overhead. Therefore, costs vary significantly across programs. The costs provided for the Turn-key program encompass maintenance and networking rebates for eligible sites in DAC and MUD. Costs related to both utility-side and customer-side costs of the Turn-key program where SCE owns and operates the EVSE will be detailed in next year's report, following the completion of additional Turn-key sites. DCFC program was not included because no sites have been installed and therefore financially closed out.

Table 20. Covers from the Beginning of the Program 2021 until December 31, 2024

Cost Type	CIR	Turn-Key[a]	CSMR	SSR	NCR
Utility-side costs[b]	3,950,545	-	584,464	-	-
Customer-side costs[c]	11,948,729	-	-	-	-
Rebate costs[d]	1,974,204	1,012,500	3,022,959	139,876	1,794,509
Number of Ports	1,054	-	322	16	515
Total	**17,873,479**	**1,012,500**	**3,607,423**	**139,876**	**1,794,509**

[a] Includes maintenance and networking rebates for four CSMR projects that were DAC and MUD for 125 ports. All other costs for these ports are included in the CSMR column.

[b] The utility-side site-level costs represent the utility-side (to the meter) infrastructure expenditure for all capital direct costs and indirect labor overhead recorded costs, up to the interconnection point with the panel for completed projects within the reporting period.

[c] The customer-side site-level costs represent the customer-side (behind or beyond the meter) infrastructure expenditure for all capital direct and indirect labor overhead recorded costs from the panel, up to but not including the electric vehicle supply equipment (EVSE), for completed projects within the reporting period. For Turn-Key, customer-side costs include SCE-owned EVSE.

[d] Rebates include various categories for EVSE, maintenance & networking for Turn-Key sites where the customer owns & operates the EVSE, customer-side make-ready infrastructure, Small Site Rebate, and New Construction Rebate.

Table 21 shows the average cost per port for each sub-program, which was derived by dividing the total cost per program by the number of ports the program installed.[32] We chose to derive the average cost per port because many other programs reported the average cost per port. Some programs reported additional detailed cost information, like capital costs or EVSE costs per program. However, these were less frequently or uniformly reported on.

Table 21. Covers from the Beginning of the Program in 2021 until December 31, 2024

Sub-Program	Number of Ports	Average Cost Per Port
CIR	1,054	$16,958
CSMR	322	$11,203
SSR	16	$8,742
NCR	515	$3,484

Our literature review found various incentive program offerings nationally and within California; however, many programs are not comparable to CRLD due to varying structures and cost needs. Of the few utilities that incentivized offerings most closely to CRLD, we found that they rarely reported detailed cost information publicly or consistently. As seen in Table 22, four programs were ultimately chosen for comparison due to similar program structures and offerings for their customers. See Appendix B for derivation notes and citations.

Ultimately, we found that costs in the CRLD program, compared with the other four utilities, were very similar, excluding NCR and SSR. When comparing costs, it is best to reference CIR and CSMR, as they have many sites financially closed out and account for utility-side costs and rebate costs, costing $16,598 and $11,203 per port, respectively. These numbers are expected to be higher and more closely resemble those of the other utilities when accounting for operation and maintenance costs.

[32] Note Table 22 does not include the average cost per port for the Turn-key Program as only one site has been financially closed out to date. We expect to provide average cost per port information as more sites are completed.

Table 22. Alternate Utility Costs by Sub-Program

Utility Name	Reporting Period	Sub-Program	Average Cost Per Port
Xcel Energy[33]	2021-2023	Commercial	$24,000
		Multifamily	$23,000
National Grid (Massachusetts)[34]	2021	MUD	$14,516
		Public	$13,144
		Workplace	$11,727
Connecticut Statewide Electric Vehicle Charging Program	January 2022 - March 31, 2024	Residential Multi-Family	$23,811
		Workplace & LDV Fleet	$15,813
Duke Energy Florida	2018-2021	MUD	$5,391
		Public	$6,103
		WPC (workplace)	$6,055
SCE CRLD	2021-2024	CIR	$16,958
		CSMR	$11,203
		SSR	$8,742
		NCR	$3,484

4.7 Program Delivery

Opinion Dynamics collected data from participating site hosts to understand levels of satisfaction and their experience with the program. We completed interviews with 16 site hosts in two rounds between April 2023 and September and October of 2024. Opinion Dynamics completes interviews on a rolling basis with site hosts where construction of CRLD charging stations is complete and charging stations are installed and operational.

Half of the site hosts (8) whom we interviewed identified the CRLD rebate as their primary motivation for installing EV charging infrastructure. Site hosts at government-owned sites were more likely to cite policy and community motivations, such as meeting emissions goals and addressing their communities' needs. Conversely, site hosts at commercial properties were more likely to mention market trends or the opportunity to provide advertisements to employees and customers as key reasons for installation. Notably, 11 site hosts said they still would have installed the chargers without the incentive provided by SCE. However, many noted they would've installed fewer chargers, citing financial constraints.

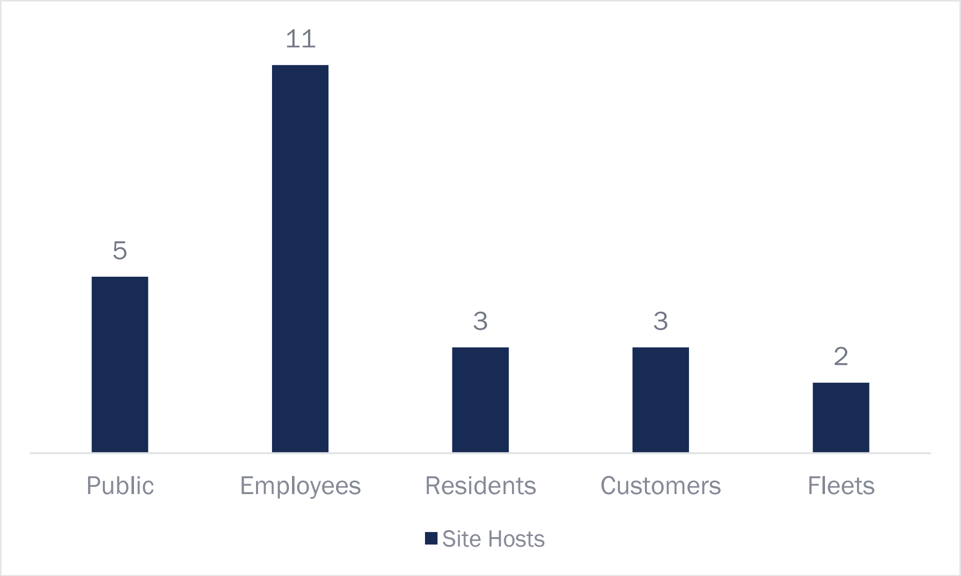
Overall, site hosts described the enrollment process as straightforward, clear, and easy to follow. Most (12 of 16) interviewees used the application instructions on SCE's website, which included helpful links and

[33] Xcel Energy's per-port average includes EVSI and charging equipment and does not include rebate costs. Multifamily only includes L2 chargers, while commercial sites include a few DCFCs.
[34] Costs included in these are rebates, invoices, and paid costs. Additionally, National Grid reported cost per site. For the purposes of this comparison, we estimated the cost per port based on an average of 1.95 ports per station based on participation data included in the same report.

descriptions, making the paperwork manageable without any confusion. Only two interviewees mentioned experiencing challenges uploading and downloading enrollment forms through the customer portal. However, five site hosts encountered challenges acquiring and installing the charging station, which did not all directly involve SCE. One interviewee reported that their equipment order was lost after several months of poor communication with EVSE customer service. They noted that they would have missed important SCE deadlines if they had not ordered in advance.[35] A second interviewee reported experiencing issues replacing a defective part for a charging station through their EVSE provider. Construction-related challenges mainly included permitting delays within the city, supply chain issues with switch gears, or not meeting the estimated completion timelines. However, one interviewee recalled that the date and time changes for SCE construction staff site visits were changed without prior notice on several occasions, adding that some of these visits were delayed because of internal miscommunications that caused visits to occur at the wrong address.

Figure 14 shows the types of end-users who, according to site hosts, are the primary users of their charging stations at the time of the interviews. Site hosts most frequently reported that their stations are used by employees (11), followed by the public (5), residents (3), customers (3), and two indicated that their chargers were used by fleet vehicles. While only five site hosts cited being currently available to the public, five additional site hosts said they hope to be open to the public soon.

Figure 14. Current Users at Site Hosts Charging Stations

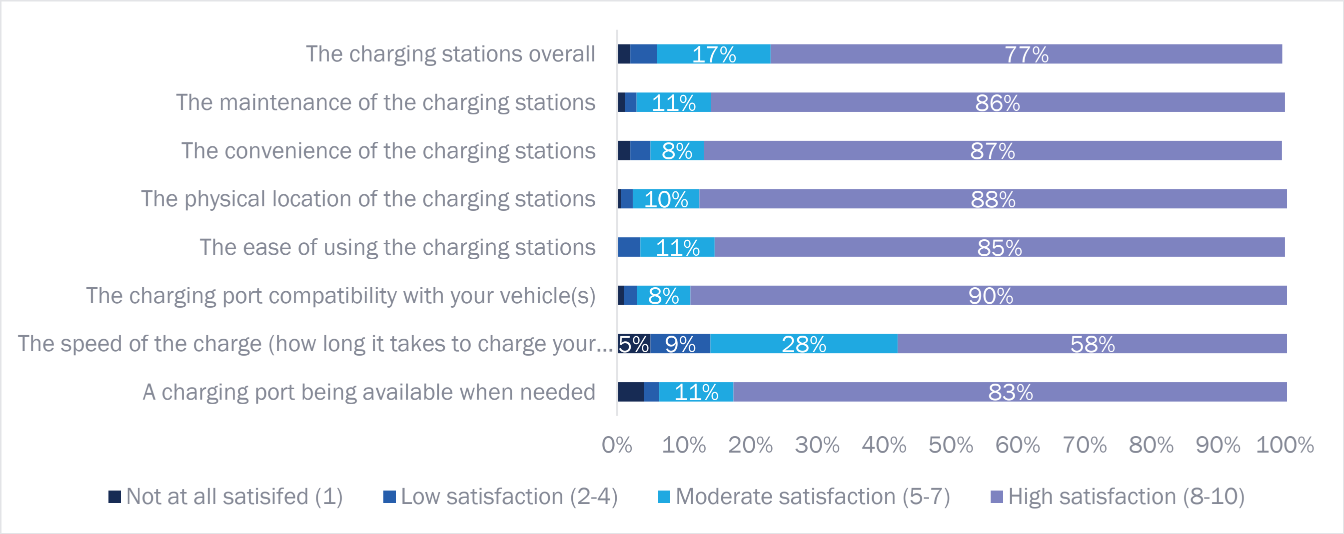


Opinion Dynamics also completed surveys with 171 end-users of CRLD charging stations. Most end-users had high satisfaction levels during their charger experience, as seen in Figure 15. The lowest satisfaction was associated with the speed of the charger, with over 40% of respondents reporting moderate or low levels of satisfaction. Site hosts primarily received positive feedback, if any, from end-users. When site hosts were asked about their satisfaction with the charging stations, 10 out of the 13 who responded to this

[35] The requirement the respondent is referring to states that the EV charging equipment must be installed and activated within 20 days of completing the infrastructure building.

question reported being very satisfied or extremely satisfied. Two site hosts reported that one charger was not working, resulting in lower reported satisfaction. Additionally, a dealership owner reported that the chargers approved by the program did not meet the EV manufacturer's requirements.[36]

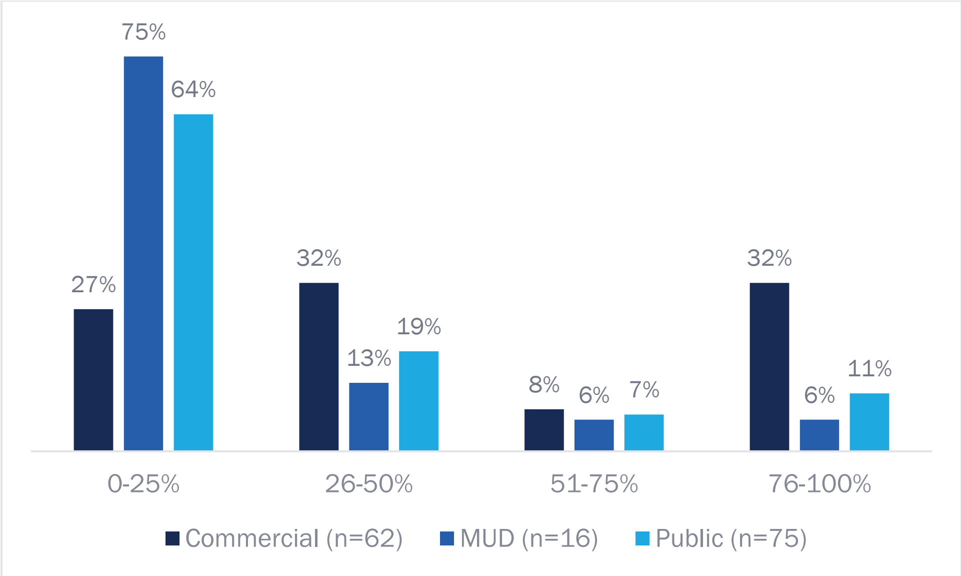
Figure 15. Satisfaction of Sites According to End-User Surveys (n=171)



We collected feedback from end-users charging at a variety of sites, including 69 responses from commercial properties, 18 from MUDs, and 84 from public properties (e.g., public parking facilities, government office buildings, etc.). End-users charging at MUD and public locations reported that the location accounted for 25% or less of their typical charging activity, as seen in Figure 16. Alternatively, end-users charging at commercial locations reported a higher share of their typical charging activity at that location (32% of respondents reported that the location accounted for between 76% and 100% of their typical charging activity).

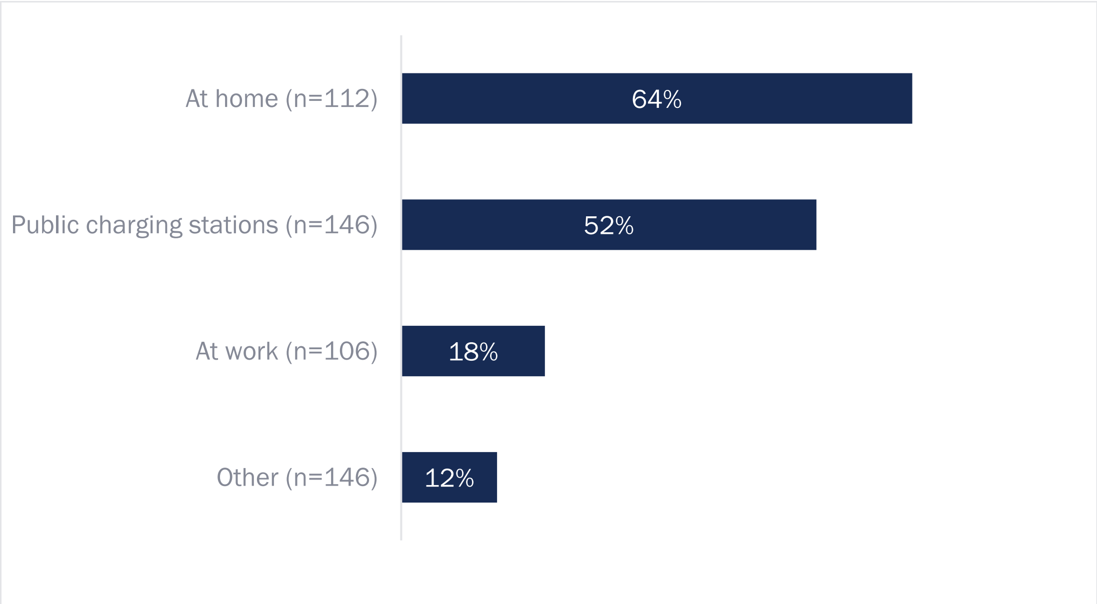
[36] The dealer mentioned having a corporate requirement of Level 2 EV chargers to dispense up to 19.2 kW of power.

Figure 16. Percentage of Charging at this Location



We also asked end-users more broadly about their charging behavior. As shown in Figure 17, respondents from all charging locations most frequently charged at home (64%) when not at the survey location. Over half of the respondents (52%) reported charging at other public charging stations, including Level 2 and DC fast chargers. Eighteen percent of respondents also reported charging at work.

Figure 17. Other Locations where Respondents Charge their EVs



Note: Respondents were able to select multiple response options. Additionally, only certain options were shown to each respondent depending on previous response so the n varies for each option. Responses are aggregated across all charging sites in this graph (MUD, Commercial, and Public).

4.8 Market Characterization

As part of the 2024 annual evaluation of SCE's CRLD Program, Opinion Dynamics conducted a market characterization study to examine EV adoption in line with the associated "EV adoption at service area level" SB 350 reporting metric. This effort included mapping the recent evolution of the EV market and public charging availability between 2020 and 2024 to illustrate the geographic relationships between EV adoption, public charging availability, and key customer segments, including historically underserved customers living within DACs across SCE's territory. The evaluation team also conducted a landscape analysis reviewing available research, secondary data sources, and policy documentation to further explore EV market trends. These data also served to inform our geographic analysis and contextualize key findings. In addition, we conducted in-depth interviews with SCE's market incubation team and program staff to explore current and forward-looking priorities for SCE transportation electrification efforts and to include SCE's perspective on market trends and anticipated market developments in this analysis.

The market characterization study sought to address the following research objectives:

- Characterize the current EV market landscape and development since 2020.
- Understand public charging availability geographically by customer segment and relative to EV adoption.
- Explore factors driving changes to the EV market over time, including customer preferences, policy, utility programs, public funding, and industry advancements.
- Identify key considerations for maximizing future influence on EV adoption.

As part of the geographic analysis, we assembled several publicly available secondary data sources reflecting historical and current information on EV adoption, publicly available charging stations, census-based demographics, and areas designated as DACs, in addition to SCE CRLD program tracking data. These data sources are briefly summarized in

Table 23 and further detailed in Appendix B.

Table 23. Geographic Analysis Data Sources

Metric	Source
Historical and Current EV Adoption[A]	California DMV EV registrations as a percentage of total light duty vehicles, as of December 2020 (prior to CRLD) and December 2023 (latest available) as a percent, by ZIP code.
Historical and Current Public Charging Sites[B]	Annual U.S. Department of Energy data inclusive of all publicly accessible charging locations as of December 2020 (prior to CRLD) and December 2024 (latest available), by address.
Active CRLD Sites	SCE CRLD program tracking data indication of currently active CRLD charging sites, as of December 2024, by address.
Disadvantaged Communities	CalEnviroScreen 4.0 indication of areas disproportionately burdened by pollution or with median incomes under 60% of statewide levels or tribal lands, by census tract.
Low-to-Moderate-Income Populations	U.S. Department of Housing and Urban Development data reflecting incidence of households below 80% of Area Median Income (AMI) from 2015 American Community Survey data, by census tract.
Multifamily Housing Prevalence	IPUMS data reflecting the incidence of multifamily housing based on 2022 American Community Survey data, by Public Use Microdata Area (PUMA).

A Throughout this report, EV adoption refers to the incidence of registered EVs as a percentage of total light duty vehicles.

B U.S. Department of Energy public charging data is inclusive of a subset of active CRLD charging sites installed in public access locations.

4.8.1 Current EV Adoption and Public Charging Availability

Since 2020, EV adoption has increased substantially in concert with public charging availability, though direct causality is not readily measurable. As part of the geographic analysis, we examined historical public charging availability relative to EV adoption. The overall prevalence of public charging stations and EV adoption in SCE's service territory have both grown considerably over the past five years, reflected by a 176% increase in total EV registrations and a 253% increase in total publicly available chargers. However, at a more granular level, EV adoption and public charging incidence are not closely aligned by zip code—the most granular level at which both metrics are available. It is also notable that while many more CRLD charging sites are in development (4,301 as of December 2024), the 234 currently active CRLD sites only account for 5% of all public charging in SCE's service territory and 18% of total public charging growth since 2020. Figure 18 compares public charging and EV adoption levels in 2020 and current across SCE's service territory. Figure 19 provides additional granularity around the more population-dense coastal areas.

Figure 18. EV Adoption and Public Charging, 2020 and Current

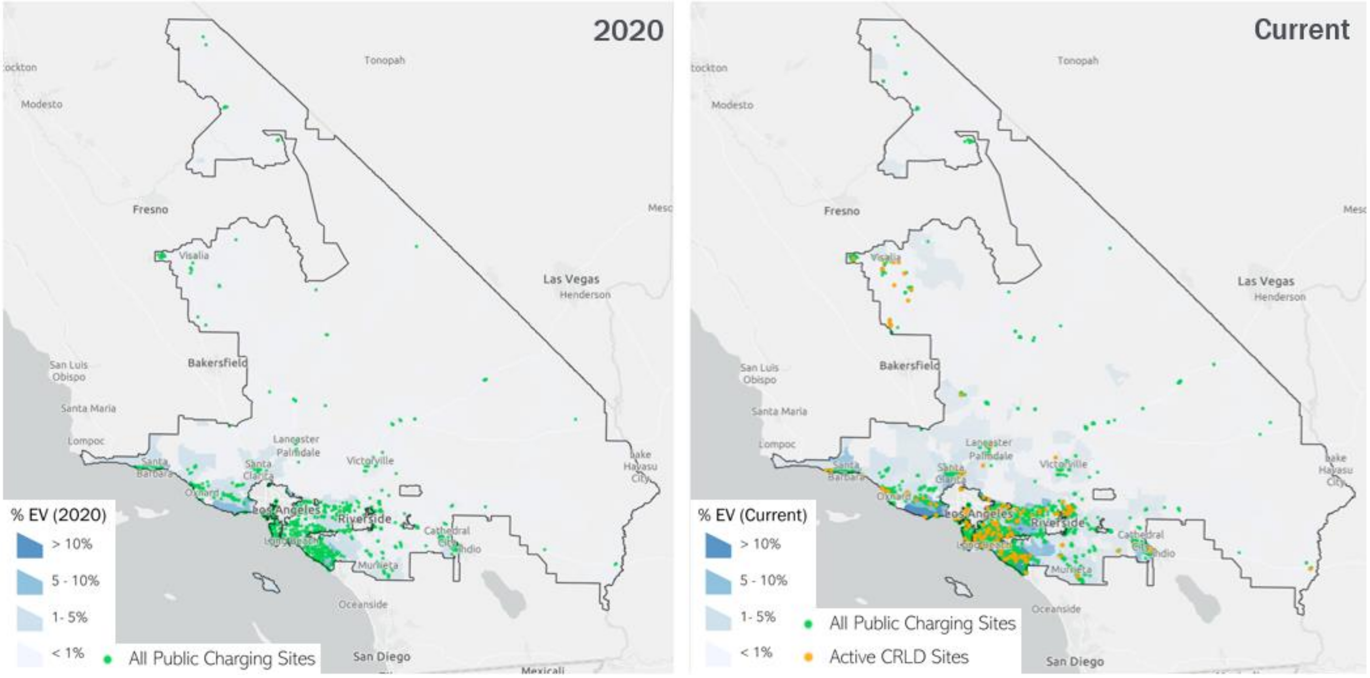
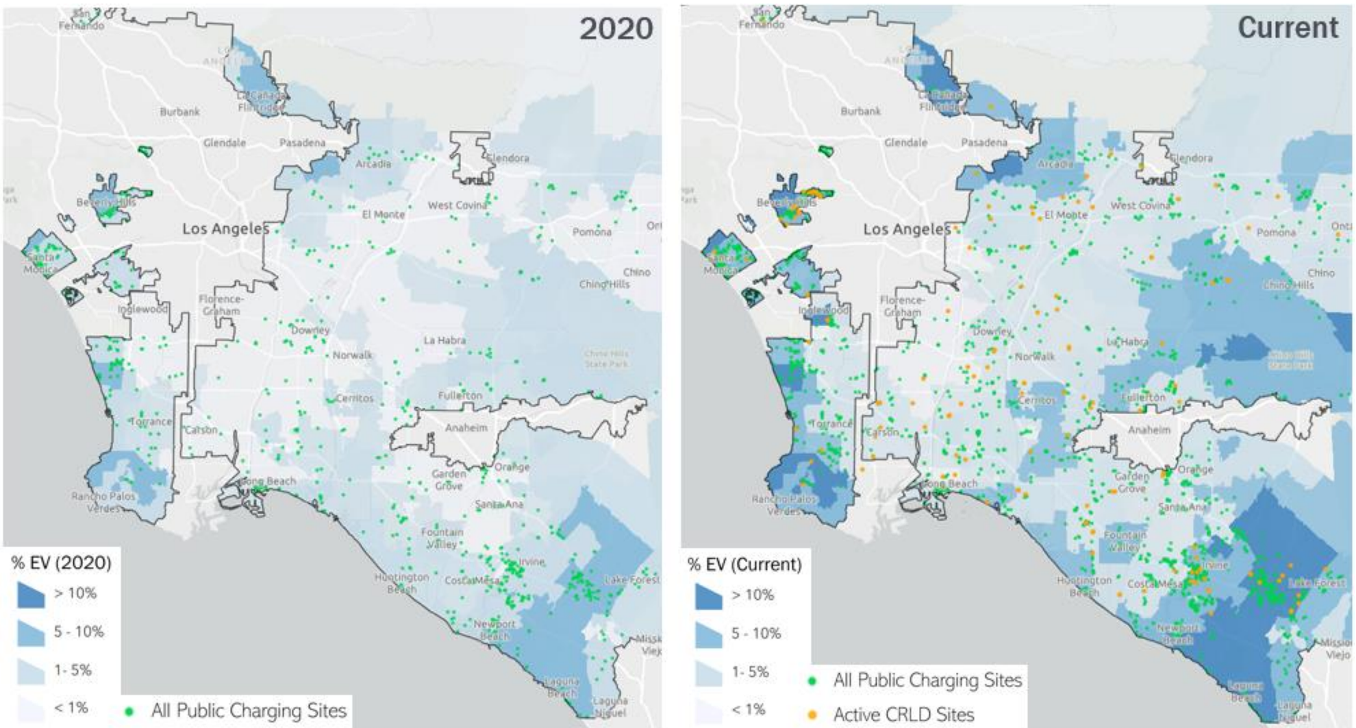


Figure 19. Urban Snapshot: EV Adoption and Public Charging, 2020 and Current



As noted in previous sections, SCE prioritizes facilitating CRLD charging site development in DAC. This is further evidenced by the higher percentage of CRLD charging sites located in DACs relative to other publicly available charging sites. Across SCE's service territory, public charging stations are generally more concentrated outside of DACs. As of 2024, 20% of all publicly available charging sites across SCE's service territory are located in DACs (924 of 4,686), whereas 34% of active CRLD sites are located in DACs (80 of 234). SCE aims to complete 50% of all CRLD charging site installations in DAC areas. The broader prevalence of public charging in DACs has also increased substantially since 2020. As of 2020, less than 3% of DACs in SCE service territory had at least three public charging stations, whereas in 2024, more than 10% of DACs have three or more charging stations. Because the DAC definition accounts for a combination of air quality, median income, and tribal land designations, some notably more affluent DACs have seen disproportionate progress, including portions of Long Beach and Santa Monica where at least 30 public charging sites exist in a single ZIP code as of 2024. Figure 20 shows public charging and EV adoption levels relative to DAC areas throughout SCE's service territory in 2020 and current, and Figure 21 provides additional granularity around the more population-dense coastal areas.

Figure 20. DACs, EV Adoption, and Public Charging, 2020 and Current

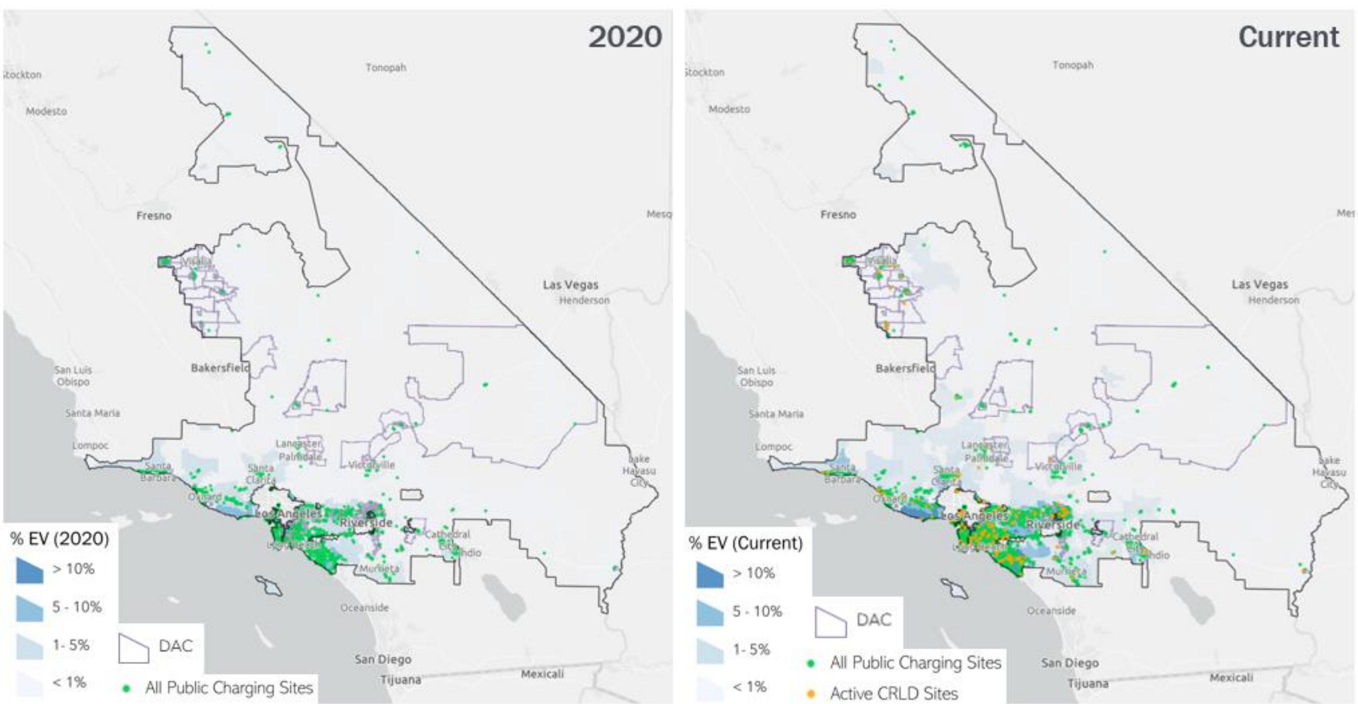
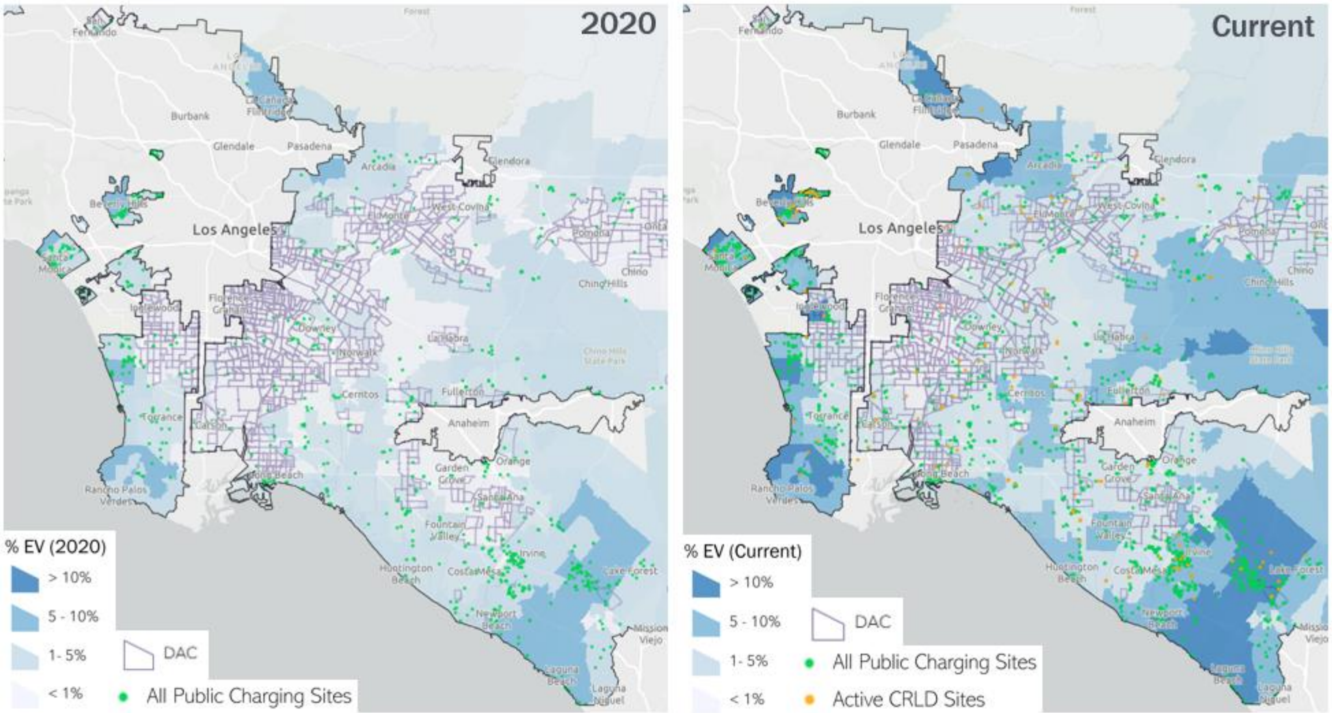
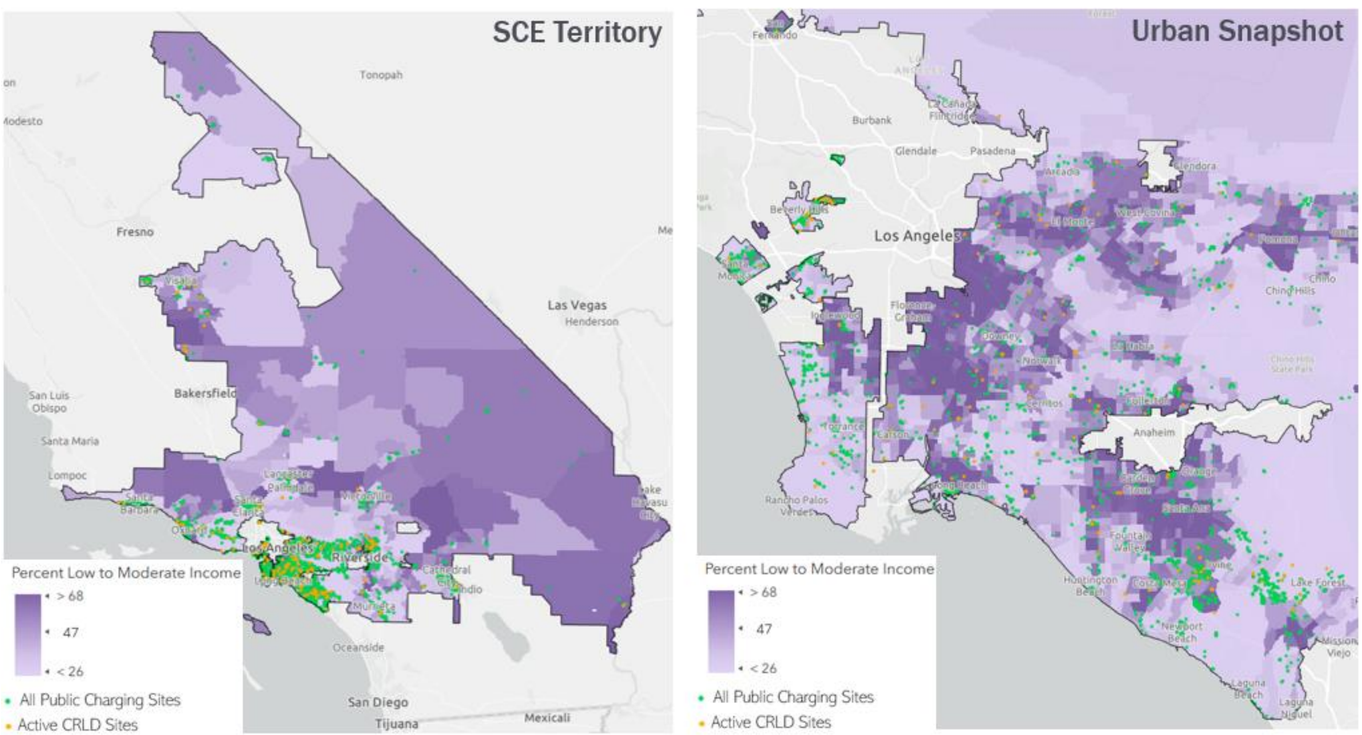


Figure 21. Urban Snapshot: DACs, EV Adoption, and Public Charging, 2020 and Current



CRLD charging sites tend to be more concentrated in lower-income areas than other publicly available charging sites. As discussed above, more affluent communities in coastal areas tend to have higher EV adoption rates, and broadly speaking, public charging tends to be somewhat more concentrated in and around these areas. Just 41% of all public charging sites are located in areas with above-average incidences of low-to-moderate income customers. Conversely, the majority (57%) of CRLD charging sites are in areas with higher-than-average incidences of low-to-moderate income customers. Many census tracts in the eastern portion of the state have higher-than-average incidences of low-to-moderate income customers, and those same areas tend to have lower levels of EV adoption than the urban and coastal portions of the territory. Figure 22 shows publicly available and CRLD charging stations in relation to the percentage of the population living below 80% of AMI.

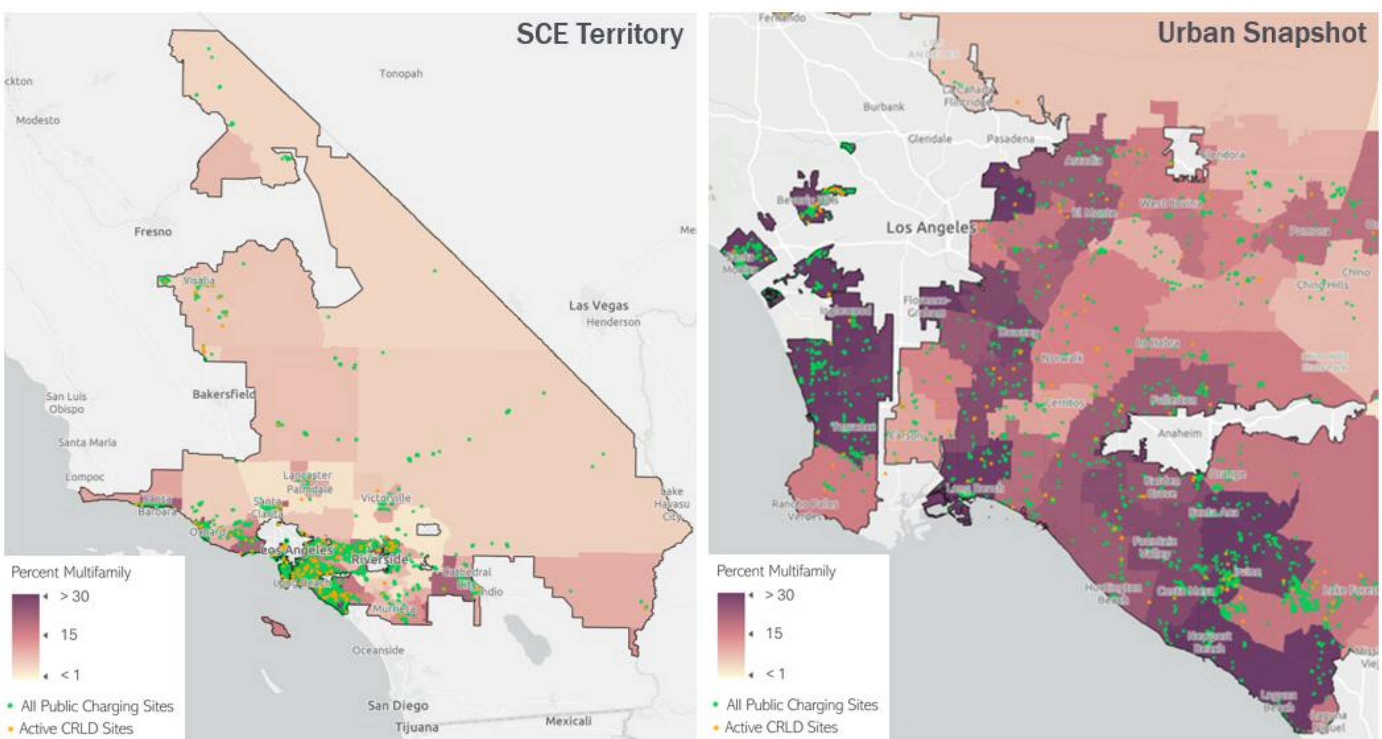
Figure 22. Low-to-Moderate Income Levels and Public Charging



EV adoption is highest in areas with higher incomes, indicative of the relatively early stage of the market and the relatively high upfront cost of EVs. As of January 1, 2024, 53% of all EVs in SCE's service territory are registered in zip codes with average per capita incomes above median levels for the state of California. Prior research consistently points to upfront cost as a leading barrier to EV adoption, including past customer research by Opinion Dynamics[37] and a 2023 EPRI meta-analysis of national research on EV adoption barriers.[38] SCE staff noted that they anticipate the advancement of the used vehicle market for EVs to progress in the coming years, thus increasing their affordability. EV adoption among lower-income customers in less urban and coastal parts of SCE's service territory may be further supported and enabled by additional charging infrastructure in those areas. The EV market continues to rapidly develop and transform, marked by volatility in Tesla sales, year-over-year improvements in battery efficiency and affordability, [39,40] and recent coordinated efforts across multiple automakers to improve cross-compatibility of charger connectors[41] and help develop charging infrastructure.[42]

SCE prioritizes CRLD coverage of MUDs where home charging may not be easily accessible, and a majority of CRLD charging sites are located in areas with higher-than-average incidences of MUD housing. Among active CRLD charging sites, 33% are located at MUDs. Public charging sites generally tend to be located in more densely populated areas, which tend to have higher incidences of MUD housing. Three-fourths (75%) of all public charging sites are in areas where at least 15% of the population lives in MUDs, while just over two-thirds (68%) of active CRLD chargers are in areas where at least 15% of the population lives in MUDs. Figure 23 shows the distribution of publicly accessible and CRLD charging sites in relation to the prevalence of MUD housing.

Figure 23. MUD Housing Presence and Public Charging



4.8.2 Market Factors and Drivers of EV Adoption

Customers commonly cite a lack of public charging availability as a barrier to EV adoption, but the addition of public charging infrastructure is not likely to directly result in immediate or localized EV adoption. Rather, the widespread presence of highly visible charging infrastructure is one critical prerequisite to broader EV adoption, along with several other factors. Hesitance to adopt EVs due to limited public charging availability and EV range anxiety is well documented—for example, a 2024 CARB survey of California customers[43] and the 2023 EPRI meta-analysis of national research on EV adoption barriers.[44] Both found limited charging infrastructure to be the leading barrier to EV adoption among non-EV owners, with EPRI's findings suggesting that 78% of Americans believe finding a public EV charger is difficult. However, findings from a 2024 study published by researchers at UC Davis challenge the assumption of a direct correlation between rates of EV ownership and public charging density. The study did not find a statistically significant relationship between the availability of public charging in one's zip code and awareness of local public charging or likelihood of purchasing an EV.[45]

Even when public chargers are available, it may not translate to increased EV adoption unless accompanied by broader efforts to engage consumers and enhance perceptions of EV technology. Consumers may easily overlook public charging infrastructure unless they are interested in EVs. As a result, the density of chargers in each area does not directly influence whether people report seeing them or directly increase purchase consideration. Therefore, public charging alone is unlikely on its own to generate interest in EVs among those not considering an EV. Furthermore, any influence of infrastructure development on EV purchase decisions that does exist is likely to take time, as there is an inevitable lag between customers' recognition of new infrastructure and subsequent vehicle purchases. Still, widespread public charging is a critical component for enabling future EV adoption and should be considered part of a larger strategy to engage consumers and impact EV adoption. Public charging station visibility may also be as important as its availability, and easily recognizable signage has the potential to help shift public perception of charging availability.[46] Alongside the development of public charging infrastructure, engagement and education campaigns directed towards non-EV owners have the potential to address negative perceptions around EV reliability and availability that serve as leading barriers to adoption.

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[37] https://opiniondynamics.com/wp-content/uploads/2024/03/Xcel-Energy-TEP_Residential-Customer-Research-Memo_FINAL.pdf
[38] https://energycentral.com/o/EPRI/understanding-barriers-and-challenges-greater-ev-adoption
[39] Govind Bhutada, Elements. September 25, 2022. Visualizing the Range of Electric Cars vs. Gas-Powered Cars. https://elements.visualcapitalist.com/range-of-electric-cars-vs-gas/
[40] Goldman Sachs. Electric vehicle battery prices are expected to fall almost 50% by 2026. October 7, 2024. https://www.goldmansachs.com/insights/articles/electric-vehicle-battery-prices-are-expected-to-fall-almost-50-percent-by-2025
[41] https://www.motortrend.com/features/tesla-nacs-charging-port-automaker-compatibility/
[42] Seven Automakers Unite to Create a Leading High-Powered Charging Network Across North America. July 26, 2023. Stellantis. https://www.stellantis.com/en/news/press-releases/2023/july/seven-automakers-unite-to-create-a-leading-high-powered-charging-network-across-north-america
[43] https://ww2.arb.ca.gov/sites/default/files/2024-06/CARB%20EV%20Barriers%20Survey%20Results%20Report%20ADAReview_1.pdf
[44] https://energycentral.com/o/EPRI/understanding-barriers-and-challenges-greater-ev-adoption
[45] UC Davis. If you build it, will they notice? public charging density, charging infrastructure awareness, and consideration to purchase an electric vehicle. Published in: Transportation Research Interdisciplinary Perspectives. https://www.sciencedirect.com/science/article/pii/S2590198223002543.
[46] Ibid

4.8.3 Forward-Looking Market Outlook

Following CPUC's December 2023 rulemaking suspending ratepayer-funded support of TEF initiatives, SCE continues to evolve its offerings. Prior to the 2023 ruling, TEF policy helped drive EV infrastructure investment by California IOUs, and with the uncertainty created by the suspension of that funding, SCE should continue to explore all possible state and federal funding sources in support of EV adoption and charging infrastructure development. Funding from federal initiatives, including the 2022 Inflation Reduction Act (IRA) and 2021 Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Law), is also in question given the shift in priorities between the Biden and Trump administrations, leaving state policy and IOUs to determine direction and funding sources for developing EV-related infrastructure and encouraging EV adoption.[47,48] IRA funding also included emphasis on reaching underserved rural communities, leaving a potential gap in rural EV charging infrastructure development that may benefit from SCE prioritization.[49]

Programs like the Low Carbon Fuel Standard (LCFS)[50] and Electric Program Investment Charge (EPIC) Fund represent potential avenues for additional funding to support wide-ranging efforts to engage with customers and promote EV adoption. In April of 2024, SCE submitted a request for an Exemption to the Public Utilities Code and Implementation Plan for programs funded by LCSF for 2024-2027. As part of this request, SCE proposed several efforts in support of the light-duty EV market, including:

- Continuing to fund the pre-owned EV Rebate Program;
- Expanding the Charge Ready Home Rebate Program to support individual circuit installations in single-family homes; and
- Providing income-qualified EV drivers with subsidized public charging to effectively access the discounted rates when publicly charging their EVs by enabling affordable charging wherever the driver decides to go, using subsidized EV charging through preloaded debit cards.

Diversification of SCE's campaign to encourage EV adoption is critical to addressing the wide-ranging challenges associated with driving changes to consumer preferences around personal vehicles. This effort will benefit from continued support of public charging infrastructure development that includes DCFC charging and targets DACs, lower-income areas, MUD housing, and rural areas. Pairing infrastructure development with high-visibility signage and educational awareness campaigns that highlight EV benefits, charging availability, and available vehicle incentives all have the potential to help encourage widespread EV adoption.

[47] https://www.thomsonreuters.com/en-us/posts/corporates/ira-uncertain-future/
[48] https://www.brookings.edu/articles/what-the-trump-administration-might-mean-for-the-future-of-the-bipartisan-infrastructure-law/
[49] https://e2.org/wp-content/uploads/2024/01/E2-IRA-Rural-Report-23-12-A_06_locked.pdf
[50] California Air Resource Board. Low Carbon Fuel Standard. https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard

5. Detailed Findings, Successes, and Recommendations

In this section, we summarize the detailed findings, highlight successes, and provide recommendations from the 2024 CRLD Program evaluation.

- **The CRLD Program has driven the commitment of 20,330 electric charging ports in SCE's service territory from the program's start in 2021 through 2024.** The largest share of the committed ports under the Make Ready Program are associated with MUDs (7,237 or 44% of total committed ports). Additionally, nearly half of the ports committed through the Make Ready Program (53%), and nearly a quarter of those committed through the NCR Program (22%) will be in DACs. These commitments ensure that investments in clean transportation benefit those historically underserved and prepare for the future.
  - The CRLD Programs are on track to meet the Make Ready Expansion Program's DAC participation targets. CRLD Program staff's intentional focus on prioritizing applications and executing projects in DACs has put SCE on track to meet the Make Ready Expansion Program's target for 50% of CIR, CSMR, Turnkey, and SSR port installations to be in DACs by the end of the program. Across applications submitted in 2024, 47% of committed Make Ready CIR, CSMR, Turnkey, and SSR ports were in DACs, raising the cumulative percentage of Make Ready CIR, CSMR, Turnkey, and SSR ports committed in DACs to 53%. Also, across 2024 applications, SCE committed 46% of NCR ports in DACs, compared to 29% at the end of 2023. Staff also noted their success in attaining high port counts per application, which helps lower program costs.
- **Over the three—and-a-half calendar period that the CRLD Program has been active, CRLD charging stations have helped to avoid an estimated 3,367 metric tons of carbon dioxide equivalents (MT CO2e) by expanding access to electric vehicle charging infrastructure.** In 2024 alone, the CRLD Programs helped to avoid an estimated 2,740 metric tons of carbon emissions that would have been emitted by traditional internal combustion engine vehicles. Shifting energy consumption times when carbon intensity is low (i.e., the fuel contributing to the energy on the grid is comprised of more renewable energy), such as between 8 a.m. and 4 p.m., and away from periods with higher CIs, such as 5 p.m. to 11 p.m., can reduce the CI of the electricity used to charge vehicles. This change will further increase the GHGs avoided due to the CRLD charging activity. We recommend that CRLD program staff, in coordination with SCE's DR program teams, continue to encourage charging during periods with a higher share of renewable resources available on the grid.
  - Opinion Dynamics recommends that CRLD program staff, in coordination with SCE's DR program teams, continue to encourage charging during periods with a higher share of renewable resources available on the grid. Shifting energy consumption times when carbon intensity is low (i.e., the fuel contributing to the energy on the grid is comprised of more renewable energy), such as between 8 a.m. and 4 p.m., and away from periods with higher CIs, such as 5 p.m. to 11 p.m., can reduce the CI of the electricity used to charge vehicles. This change will further increase the GHGs avoided due to the CRLD charging activity.
- **SCE continues to see significant demand for CRLD Programs.**

    - The SSR Program, introduced in 2023, was the second most common application in 2024, receiving 264 applications, nearly double the number received in 2023.
    - The DCFC Program (205 ports available), which began accepting applications in April 2024, received a great deal of interest. To curb the number of applications, the program only accepted applications during two short windows, but it still received 218 applications in 2024.
- **AMI data revealed steep increases in daily consumption for CRLD chargers in operation in 2024, which signals increasing utilization of new and existing sites. This may put downward pressure on rates.** The average daily consumption per energized application nearly doubled from 2023 to 2024, increasing from 41 kWh to 74 kWh. This increase in average daily consumption may be due to increased usage of existing charging stations or the installation and energization of additional charging stations with high usage. Further, the highest daily consumption in 2024 (14,772 kWh) nearly tripled the 2023 maximum, and the lowest daily consumption recorded in 2024 (1,989 kWh) was nearly 22 times the minimum daily demand recorded in 2023.
- **CRLD program staff continued to observe knowledge gaps in the charging infrastructure market.**
    - CRLD Program staff have observed a market-wide lack of knowledge about the complexities of EV charging infrastructure expansion projects. This was particularly acute for customers interested in the DCFC Program. While there were extremely high levels of interest in this program, SCE staff experienced higher rates of customers "dropping out" of the program due to a lack of understanding of the cost and complexities of installing DC fast charging equipment. CRLD program staff have observed that customers often do not understand the space required to install DC fast charging equipment, and the very high cost of these types of charging stations is surprising to some applicants.
    - In addition to a lack of understanding about the technical requirements to install EV charging infrastructure, customers and trade professionals required continued education about CRLD Program's technical and documentation requirements in 2024. As such, SCE prioritized trade professional education, as most applications come through their network of qualified trade professionals. SCE held quarterly training sessions in 2024 for new trade professionals to educate them on the program eligibility, requirements, and the application process. One training specifically focused on the new DCFC Program. The quarterly training brought in 150 new trade professionals. Additionally, SCE has a dedicated team for current trade allies that provides continued support and education to their customers.
        - The CRLD program team should consider increasing training efforts aimed at certain types of trade professionals. Program staff continued to raise issues related to technical knowledge gaps amongst trade professionals in 2024, and site hosts also reported maintenance issues and a lack of customer service among EVSEs. The CRLD team does offer several training sessions for trade professionals, but these are largely related to navigating program requirements and processes.
    - In 2024, CRLD program staff also focused on customer engagement and, through marketing and outreach campaigns, brought in over 1,200 leads. Marketing campaigns prioritized hard-to-reach customers in MUDs, churches, and golf courses, and SCE dedicated significant staff resources to one-on-one engagement with hard-to-reach customers.

        - CRLD program staff should continue to devote staff resources to providing one-on-one outreach tailored to specific market segments, such as certain non-residential market segments within DACs. The CRLD program team has developed a small group dedicated to encouraging participation amongst specific segments that include MUD customers, churches, and golf courses. SCE should increase these types of efforts with the goal of reaching other market segments of interest within DACs.

- **SCE has continued to see somewhat limited participation in the NCR Program in 2024.**
    - Program staff reported that this is likely due to a stricter CalGreen code cycle (2022 code with July 2024 update), which requires MUDs to have 10% EV chargers and 40% EV Ready low-power fully wired and ready for use. Additionally, the program requires program participants to agree to a 10-year contract for the chargers. Many new construction developers follow build-to-sell models, making it challenging to agree to a 10-year commitment before they can transfer to new ownership.
    - Building developers continue to feel the impact of higher costs and interest rates that have persisted in the wake of the COVID-19 pandemic. These challenges persist throughout the new construction industry, and are particularly acute in the housing market, particularly for MUDs located in DACs.
- **While customers commonly cite a lack of public charging availability as a main barrier to EV adoption, adding more charging infrastructure is unlikely to lead to immediate or localized EV adoption.** In the end-user survey, 83% of respondents mentioned insufficient charging locations in their communities. However, our market characterization literature review revealed that while the widespread presence of highly visible charging infrastructure is one critical prerequisite to broader EV adoption, other factors, such as perceptions of EV technology, play a key role. Even when public chargers are available, adoption may not rise unless paired with efforts to engage and educate consumers, especially those not already interested in EVs. To effectively overcome barriers like concerns about EV reliability and availability, public charging expansion must be complemented by campaigns that improve consumer perceptions of EV technology.
    - Opinion Dynamics recommends that SCE continue to promote CRLD broadly within its service territory, highlighting the increased availability of public charging infrastructure in specific neighborhoods. Research and evaluations of other similar public charging programs throughout the United States highlighted the benefits of having broad visibility of public charging programs, specifically as it relates to increasing adoption of EVs.
- **The CRLD Program team developed relationships with new switch gear suppliers in 2024.** Acquiring new switch gear suppliers has resolved a previous supply issue from 2023. The ordering process has also been moved up slightly, and internal members with new vendors have been acquired, resulting in quicker turnaround times. Switch gear is no longer considered a high-risk item.

Appendix A. Market Characterization: Detailed Findings

As part of the 2024 annual evaluation of SCE's CRLD Program, Opinion Dynamics conducted a market characterization study to examine EV adoption in line with the associated "EV adoption at service area level" SB 350 reporting metric. This effort included mapping the recent evolution of the EV market and public charging availability between 2020 and 2024 to illustrate the geographic relationships between EV adoption, public charging availability, and key customer segments, including underserved customers and disadvantaged communities (DACs) across SCE's territory. The evaluation team also conducted a landscape analysis reviewing available research, secondary data sources, and policy documentation to further explore EV market trends and help inform the geographic analysis and contextualize key findings. In addition, we conducted in-depth interviews with SCE's market incubation team and program staff to explore current and forward-looking priorities for SCE TE efforts and gain additional insights regarding recently observed market trends and anticipated market developments.

The market characterization study sought to address the following research objectives:

- Characterize the current EV market landscape and development since 2020
- Understand public charging availability geographically by customer segment and relative to EV adoption
- Explore factors driving changes to the EV market over time, including customer preferences, policy, utility programs, public funding, and industry advancements
- Identify key considerations for maximizing future influence on EV adoption

This section details integrated results from the market characterization study's geographic analysis, landscape analysis, and industry actor interviews, organized around the study's research objectives.

California EV Market Landscape and Recent Market Trends

California's policy landscape is driving EV and charging station adoption across SCE's service territory. Enacted in 2015, the Clean Energy and Pollution Reduction Act (Senate Bill 350)[51] laid foundational policy for programs like CRLD by mandating that California's electric investor-owned utilities (IOUs) incorporate transportation electrification into their long-term planning. The act encouraged the electric IOUs to support electric vehicle (EV) infrastructure development, contributing to the state's GHG emission reduction goals and prioritizing improvements in disadvantaged communities (DACs). The state aims for a 40% reduction in GHG emissions by 2030 and an 80% reduction by 2050.

In 2016, CPUC approved the three electric IOUs' applications (filed in 2014) for pilots to install light-duty, primarily Level 2 EV charging stations. SCE's initial one-year Charge Ready and Market Ready Phase 1 Pilot (Phase 1 Pilot) deployed charging stations and complementary marketing, education, and outreach in support of electric transportation.[52] In 2020, the CPUC approved the Charge Ready 2 Infrastructure and Market Education Program—also known as Charge Ready Light Duty (CRLD) Program—as a four-year

[51] Cite Clean Energy and Pollution Reduction Act (SB 350) document

[52] Legislation Approving SCE CRLD (Phase 1 Pilot). COM/CAP/ ar9. Decision 16-01-023

extension of the Phase 1 Pilot. SCE's CRLD Program launched in July 2021 and began accepting applications for Level 2 charging stations. In November 2023, the CPUC approved a Direct Current Fast Charging (DCFC) Program, which provides financial incentives for DCFC charging stations (i.e., Level 3 charging), and in April 2024, SCE began accepting applications for the DCFC Program.

The main objective of the CRLD Program is to increase the availability of charging infrastructure for passenger vehicles at locations such as workplaces, destination centers, fleet parking, and MUD housing, by addressing associated barriers relating to cost and complexity. The CRLD Program aims to install 30,000 EV charging ports, including minimum adoption targets by subprogram of at least 50% of ports in DACs and 30% in MUDs. Of SCE's 14 million residential accounts, approximately one-third are eligible for SCE's California Alternate Rates for Energy (CARE)[53] while 27% reside in DACs and 30% reside in MUDs.[54] Thus far, of all CRLD (including NCR) charging stations installed, 35% are located in DACs and 68% are located in areas where at least 15% of the population resides in MUDs.

In 2022, the California Air Resources Board (CARB) issued a roadmap to reduce California's demand for petroleum by 94%, cut air pollution by 71%, reduce GHG emissions by 85%, and reach carbon neutrality by 2045.[55] CARB referenced several regulations and policies that position California at the forefront of global efforts to reduce GHG emissions through accelerated transportation electrification, including the following:[56]

- Zero Emission Vehicle Executive Order: The Governor's Executive Order N-79-20 established a target of 100% zero-emissions in-state sales of new passenger cars and trucks by 2035 and set similar goals for medium-duty, heavy-duty, and off-road vehicles and equipment operations.[57]
- Advanced Clean Cars II: These regulations ramp up the sales requirement for passenger zero-emission vehicles (ZEVs) starting with the 2026 model year to achieve 100% by 2035.[58] This is among the first binding requirements for 100% ZEV sales worldwide. Since gasoline vehicles will continue on California's roads for many years, the regulations also tighten the emission standards for conventional gasoline-powered cars and light trucks.[59]
- Electric Vehicle Charging Standards: The Electric Vehicle Supply Equipment (EVSE) Standards regulation establishes rules for payment options at charging stations with the aim of making charging more accessible and easier to access by ensuring drivers can charge their car without a membership, use standard payment methods, and be provided transparent costs upfront.[60]
- Clean Miles Standard: Transportation network companies like Uber and Lyft must meet steadily increasing annual targets aimed at curbing greenhouse gas emissions, beginning in 2023 and

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[53] CARE offers financial assistance to income-qualifying households. SCE public presentation. Using Data to Profile Low-Income High Energy Users.

[54] Interview with SCE Market Incubation Team. 11/01/2024

[55] https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp.pdf

[56] https://ww2.arb.ca.gov/going-zero#:~:text=Advanced%20Clean%20Cars%20II,vehicle%20sales%20in%20the%20world.

[57] https://ww2.arb.ca.gov/resources/fact-sheets/governor-newsoms-zero-emission-2035-executive-order-n-79-20?keywords=2025

[58] Note that "zero-emission vehicle" (ZEV) typically denotes vehicles with no internal combustion engine, which excludes plug-in hybrid vehicles (PHEVs) and includes fuel cell electric vehicles (FCEVs), whereas "electric vehicle" (EV) refers to any vehicle with plug-in charging capability (i.e., PHEVs and BEVs).

[59] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii

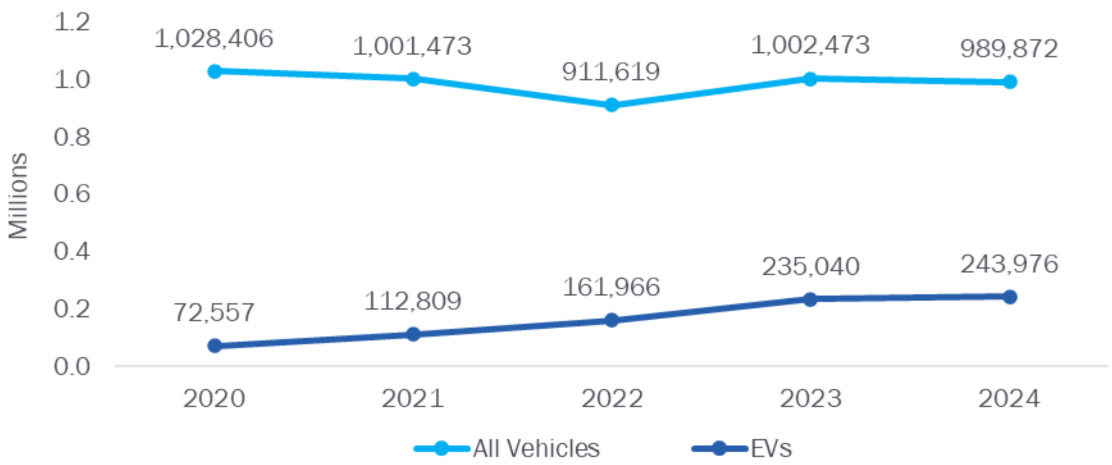
[60] https://ww2.arb.ca.gov/our-work/programs/electric-vehicle-supply-equipment-evse-standards

ending with 2030 targets of 90% electric vehicle miles traveled and zero greenhouse gas emissions.[61]

EV Market Trends in SCE Service Territory (2020-2024)

SCE's Pathway 2045 assessed various approaches to meet California's climate targets, identifying transportation electrification as one of the most feasible and cost-effective options, and targeting at least 24% EV adoption by 2030 (i.e., EVs making up at least 24% of all light-duty vehicles in SCE service territory).[62] EV sales have grown steadily as a percent of total light duty vehicle sales in SCE's service territory since the launch of the CRLD Program in 2020.[63] As of 2020, EVs amounted to 7% of all light duty vehicle sales, and by 2024 they accounted for 25% of new vehicles sold.[64] Overall, there has been a 236% increase in EV sales in SCE territory since 2020. Figure 24 summarizes annual EV sales relative to total light duty sales from 2020 to 2024.

Figure 24. Annual Light Duty Vehicle Sales in SCE Service Territory



Note: Sales figures from 15 counties served by SCE: Fresno, Imperial, Inyo, Kern, Kings, Los Angeles, Madera, Mono, Orange, Riverside, San Bernardino, Santa Barbara, Tuolumne, Tulare, and Ventura

In its Clean Power and Electrification Pathway report, SCE recognized that meeting the needs of California's anticipated EV adoption will require significant investment in charging infrastructure.[65] The report states that California will need over one million away-from-home charging ports to support at least 7 million electric cars by 2030. As of 2024, DOE records indicate 4,686 total charging sites are currently operating in SCE's service territory, reflecting an increase from 552 sites in 2020. CRLD sites account for 234 of the nearly 5,000 public charging sites in operation as of 2024 (or 5% of total sites). Figure 25 shows the geographic

[61] https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard
[62] Southern California Edison. Pathway 2045. https://www.edison.com/clean-energy/pathway-2045
[63] The California Energy Commission (CEC) uses the term zero-emission vehicle (ZEV) to refer to BEVs, PHEVs, and FCEVs.
[64] Counties served by SCE: Fresno, Imperial, Inyo, Kern, Kings, Los Angeles, Madera, Mono, Orange, Riverside, San Bernardino, Santa Barbara, Tuolumne, Tulare and Ventura
[65] Southern California Edison. Pathway 2030. https://www.edison.com/clean-energy/pathway-2030

distribution of public charging sites across SCE's service territory in 2020 and 2024, illustrating the sharp increase in prevalence, particularly in coastal and populous areas and along primary transportation corridors including the I-15 from Los Angeles to Las Vegas.

Figure 25. Public Charging Sites, 2020 and 2024

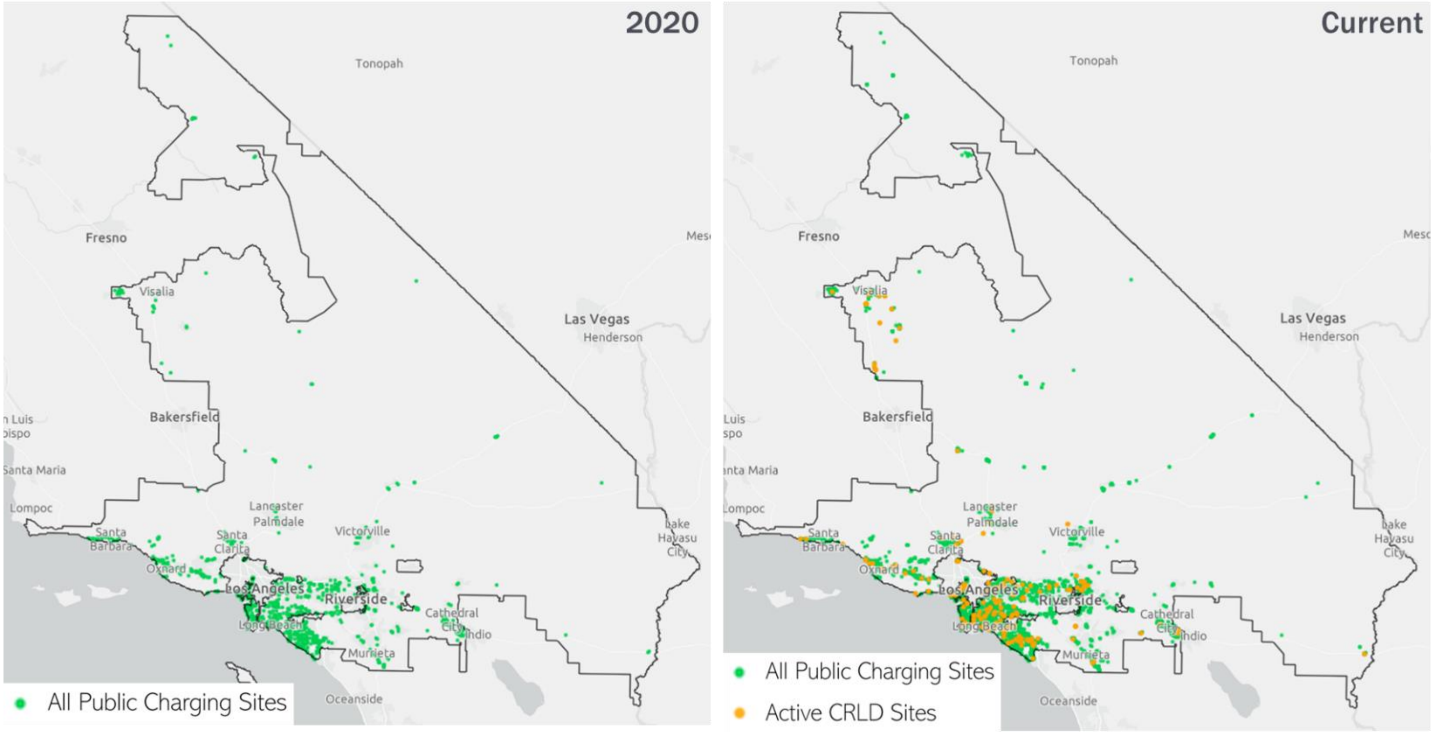


Figure 26 highlights zip codes in SCE's service territory with the highest percentage increases in EV adoption between 2020 and current. As shown, each of these areas saw at least a 100% increase in public charging sites accompanied by increases of at least 11% EV adoption.

Figure 26. Public Charging in Zip Codes with Highest Growth in EV Adoption since 2020

Zip Code	Nearest City	% Increase in EV Adoption (2020-2024)	% Increase in Public Charging (2020 to 2024)	Count of Public Charging Sites in 2024
90401	Santa Monica	22%	259%	61
90301	Inglewood	14%	2400%	25
92618	Irvine/Lake Forest	12%	400%	290
92602	Irvine	11%	150%	15
90077	Beverly Hills/Bel Air[a]	11%	100%	8

[a] Only a portion of the 90077 zip code fell within the boundaries of SCE's service territory.

A recent CALTEC study outlined 243 possible scenarios for the number of residential, non-residential, and public charging ports needed to support 5 million electric vehicles in California by 2030.[66] Different scenarios estimated need for between 3.8 and 6 million charging ports to support widespread EV adoption by 2030, representing an even more aggressive target than SCE's Clean Power and Electrification Pathway Report estimate of "over one million" ports. CALTEC estimates that the total infrastructure costs associated with these installations are likely to fall anywhere between $5.5 billion and $25.4 billion. These costs include utility and customer-side expenditures, highlighting the extensive development needed to ensure California can meet its climate goals. In SCE's Pathway 2030, SCE indicates that more funding will be needed to enable utilities and charging infrastructure companies to deploy more EV infrastructure and chargers.[67] Additionally, as EV adoption grows, faster charging needs and higher concentrations of EVs will inevitably put more strain on the grid.

Table 24 provides the breakdown of publicly available charging sites in both 2020 and 2024 by charging speed. Both Level 2 and DCFC charging increased threefold from 2020 to 2024. SCE's DCFC Program, which began accepting applications in April 2024, is expected to begin contributing to the population of active DCFC chargers in SCE's territory in 2025 as installations begin coming online.

Table 24. Public Charging Sites by Charging Speed in SCE Territory in 2020 and 2024

Charging Site Type	2020	2024
Level 2	1,164	4,070
DCFC	236	705
Total	1,327	4,686

[66] CALTEC. The Infrastructure Needs and Costs for 5 million Light-Duty Electric Vehicles in California by 2030. https://caletc.com/wp-content/uploads/2024/03/EV-infrastructure-study-white-paper-FINAL.pdf
[67] Sothern California Edison. Pathway 2030. https://www.edison.com/clean-energy/pathway-2030

Figure 27 and Figure 28 show the distribution of EV adoption across SCE's service territory in 2020 and 2023 (latest available). Less populated inland areas lag in EV adoption relative to urban coastal areas, but EV adoption broadly increased and there is an evident eastward spread in the map. Still, as of 2023, EV adoption outside of urban centers mostly remains under 5%. More than six times as many zip codes across SCE service territory have at least 5% EV adoption in 2023 (n=142) compared to 2020 (n=22). This aligns with CEC reporting on new vehicle sales in the area, which indicated an increase from 7% of the market in 2020 to almost 25% in 2024.

Figure 27. Percent of Battery Electric Vehicles by Zip Code, 2020 and Current

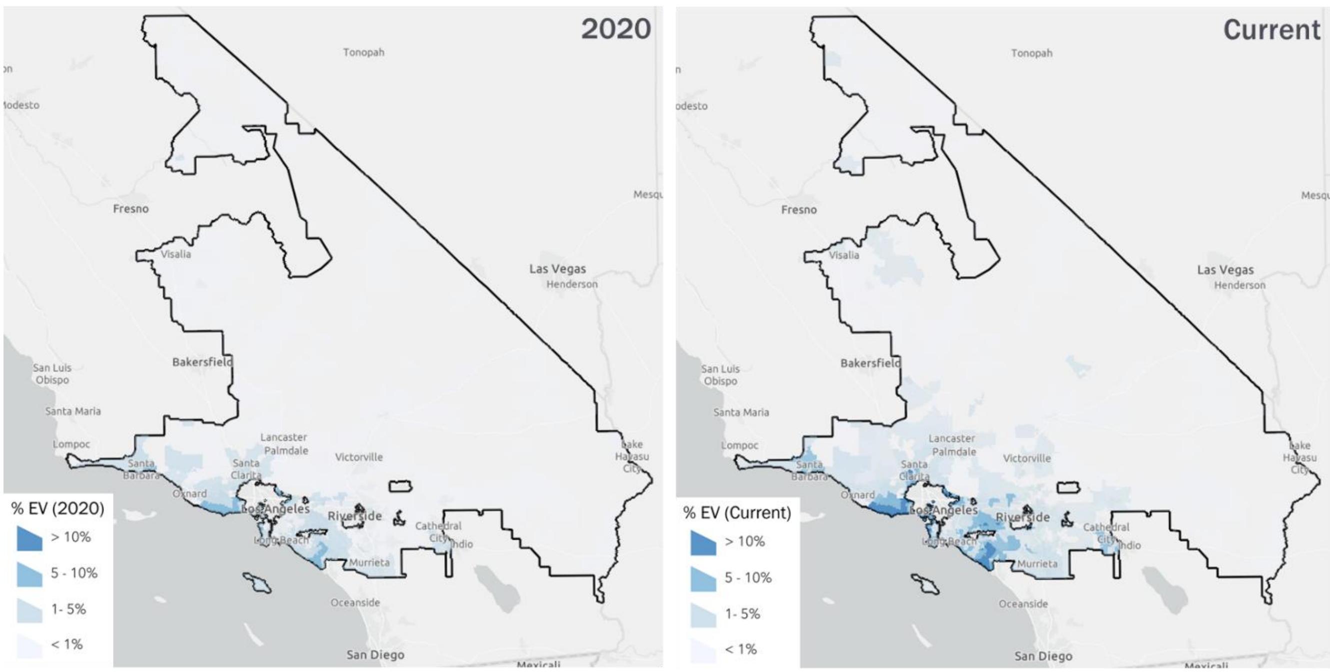


Figure 28. Urban Snapshot: Percent of Battery Electric Vehicles by Zip Code, 2020 and Current

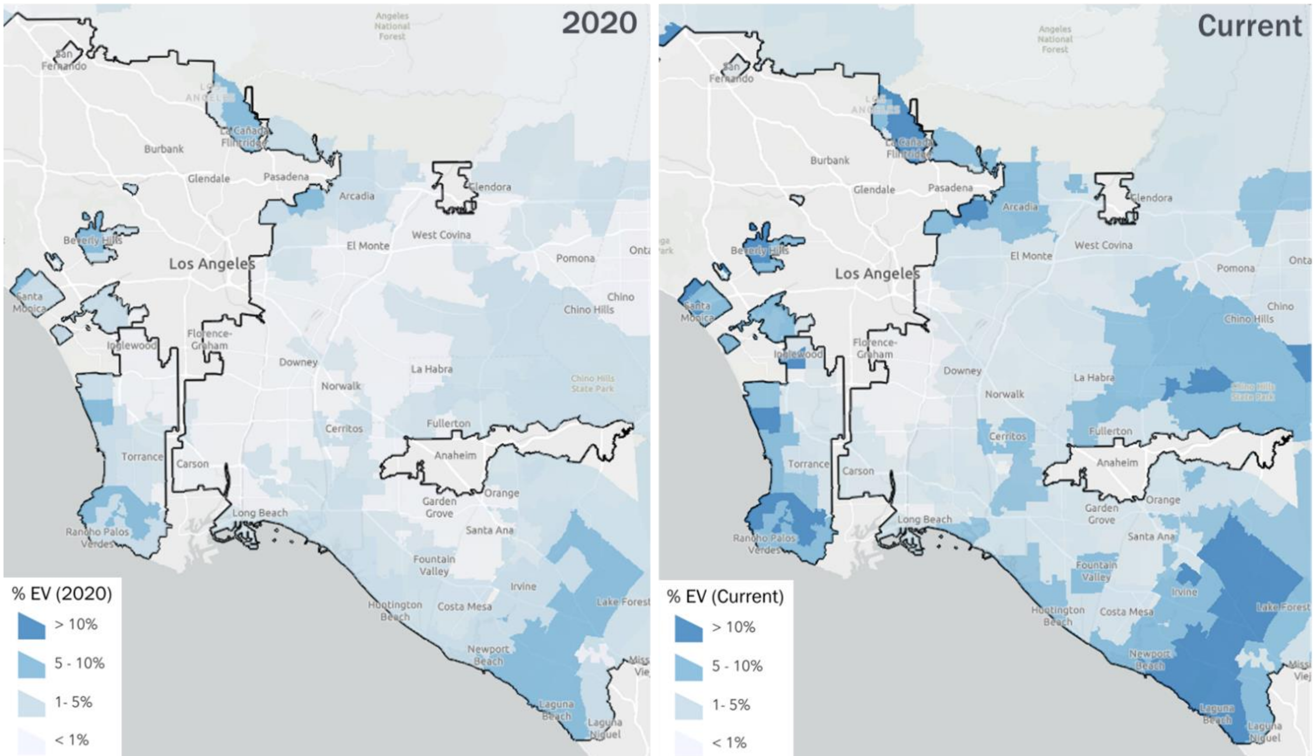
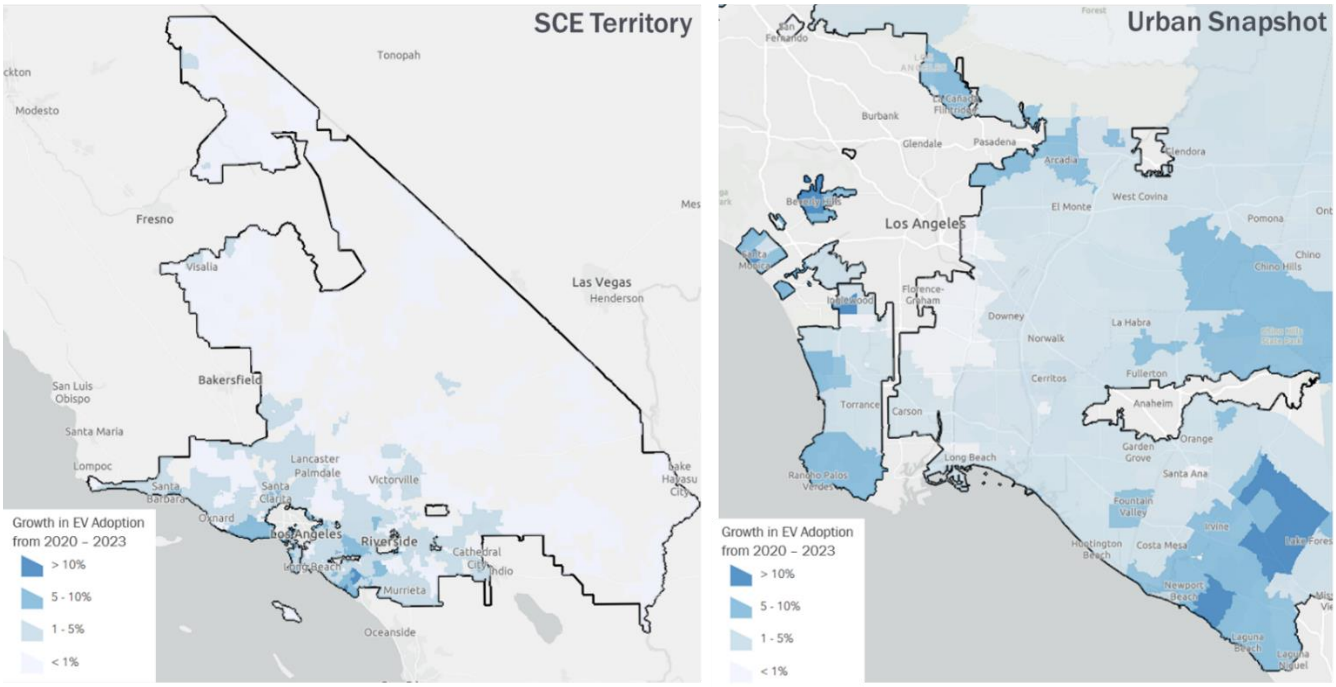


Figure 29 illustrates the percentage change in EV adoption from 2020 to 2023. Substantial portions of the area around Los Angeles and near the coast saw increases in EV adoption of over 5%, while broad swaths of territory saw more modest growth in EV adoption.

Figure 29. Growth in EV Adoption from 2020 to Current



SCE's Clean Power and Electrification Pathway acknowledges that ensuring the affordability of and access to EVs for low- and moderate-income Californians is critical to reaching its transportation electrification goals.[68] Despite the recent introduction of select EV models with slightly lower price points, upfront cost remains a clear barrier. The used market for EVs is still in its infancy, though increasing availability of used EVs in coming years is likely to help improve EV affordability.[69] SCE staff also acknowledged the increasing market for used EVs as a potentially significant anticipated market development.

According to CARB, California's most vulnerable populations, including children, elder adults, lower-income households, and communities of color, bear a disproportionate burden of pollution and have the most to gain from the transition to zero-emission transportation.[70] The CPUC defines California's vulnerable populations, or the state's equity segment, as hard-to-reach (HTR) utility customers, underserved customers, and customers in DACs. The definitions consider a combination of demographic, socioeconomic, and air pollution/geography when determining customer need for energy and environmental programs, as outlined in Table 25.

[68] Pathway 2045. https://www.edison.com/clean-energy/pathway-2045
[69] https://www.forbes.com/sites/stacynoblet/2025/02/19/used-ev-market-volume-reaches-new-high-so-whats-next/
[70] https://ww2.arb.ca.gov/going-zero#:~:text=Advanced%20Clean%20Cars%20II,vehicle%20sales%20in%20the%20world.

Table 25. CPUC Definitions for Equity Segment Customer Groups

Equity Segment Category	Definition
Hard-to-Reach (Residential)	Customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a combination of language, geographic, and split incentive barriers. For the Residential sector (two criteria are considered sufficient if one of the criteria met is geographic): ▪ **Language**: Primary language spoken is other than English ▪ **Geographic**: Homes in disadvantaged communities (as designated by CalEPA) and/or areas other than the United States Office of Management and Budget Combined Statistical Areas of the San Francisco Bay Area, the Greater Los Angeles Area and the Greater Sacramento Area or the Office of Management and Budget metropolitan statistical areas of San Diego County ▪ **Income**: Those customers who qualify for the California Alternative Rates for Energy (CARE) or the Family Electric Rate Assistance Program (FERA) ▪ **Housing Type**: Multifamily and mobile home tenants (rent and lease)

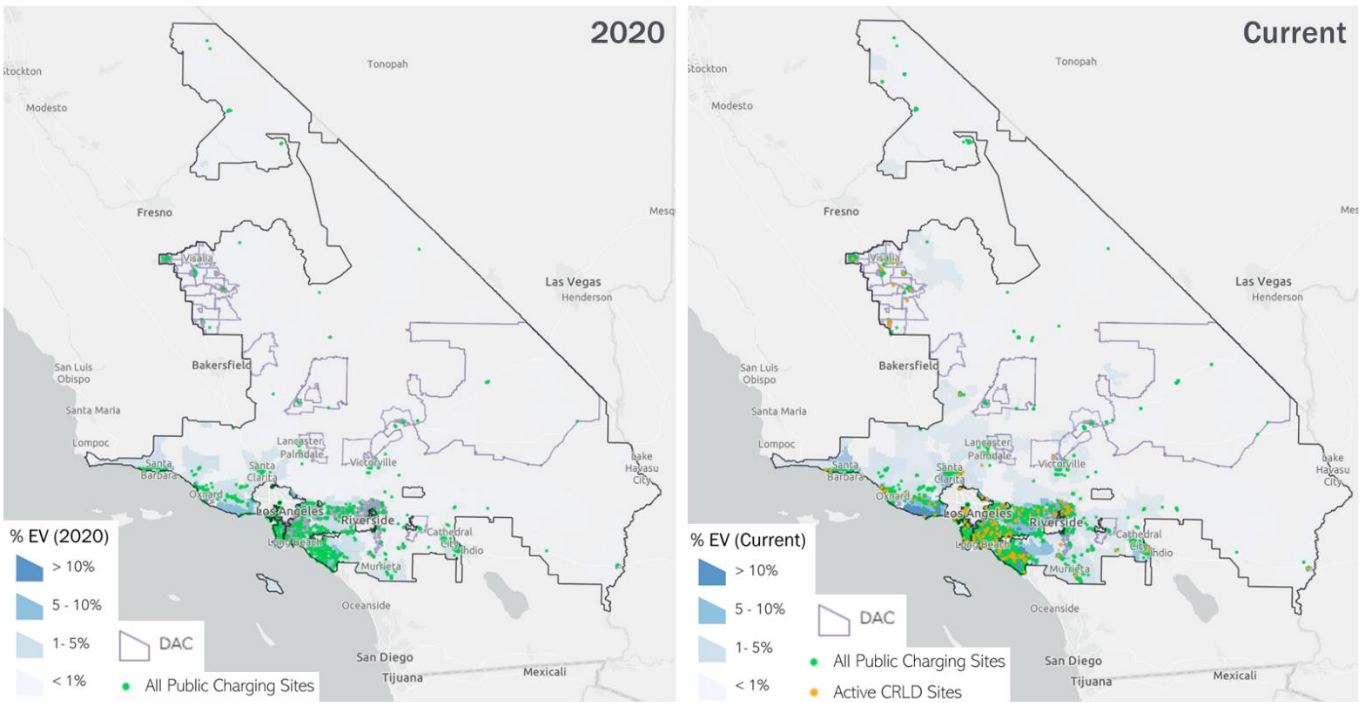
Underserved	A community that meets one of the following criteria:
	▪ **"Disadvantaged communities,"** or communities in the 25% highest scoring census tracts according to the California communities Environmental Health Screening Tool (CalEnviroScreen); as well as all California tribal lands, census tracts with median household incomes less than 60% of state median income; and census tracts that score in the highest 5% of Pollution Burden within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data.
	▪ **"Low-income communities,"** or census tracts with median household incomes at or below 80% of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits.
	  ▪ Is within an area identified as among the **most disadvantaged 25%** in the state according to the California Environmental Protection Agency and based on CalEnviroScreen.
	  ▪ A community in which at **least 75% of public-school students are eligible for free or reduced-price meals** under the National School Lunch Program.
	  ▪ A community **located on lands belonging to a federally recognized California Indian tribe.**

Disadvantaged Communities	Communities in the **25% highest scoring census tracts according to CalEnviroScreen**; as well as all **California tribal lands**, census tracts with median household **incomes less than 60% of state median income**; and census tracts that score in the **highest 5% of Pollution Burden** within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data.

Source: California Public Utilities Commission. Environmental & Social Justice Action Plan Version 2.0. April 2022. https://www.cpuc.ca.gov/esjactionplan/.

Figure 30 shows the number of public charging sites in relation to EV adoption and DAC census tracts. DACs are those census tracts with a CalEnviroScreen score placing them in the top 25% of most burdened by pollution, as well as tribal lands and those with lower median household incomes.[71] Across SCE territory, public charging stations are generally more concentrated outside of DACs, but DAC coverage has increased substantially since 2020. As of 2020, less than 3% of DACs had at least 3 public charging stations, and in 2024 more than 10% had three or more charging stations. In addition, 20% of all publicly available charging sites and 34% of active CRLD sites are located in DACs as of 2024, representing progress toward the CRLD target of 50% of sites being completed in DAC areas.

Figure 30. EV Adoption, Public Charging Sites, and Disadvantaged Census Tracts, 2020 and Current



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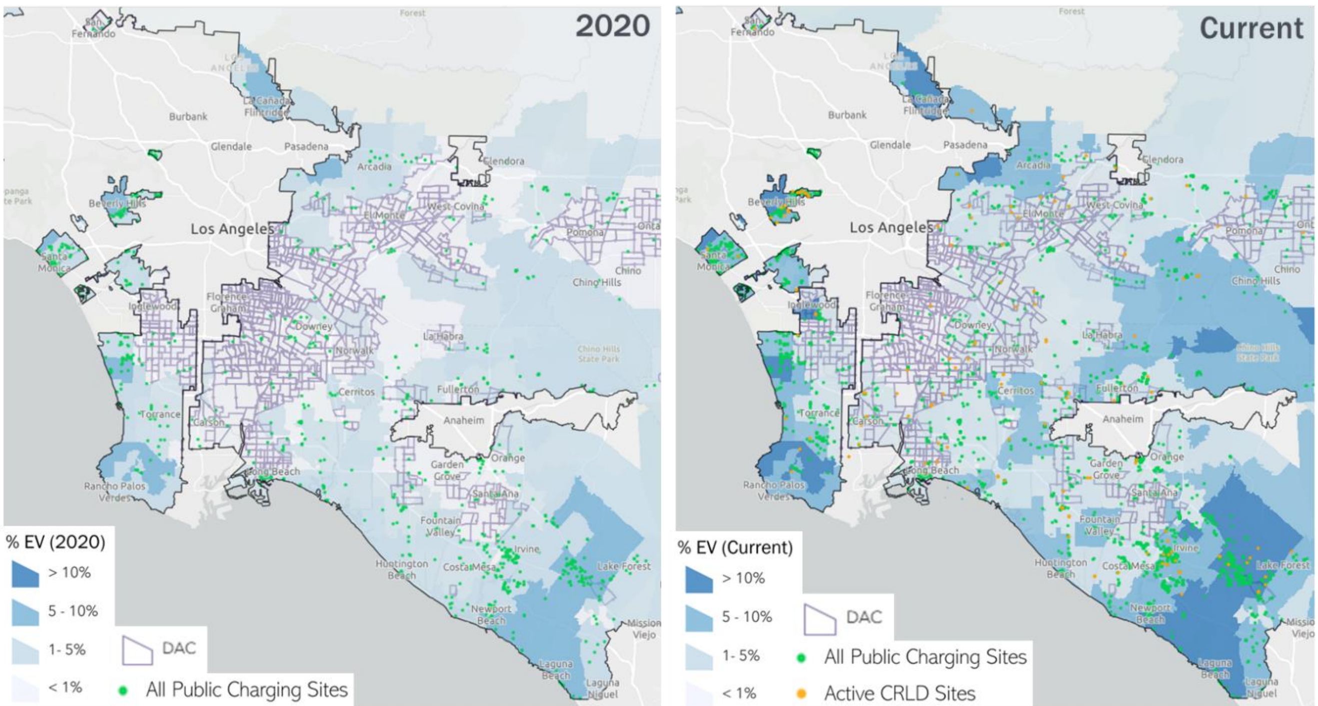
71 https://oehha.ca.gov/calenviroscreen/scoring-model

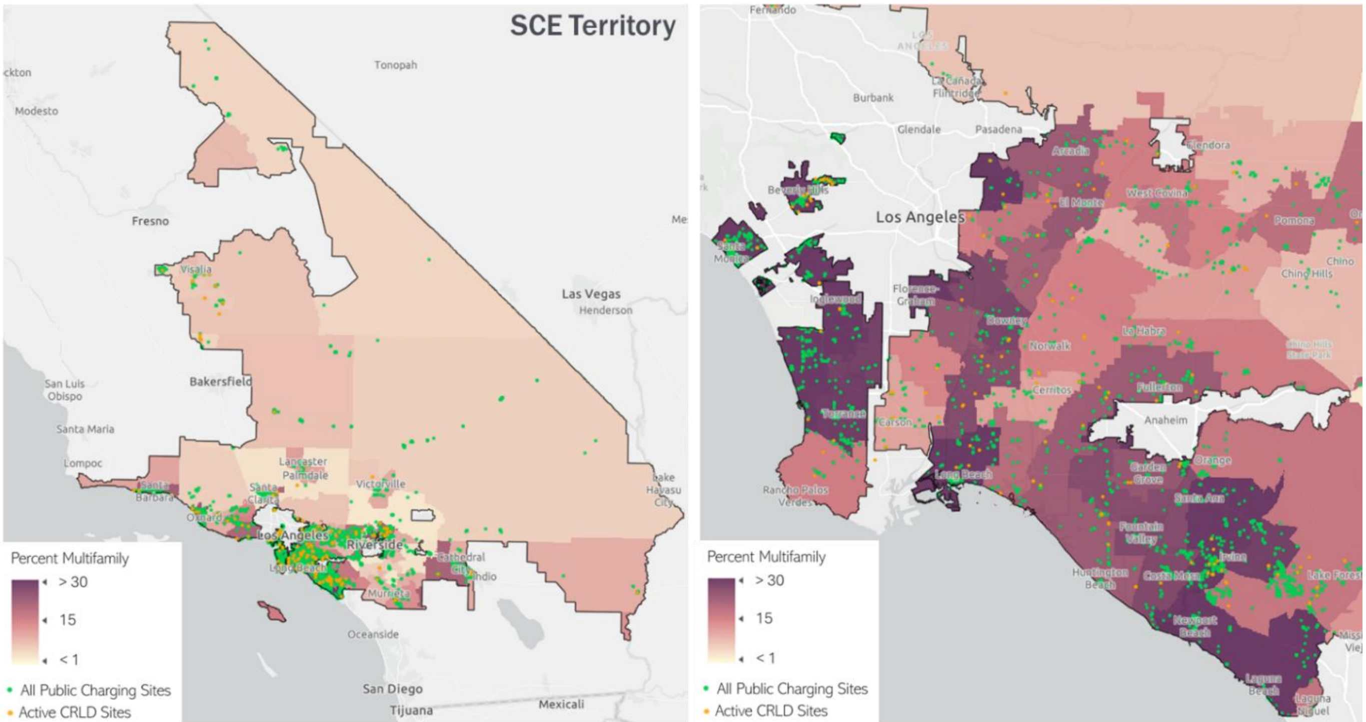
Figure 31 illustrates public charging locations and EV adoption levels relative to DAC areas in the urban, coastal areas of SCE's service territory. This granularity highlights the concentration of charging locations outside of DACs in areas like Torrance, Santa Monica, Beverly Hills, Irvine, and Costa Mesa. Conversely, some parts of Long Beach and Santa Monica stand out as DAC areas with upwards of 30 charging sites in a single zip code.

Figure 31. Urban Snapshot: Public Charging Sites and Disadvantaged Census Tract, 2020 and Current



SCE is particularly focused on increasing charging availability for residents of MUDs. SCE has a goals for each CRLD subprogram targeting between 30% and 100% of sites installed at MUDs. Figure 32 shows the distribution of public charging sites relative to prevalence of multifamily housing. Public charging sites tend to be located in more densely populated areas which tend to have higher levels of multifamily housing. Three-fourths (75%) of all public charging sites are in areas where at least 15% of the population lives in multifamily housing, while just over two-thirds (68%) of active CRLD chargers are in areas where at least 15% of the population lives in multifamily housing. Multifamily housing is sometimes more prevalent in lower-income areas, but several notably high-income areas in SCE's territory, such as Santa Monica, have high particularly high incidences of MUDs. In areas with a lower percentage of residents living in MUDs, public charging sites flank transportation corridors, such as Highways 15 and 99.

Figure 32. Percent of Population Living in Multiunit Dwellings by PUMA



Market Factors and Drivers of EV Adoption

Published literature indicates a wide variety of factors including customer preferences, perceived public charging availability, public policy and funding, utility programs, and industry advancements all contribute to EV industry growth. This section explores the factors driving changes to the EV market over time.

Customer Preferences and Market Segments

One 2022 UC Davis study explored the complexities associated with EV purchase decisions, identifying the following drivers of consumer preferences:[72]

- **Pro-Environment Attitudes:** Individuals with positive attitudes toward environmental regulations and eco-friendly lifestyles are more likely to adopt EVs.[73] These "pro-environment" consumers are willing to pay more for cleaner vehicles and support policies to reduce environmental impacts.
- **Tech-Savvy Consumers:** Tech-savvy individuals, characterized by their openness to new experiences and comfort with emerging technologies, strongly prefer EVs. This group views EV adoption as aligned with their interest in innovation and cutting-edge technology.

[72] Iogansen, Xiatian. UC Davis. Deciphering the factors associated with adoption of alternative fuel vehicles in California: An investigation of latent attitudes, socio-demographics, and neighborhood effects. October 23, 2022.
[73] This article uses alternative fuel vehicle (AFV) as terminology that includes: Plug-in hybrid electric vehicles (PHEVs), Battery electric vehicles (BEVs), Hydrogen fuel cell electric vehicles (FCEVs) and Natural gas vehicles (NGVs)

- **Car-Utilitarian Attitudes:** Consumers prioritizing functionality over brand prestige show an increasing interest in EVs. The study suggests that this group focuses on practical benefits, such as reliability and lower operating costs.
- **Suburban Households:** Suburban residents are more likely to adopt EVs primarily because home charging infrastructure is relatively convenient and cost-effective for them to install.
- **Car-Dependent Individuals:** Heavily car-dependent consumers rely on vehicles for daily life, and may be reluctant to adopt EVs and risk changing their driving habits due to vehicle range. However, this group may be most influenced by increased availability of public charging infrastructure and higher-speed charging.

Prior research consistently points to upfront cost as a leading barrier to EV adoption, including past customer research by Opinion Dynamics[74] and a 2023 EPRI meta-analysis of national research on EV adoption barriers.[75] In 2023, the Center for Sustainable Energy (CSE) completed a comprehensive study examining the characteristics of California consumers purchasing and leasing EVs between 2017 and 2020. This research highlights how the demographics of EV drivers have evolved as the market progresses beyond the early adopter stage, and demographics among EV buyers shift to more closely resemble the broader population of vehicle buyers. The CSE study also points out that those purchasing plug-in hybrid vehicles (PHEVs) are more demographically similar to the broader population of vehicle buyers than those purchasing battery electric vehicles (BEVs), likely because PHEVs still have ability to operate on their internal combustion engines (ICEs) making them less reliant on charging.[76]

Still, key demographic differences remain between EV drivers and the broader population, with recent EV buyers still typically higher-income and more likely to be single-family homeowners than the general vehicle-buying public,[77] as summarized in a 2023 Transportation Journal article:[78]

- **Age and Gender:** EV drivers tend to be younger individuals (18–34 years), particularly younger men.
- **Income and Education:** Higher-income and higher levels of education strongly correlate with EV adoption.
- **Housing and Residential Factors:** Homeowners and single-family households are more likely to adopt EVs; these residents typically have an easier time installing home chargers than renters living in multifamily units.

Survey research conducted by Opinion Dynamics in 2023 with Xcel Energy Colorado EV drivers found that 76% of customers cited battery capacity or limited range as a leading concern when first considering purchasing or leasing an EV. Around half of these respondents cited upfront cost (52%) or charger availability (46%) as a primary concern.[79] When asked about their rationales for ultimately deciding to get an

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[74] https://opiniondynamics.com/wp-content/uploads/2024/03/Xcel-Energy-TEP_Residential-Customer-Research-Memo_FINAL.pdf
[75] https://energycentral.com/o/EPRI/understanding-barriers-and-challenges-greater-ev-adoption
[76] Center for Sustainable Energy (CSE). Assessing Progress and Equity in the Distribution of Electric Vehicle Rebates Using Appropriate Comparisons. Transport Policy.
[77] Ibid.
[78] Transportation Research Part A, “Deciphering the factors associated with adoption of alternative fuel vehicles in California: An investigation of latent attitudes, socio-demographics, and neighborhood effects”
[79] https://opiniondynamics.com/wp-content/uploads/2024/03/Xcel-Energy-TEP_Residential-Customer-Research-Memo_FINAL.pdf

EV, more than three-quarters of respondents pointed to environmental benefits (85%) and lower fuel costs (83%). Other common motivations included reduced maintenance (61%) and vehicle performance (61%).

Customers commonly cite lack of public charging availability as a barrier to EV adoption, according to a recent CARB survey of California customers[80] as well as a broader meta-analysis of national research on EV adoption barriers.[81] The CARB survey gathered feedback from over 2,600 Californian EV drivers about their experience with EVs, and more than two-thirds had at some point experienced issues with public charging sites, including all chargers being in use (68%), chargers being unresponsive (67%), and chargers being physically damaged (59%).[82] The broader, national meta-analysis, conducted in 2023 by EPRI, indicates that 78% of Americans believe finding a public EV charger is difficult. The data suggest that concerns around charging availability and range, as well as upfront cost, are the leading forces preventing EV adoption. The same research also indicates that inherent 'consumer inertia' inhibits EV adoption, such that customers accustomed to gas cars and gas stations will inevitably take some time to adapt to owning an EV.

Findings from a UC Davis study challenge the assumption that increasing public charging infrastructure directly correlates with EV adoption.[83] The research indicates that public charging density has no statistically significant relationship with EV purchase consideration, assessments of charging access, or EV marketability. Even when public chargers are available, they may not translate to increased EV adoption unless accompanied by broader efforts to engage consumers and enhance perceptions of EV technology. The UC Davis study finds that many consumers overlook public charging infrastructure unless they are interested in EVs. The density of chargers in a given area does not directly influence whether people report seeing them, nor does it increase purchase consideration. This suggests that public charging alone cannot generate interest among those not considering an EV. Even for individuals aware of public charging, purchase decisions are mediated by prior interest in EVs, assessments of marketability, and home charging access rather than the presence of public chargers.

According to the same UC Davis study, public charging must be part of a larger strategy to engage consumers and impact EV adoption significantly. The study suggests focusing on:

- **Increasing Awareness:** Public charging infrastructure should be promoted to enhance visibility and understanding among potential EV buyers.
- **Targeted Messaging:** Efforts should prioritize engaging consumers with low prior interest in EVs and address perceived barriers such as reliability and availability.
- **Home Charging Solutions:** Expanding access to residential charging, particularly for MUDs, is critical for overcoming adoption barriers.

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[80] https://ww2.arb.ca.gov/sites/default/files/2024-06/CARB%20EV%20Barriers%20Survey%20Results%20Report%20ADAReview_1.pdf

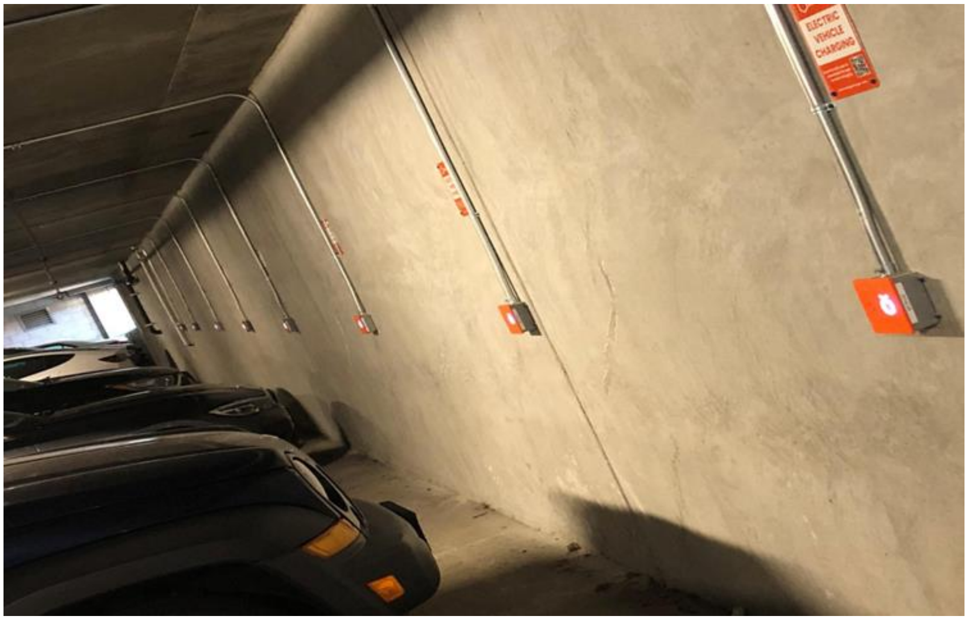
[81] https://www.sciencedirect.com/science/article/pii/S2773153724000057

[82] https://ww2.arb.ca.gov/sites/default/files/2024-06/CARB%20EV%20Barriers%20Survey%20Results%20Report%20ADAReview_1.pdf

[83] UC Davis. If you build it, will they notice? public charging density, charging infrastructure awareness, and consideration to purchase an electric vehicle. Published in: Transportation Research Interdisciplinary Perspectives.

During interviews, SCE staff suggested that retrofitting MUD parking garages to install Level 2 chargers is particularly expensive and complex, yet increasing charging access for MUD residents remains a point of emphasis for the CRLD Program.[84] As part of their presentation at the California Efficiency and Demand Management Council (CEDMC) Fall 2024 conference, Peninsula Clean Energy outlined their program that adds a Level 1 charger to every parking spot in existing MUD parking garages for just $2,500 per outlet (much less than the cost of installing a Level 2 charger in these locations). Although Level 1 chargers only provide about 10 percent charge overnight, they are often sufficient for those who commute less than 30 miles daily. Figure 33 shows an example of the Peninsula Clean Energy Level 1 chargers and associated signage.[85]

Figure 33. Peninsula Clean Energy Level 1 Charging in MUDs



Source: Peninsula Clean Energy CEDMC Presentation

Policy, Programs, and Funding Sources

Utility, state, and federal incentives also have potential to influence EV adoption. According to the CEC's Clean Vehicle Rebate Program 2020 survey of EV drivers, those who had access to Federal Tax Credits, State Rebates, or carpool lane access frequently indicated these programs were critical in their decision to buy or lease their EV (47% for Federal Tax Credits, 43% for State Rebates, and 37% indicating access to the carpool lane).[86] California allows EV drivers a "Clean Air Vehicle" sticker to use the carpool lane regardless of the number of occupants in the vehicle.

[84] Opinion Dynamics Interview with SCE staff, November 2024.
[85] Note that Level 1 chargers usually do not meet CRLD Program networking requirements and so are typically not viable options for the Program.
[86] California Energy Commission (2021). 2019 California Vehicle Survey. Retrieved (11/23/2024) from https://www.energy.ca.gov/data-reports/surveys/california-vehicle-survey

This section discusses the state and federal transportation electrification policies affecting SCE customers and associated programs and funding available to SCE and its customers since 2020.

Transportation Electrification Framework (TEF)

The CPUC began approving Funding Cycle Zero (FC0) programs in 2016, which were expected to end by December 31, 2024. FC0 represents a series of transportation electrification investments, programs, applications, and advice letters that have been approved or are pending the CPUC's approval.

In November 2022, the CPUC approved the Transportation Electrification Framework (TEF) via Decision 22-11-040, which laid out a series of funding structures for transportation electrification investments, including a grace period allowing FC0 programs to phase out by the end of 2026, and introduced Funding Cycle 1 (FC1), which included a $1 billion budget to be made available in 2025. The TEF was designed to coordinate efforts between the IOUs in support of the state's clean transportation goals as mandated by Senate Bill 350, and includes the following:

1. **Investment Guidelines**: Outlines a structured approach for utility investments in EV charging infrastructure.
2. **Rebate Programs:** Proposes a statewide rebate program for behind-the-meter (BTM) vehicle charging infrastructure equipment targeting MUDs and the medium to heavy-duty sectors.
3. **Administrative Efficiency:** Eliminates utility ownership of BTM charging infrastructure, in favor of rebate structures intended to minimize ratepayer costs and risks.
4. **Stakeholder Engagement:** Emphasizes ongoing stakeholder input through annual roundtables.
5. **Equity and Accessibility:** Highlights the importance of addressing equity concerns within transportation electrification investments, aiming to ensure that benefits are accessible to all Californians, particularly disadvantaged communities.[87]

In December 2023, the CPUC initiated a new rulemaking suspending the ratepayer-funded support of TEF initiatives, directly impacting CRLD funding and SCE's strategic priorities.[88] SCE continues to evolve its transportation electrification offerings in response to these proceedings, advocating in July 2024 formal comments to the CPUC for a series of changes to transportation electrification program timing and administration, including EV rebates, FC0, and FC1 programs.[89]

California Programs

Beyond TEF, California offers several state-funded transportation electrification initiatives, some of which SCE has already leveraged to enhance its transportation electrification offerings for customers.

Low Carbon Fuel Standard Funds

The Low Carbon Fuel Standard (LCFS) is a state program designed to reduce the carbon intensity of fuels. It creates a revenue stream for clean transportation projects through credits generated by low-carbon fuel

[87] Transportation Electrification Framework (TEF) legislation. (D.22-11-040)
[88] Order Instituting Rulemaking Regarding Transportation Electrification Policy and Infrastructure and Closing Rulemaking 18-12-006
[89] SCE's reply to response to TEF legislation. R.23-12-008

providers.[90] SCE actively engages with the LCSF program, using LCSF funds to support both the Pre-Owned Electric Vehicle Rebate Program, which provides rebates of up to $4,000 to customers who purchase or lease eligible pre-owned electric vehicles,[91] and the Charge Ready Home Rebate Program, which incents in-home panel upgrades required to install Level 2 chargers.[92]

In April of 2024, SCE submitted a request for an Exemption to the Public Utilities Code and Implementation Plan for programs funded by LCSF for 2024-2027.[93] As part of this request, SCE proposed several efforts in support of the light-duty EV market:

1. Continuing to fund the pre-owned EV Rebate Program
2. Expanding the Charge Ready Home Rebate Program to support individual circuit installations in single-family homes
3. Providing income-qualified EV drivers with subsidized public charging to effectively access the discounted rates when publicly charging their EVs by enabling affordable charging wherever the driver decides to go, using subsidized EV charging through preloaded debit cards.

Electric Program Investment Charge Funds

In 2012, the CPUC established the Electric Program Investment Charge (EPIC) Fund to support public interest investments in clean energy research.[94] The CPUC oversees and monitors the implementation of the ratepayer-funded EPIC resource, and funds are administered by the California Energy Commission (CEC) to support CA IOU efforts in support of clean energy innovation, including technology that advances grid reliability and resilience.

Currently, SCE is the PA for a DC Fast Charging Demonstration funded through EPIC. This project aims to demonstrate public DCFC charging stations at SCE facilities near freeways in optimal locations to benefit electric vehicle miles traveled (eVMT) by EVs while implementing smart grid equipment and techniques to minimize system impact.[95] Additionally, SCE administers a Vehicle-to-Grid (V2G) Integration project funded by EPIC that assesses and evaluates new interconnection requirements, V2G-related technologies and standards, and utility and third-party controls to demonstrate how V2G direct current (V2G-DC) and V2G alternating current (V2G-AC) capable EVs and EV chargers can discharge to the grid and be used to support charging when there's an outage on the grid.

Other examples of EPIC-funded efforts being administered by other IOUs may shed light on options for future SCE opportunities:[96]

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[90] California Air Resource Board. Low Carbon Fuel Standard. https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard
[91] https://evrebates.sce.com/
[92] https://evhome.sce.com/
[93] Southern California Edison's Request for an Exemption to Public Utilities Code Section 851 and Implementation Plan for Programs and Projects Funded with Low Carbon Fuel Standard Holdback Residential Base Charging Credit and Electric Forklift Credit Proceeds for 2024-2027.
[94] CPUC. Electric Program Investments Charge Program-EPIC. Electric Program Investment Charge Program - EPIC | California Energy Commission
[95] EPIC Database. Available in: https://database.epicpartnership.org/project/33074
[96] EPIC Database. Available in: https://database.epicpartnership.org/project/33074

- **California Energy Commission** is deploying VGI technology with unidirectional and bidirectional power flow capabilities using light fleet and consumer vehicles at the University of California San Diego (UCSD).
- **California Energy Commission** is exploring the benefits and opportunities of Total Charge Management (TCM), where EV charging is managed across multiple charging events to maximize vehicle load flexibility. The project tests how flexible an electric vehicle load can be if managed across a driver's daily or weekly charge events.
- **PG&E EV Submetering Pilot** demonstrates the use of Electric Vehicle Service Equipment (EVSE) submetering to provide an EV electric rate without the need for an additional utility meter.
- **PG&E Multi-Purpose Meter** aims to demonstrate a prototype EV submeter for use with third-party EVSEs in MUDs, individual residences, and commercial applications, allowing participation in the EV electric rate.
- **PG&E DC Fast Charging Planning Tool** maps the preferred locations for DC fast charging based on traffic patterns and PG&E's distribution system, aiming to meet customers' needs while optimizing grid demand.
- **PG&E EV Adoption Propensity Modeling** tests a new predictive model utilizing machine learning algorithms to estimate EV adoption levels. The model will inform service planning and capacity upgrades by neighborhood, thereby optimizing grid upgrade planning and mitigating the costs associated with premature or mid-sized upgrades.

Clean Cars for All

CARB's Clean Cars 4 All initiative provides incentives to help lower-income consumers replace ICE vehicles with newer, cleaner transportation.[97] Alternative mobility options are also available, and participants may choose to purchase an e-bike or receive a voucher for public transit. Additionally, buyers of EVs are also eligible for home charger incentives or prepaid EV charge cards if home charger installation is not an option.

Statewide Managed Charging Programs and Advancements

The CEC partnered with WeaveGrid, a charging optimization vendor, to initiate the ChargePerks program to support California's grid resiliency. California EV drivers who enroll and allow for charging optimization during off-peak periods earn cash rewards and savings.[98] In addition to ChargePerks, the CPUC is encouraging managed EV charging, even at public charging stations:

- **Submetering for EVs:** The CPUC has authorized submetering, enabling EV owners to measure energy use separately from their main utility meter. This advancement facilitates EV participation in demand response programs by allowing for more precise monitoring and management of charging activities.[99] Businesses with EV charging stations can manage the chargers' impact on their overall usage separately from other business operations.

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[97] Clean Cars 4 All | California Air Resources Board

[98] https://www.weavegrid.com/chargeperks

[99] VGI Policy, Pilots, and Technology Enablement. https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/vehicle-grid-integration-activities

- **VGI Roadmap:** The CPUC, in collaboration with other stakeholders, has developed a VGI roadmap to promote the integration of EVs as energy resources. This strategy encompasses public charging infrastructure, aiming to harness EV batteries for grid support through demand response and other VGI applications.[100]

Enel X also operates a virtual power plant in California, consisting of smart charging stations participating in demand response programs. These resources are active in California Independent System Operator (CAISO) markets, demonstrating the potential of aggregated public charging stations to provide grid services.[101]

Federal Programs

Federal funding also has the potential to influence the EV market and support state and utility transportation electrification efforts. However, under the current federal administration it is unknown how these funds will continue to be distributed.

Inflation Reduction Act

The Inflation Reduction Act (IRA), enacted in August 2022, represents a significant federal initiative to build projects, hire workers, and manufacture equipment needed to strengthen domestic supply chains, lower household energy costs while reducing GHG emissions, and pay fair wages for those efforts.[102] The IRA offers a range of incentives and funding opportunities to accelerate the transition to cleaner transportation and allocates funding to develop a nationwide network of EV charging stations. This includes grants and programs designed to facilitate the installation of chargers across various locations, such as urban areas, rural communities, and along major highways.

The IRA also extends and modifies tax credits for consumers purchasing electric vehicles. Eligible buyers can receive a tax credit of up to $7,500 for new qualified EVs or fuel cell electric vehicles (FCVs) and up to $4,000 for pre-owned EVs.[103] The IRA also reinstates and enhances tax credits for installing EV charging equipment. Homeowners who install qualified charging stations can receive a credit equal to 30% of the installation cost, up to a maximum of $1,000.

Bipartisan Infrastructure Law

The 2021 Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law, includes an allocation of $7.5 billion to establish a nationwide network of 500,000 EV chargers with a focus on serving rural areas.[104] Recognizing that rural residents often face longer commutes and higher fuel expenses, the U.S. Department of Transportation released the "Charging Forward" toolkit to assist these communities in planning and securing funding for EV charging infrastructure. This resource aims to connect local stakeholders with necessary partners and provide best practices for developing charging networks,

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[100] Ibidem

[101] Virtual Peaker and Enel X Partner to Provide Smart Home Energy Solutions. https://www.enelnorthamerica.com/about-us/newsroom/search-press/press/2021/07/smart-home-energy-solutions-with-enel-x-partnership

[102] U.S Department of the Treasury. Inflation Reduction Act. Available in: https://home.treasury.gov/policy-issues/inflation-reduction-act

[103] U.S Department of Energy. Federal Tax Credits for Plug-in Electric and Fuel Cell Electric Vehicles Purchased in 2023 or After. Available in: https://fueleconomy.gov/feg/tax2023.shtml

[104] Infrastructure Investment and Jobs Act (IIJA). President Biden, U.S. Department of Transportation Releases Toolkit to Help Rural Communities Build Out Electric Vehicle Charging Infrastructure | US Department of Transportation

ensuring that the benefits of EV adoption—such as reduced fuel costs and improved air quality—are accessible to all Americans, regardless of location.

Utility Programs

Several utility-sponsored EV rebate programs are available in California to encourage the adoption of light-duty and other clean vehicles.[105] In anticipation of future adoption, SEPA indicates that EVs are becoming one of the most significant loads to the electrical grid, with energy consumption comparable to residential cooling.[106]

In preparation for this increase in load, California's IOUs, including SCE, have also introduced managed charging programs to encourage EV owners to charge during off-peak hours and thus balance grid demand and reduce electricity costs.[107] Some IOU programs also explore VGI, allowing EVs to discharge energy back to the grid during peak times. Many of these programs focus on at-home charging when the demand for a full charge is less immediate. However, some experts suggest that demand response strategies are also viable for public and workplace charging stations to enhance grid reliability and efficiency.[108] Note that SCE requires participating site hosts to enroll in a time-of-use rate and participate in one qualifying demand response program.

Industry Advancements in EV Charging

EV battery and charging technology has evolved rapidly over the past decade, progressively decreasing costs, increasing range, and improving charging speed. Batteries typically account for anywhere between 10% and 20% of the total cost of manufacturing new EVs, and the cost of EV battery production has dropped 90%, from $1,400 per kWh in 2008 to just under $140 in 2023.[109] On a similar timeframe, the power density and range of EV batteries progressively increased from an average of 86 miles in 2011 to an average of 217 miles in 2021.[110] These developments in battery technology are expected to continue, with several promising new battery technologies in development and some market forecasts anticipating another 50% drop in battery costs between 2023 and 2026.[111]

Charging connectors have also evolved, and several major auto manufacturers have begun to coalesce around an agreed-upon standard. In November 2022, Tesla opened access to its proprietary charging connector, dubbing it the North American Charging Standard (NACS) and inviting other manufacturers to use

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[105] https://www.kbb.com/car-advice/electric-vehicle-rebates-by-state/#california
[106] Utilities and Electric Vehicles. The case for managed charging. April 2017. Available in: sepa-managed-charging-ev-report.pdf
[107] Ibid.
[108] EVs Can Support Power Grid Reliability and Reduce Costs. Here's How. Available in: https://blog.ucsusa.org/mark-specht/evs-can-support-power-grid-reliability-and-reduce-costs-heres-how/
[109] Department of Energy Vehicle Technologies Office. August 5, 2024. https://www.energy.gov/eere/vehicles/articles/fotw-1354-august-5-2024-electric-vehicle-battery-pack-costs-light-duty#:~:text=The%202023%20estimate%20is%20$139,173.
[110] Govind Bhutada, Elements. September 25, 2022. Visualizing the Range of Electric Cars vs. Gas-Powered Cars. https://elements.visualcapitalist.com/range-of-electric-cars-vs-gas/
[111] Goldman Sachs. Electric vehicle battery prices are expected to fall almost 50% by 2026. October 7, 2024. https://www.goldmansachs.com/insights/articles/electric-vehicle-battery-prices-are-expected-to-fall-almost-50-percent-by-2025

it. Since then, seven leading automakers, including Ford, GM, Mercedes-Benz, Nissan, Volvo, Polestar, and Rivian, have announced plans to adopt the NACS connector format. Starting in 2025, new models from these companies will come equipped with NACS ports, granting them direct access to Tesla's extensive Supercharger network, one of North America's most developed EV charging infrastructures. Adapters will facilitate access to the NACS for older models, allowing more EV owners to benefit from Tesla's already-established charging network.

Although Tesla has remained the dominant force in the national EV market over the past several years, the move among many EV manufacturers to the NACS highlights a shift toward unified standards that can enhance accessibility and convenience for EV drivers, potentially accelerating EV adoption across North America. Despite slowing Tesla sales more recently, they remained the leading seller of EVs from 2020 through 2024, as shown in Table 26.

Table 26. Top Three EV Sales by Manufacturer in SCE's Service Territory

	2020	2021	2022	2023	2024
Ranked #1 sales	Tesla	Tesla	Tesla	Tesla	Tesla
Ranked #2 sales	Chevrolet	Chevrolet	Ford	Mercedes-Benz	Hyundai
Ranked #3 sales	Audi	Ford	Hyundai	Hyundai	BMW

Other automakers are also contributing directly to public charging infrastructure. In July 2023, seven major automakers, including General Motors, BMW Group, Honda, Hyundai, Kia, Mercedes-Benz, and Stellantis, announced they were joining forces to create a new fast-charging network across the United States and Canada. This joint venture aims to install at least 30,000 fast chargers to enhance the appeal of EVs for consumers. By making charging more accessible, the automakers aim to address common concerns related to charging availability and convenience, further supporting the transition to EVs.[112, 113, 114]

Public Charging Availability

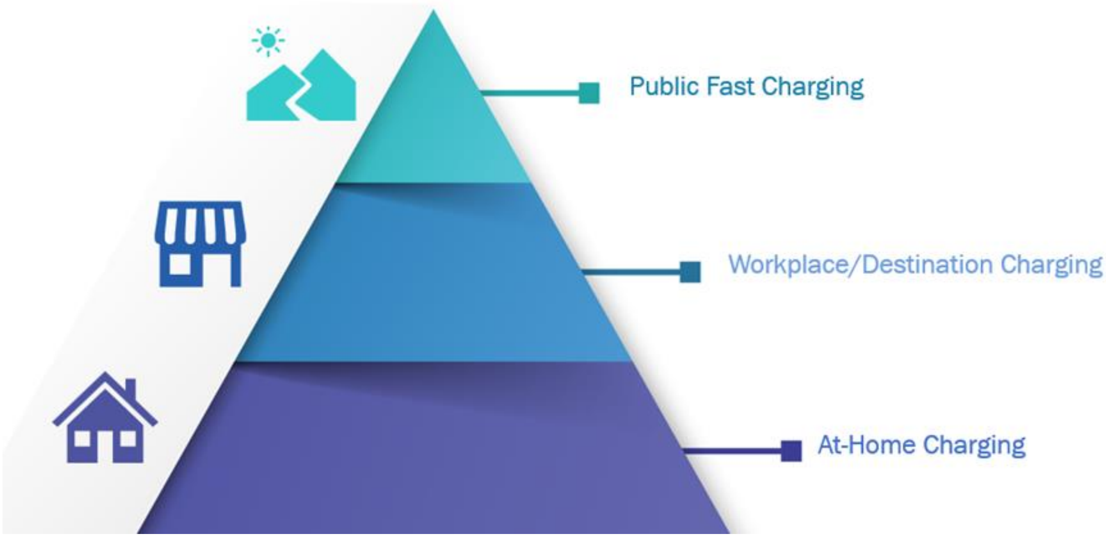
This section examines availability of public charging in SCE's service territory, including accessibility by customer segment to different charger types and locations. According a 2021 report from the Smart Electric Power Alliance (SEPA), EV drivers typically charge at home but rely on public charging for convenience and longer trips.[115] The SEPA study surveyed customers from 50 different utilities across the U.S. and found that most EV owners charge their vehicles at home, accounting for over 80% of all charging sessions. Opinion Dynamics research conducted in 2022 with PG&E customers also found that most EV owners charge their

[112] Seven Automakers Unite to Create a Leading High-Powered Charging Network Across North America. July 26, 2023. Stellantis. https://www.stellantis.com/en/news/press-releases/2023/july/seven-automakers-unite-to-create-a-leading-high-powered-charging-network-across-north-america
[113] CNN. Seven major automakers, including GM, Stellantis and Honda, join to create US charging network. CNN
[114] The Verge. Seven major automakers are teaming up on a North American EV charging network.
[115] Smart Electric Power Alliance. The State of Managed Charging in 2021.

vehicles at home, typically in the evening or overnight.[116] Public charging sessions, however, typically occur during the day and are shorter and less predictable, driven by convenience and availability.[117]

Multiple frameworks exist to conceptualize EV market transformation and charging infrastructure availability, each with distinct implications for promoting adoption effectively. The traditional pyramid model places home charging at the base, workplace/destination charging in the middle, and public fast charging at the top. This structure emphasizes that most charging happens at home and home charging is most important to enabling EV adoption. However, this model doesn't fully address dynamic needs of different types of customers and potential of public charging visibility to encouraging EV adoption beyond early adopters. Figure 34 illustrates the traditional pyramid conceptual model for EV charging infrastructure.

Figure 34. Traditional Pyramid Model for EV Charging Infrastructure



Alternatively, the National Renewable Energy Laboratory (NREL) developed a "tree model" that reflects a shift from the traditional pyramid approach to viewing EV charging infrastructure as an interconnected ecosystem.[118] The tree model offers a more nuanced view, representing EV charging infrastructure as an organic, interconnected system with visible and hidden elements, providing a valuable perspective for IOUs and other market participants seeking to support a more adaptable EV market:

- **Roots (Private Charging):** The foundation lies in a private, at-home charging infrastructure symbolized by the tree's roots. These chargers are "hidden" from view, located in garages and private spaces, yet essential for the stability and growth of the entire EV ecosystem. They support drivers who charge based on convenience and longer-term parking ability (e.g., 8+ hours).
- **Trunk (Public Fast Charging):** Public fast-charging networks represent the trunk. These are visible along highways and in high-traffic areas and serve as critical support, especially for EV owners who lack access to private charging options or are on long-distance journeys. Though fewer, these

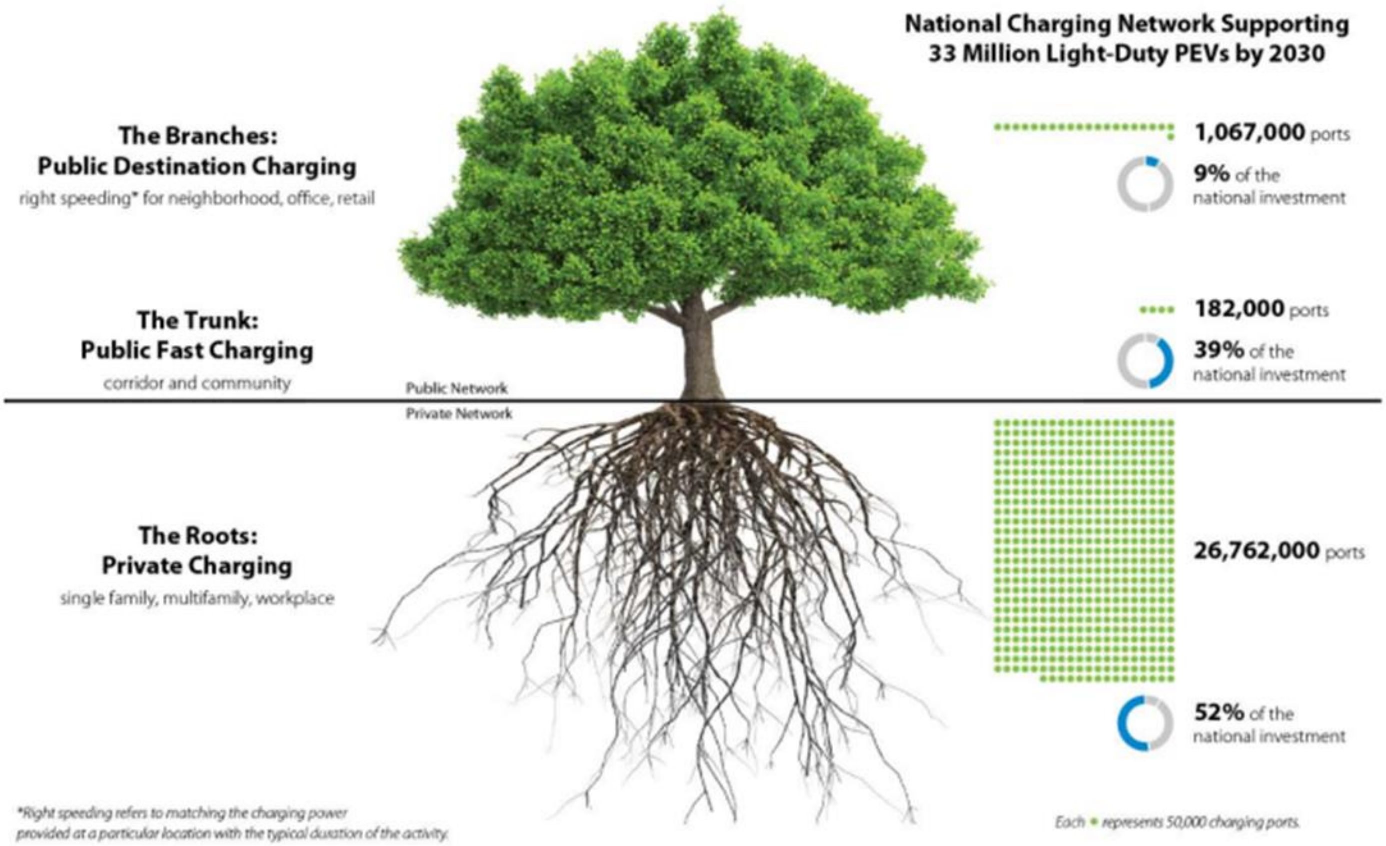
116 https://opiniondynamics.com/wp-content/uploads/2022/03/PGE-EV-ADR-Study-Report-3-16.pdf
117 Opinion Dynamics. PG&E Electric Vehicle Automated Demand Response Study Report. February of 2022
118 NREL. The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure.

chargers require substantial investment and provide reassurance for EV users, making ownership more viable and flexible.

- **Branches (Public Destination Charging):** The branches symbolize destination charging in accessible public locations like retail centers and office buildings. Like branches relying on the trunk for stability, the growth and distribution of these chargers depends on the existing private network and fast-charging infrastructure, providing EV drivers the flexibility to reliably charge while at work or other away-from-home destinations for extended periods.

Figure 35 illustrates the NREL tree model for EV charging infrastructure.

Figure 35. NREL Conceptual Illustration of EV National Charging Infrastructure Needs



Source: NREL. The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure

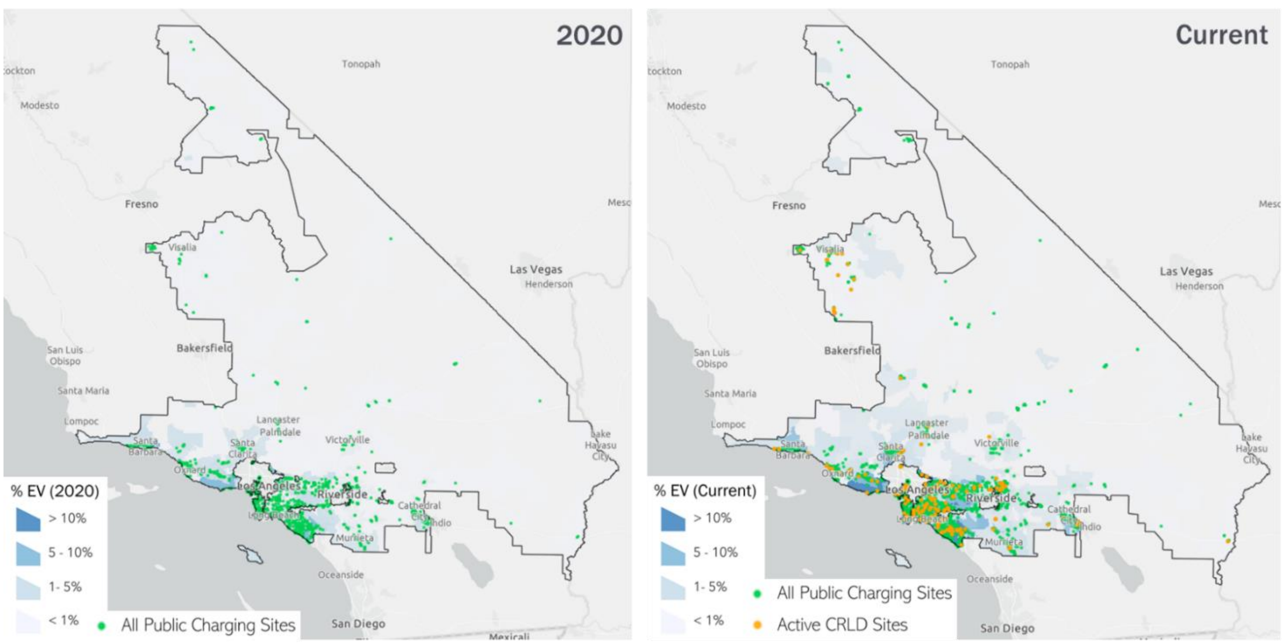
Public destination chargers are highly accessible and tend to be located in highly visible public areas. In addition to providing convenient charging for current EV owners, these publicly visible chargers have the added benefit of reassuring non-EV drivers for whom lack of public charging availability may be a barrier to EV adoption. A 2024 UC Davis study suggests charging infrastructure investments should always be paired with public awareness and engagement strategies to drive EV purchase consideration.[119]

[119] Institute of Transportation Studies, University of California, Davis. Transportation Research Interdisciplinary Perspectives

Industry experts at Automotive World also report that “increasing the visibility of charging infrastructure could help tackle concerns about the practicality of EVs and, ultimately, signal the rate of progress and tap into [customers’] desire to comply with trends they see emerging,” and that increasing the visibility of EV infrastructure should involve prioritizing highly visible and heavily trafficked areas along with “high-visibility signage and bay markings to make EV zones more attention-grabbing and help increase [driver] salience.”[120] The Transportation Journal also reported that frequent exposure to EVs has potential to positively influence EV adoption due to social proof and peer effects.[121] However, UC Davis research suggests that previous interest in EVs heavily influences whether people notice public charging stations in their everyday environment, suggesting that public charging density does not guarantee increased EV adoption.[122]

As part of the geographic analysis, we examined historical public charging availability relative to EV adoption. Although charging locations are generally more concentrated in the more population-dense, urban coastal areas, EV adoption is not closely tied to charger locations. Figure 36 shows public charging locations relative to EV adoption levels for the entirety of SCE’s service territory, and Figure 37 provides a close-up of the urban, coastal portion.

Figure 36. Public Charging and Percent of Battery Electric Vehicles by Zip Code, 2020 and Current



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120 https://www.automotiveworld.com/articles/visibility-is-key-to-shifting-behaviours-towards-electric-vehicles/

121 Transportation Research Part A, “Deciphering the factors associated with adoption of alternative fuel vehicles in California: An investigation of latent attitudes, socio-demographics, and neighborhood effects”. https://www.sciencedirect.com/science/article/pii/S0965856422002701.

122 Institute of Transportation Studies, University of California, Davis. Transportation Research Interdisciplinary Perspectives

Figure 37. Urban Snapshot: Public Charging and Percent of Battery Electric Vehicles by Zip Code, 2020 and Current

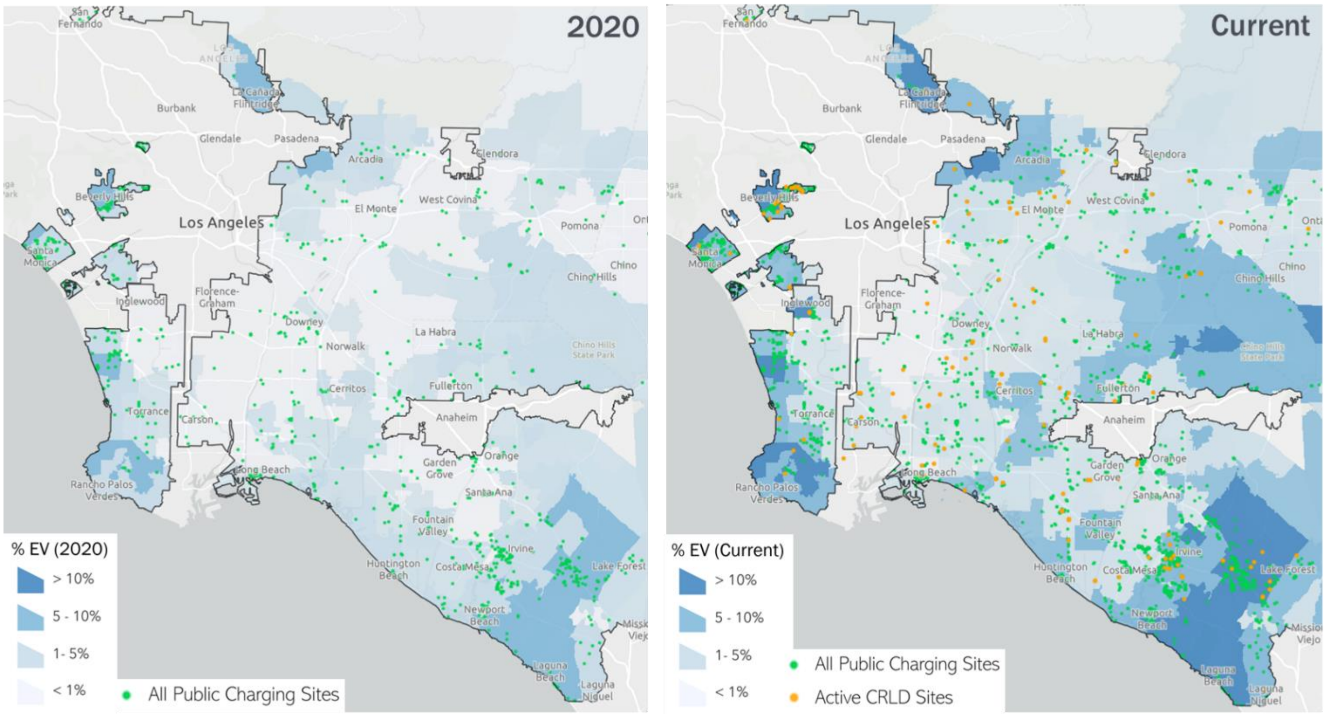
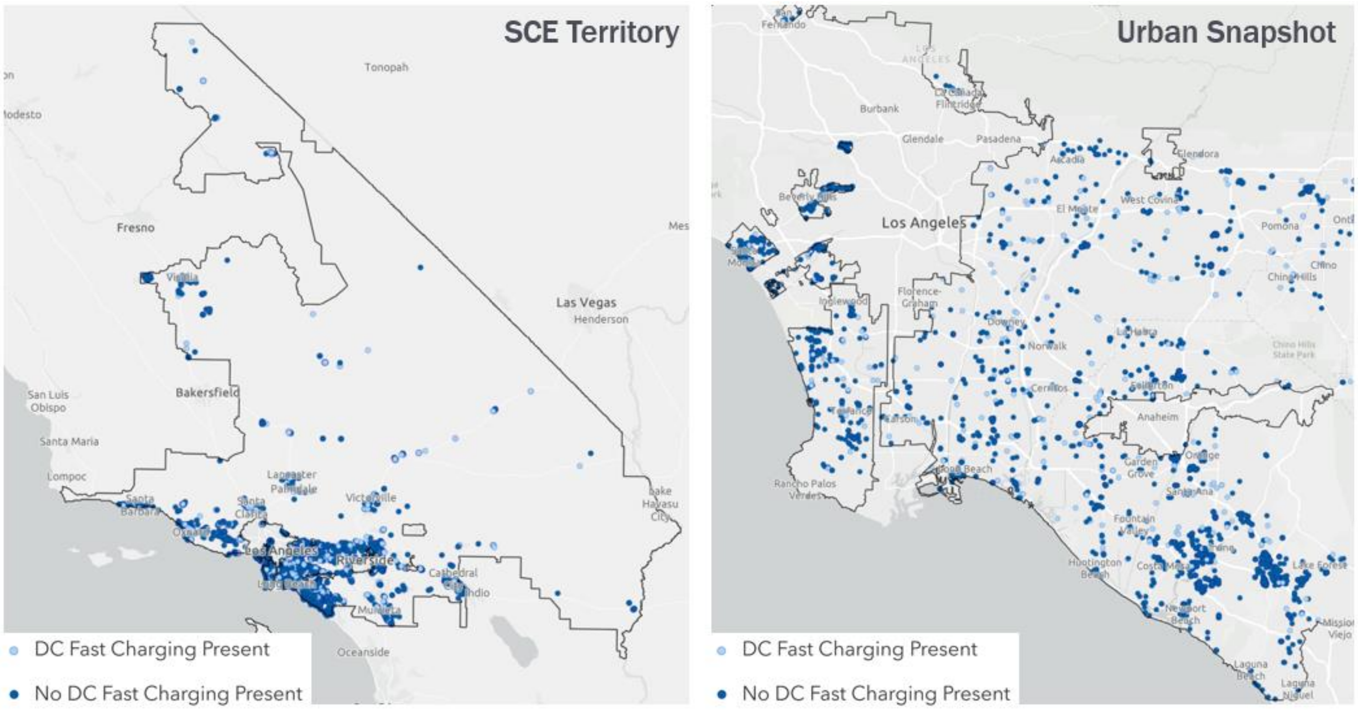


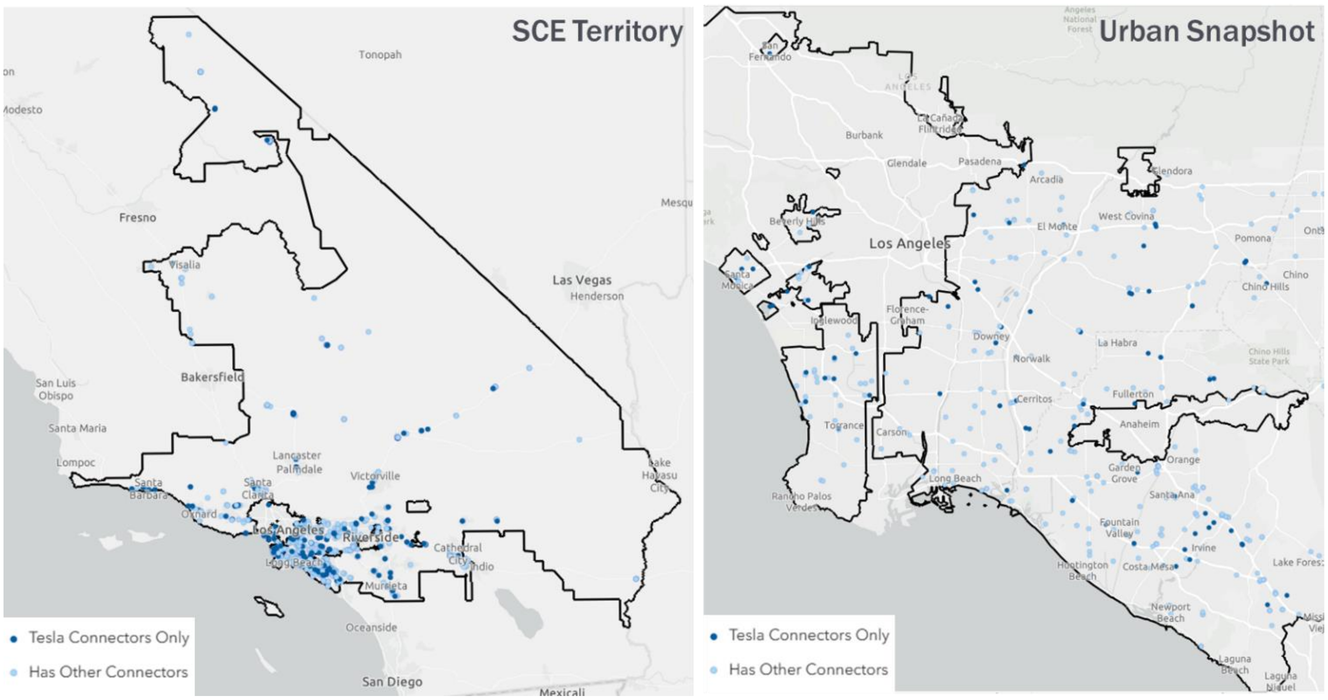
Figure 38 shows the distribution of publicly available DCFC charging stations across SCE's service area, illustrating that most public charging stations have only Level 2 capability. However, DCFC charging is more prevalent in urban areas and along transportation corridors. SCE began accepting applications for DCFC charging installations in April 2024, and according to CRLD program staff, SCE anticipates more of these chargers to come online in 2025.

Figure 38. Public DC Fast Charging Sites in 2024



As the leading EV automaker in recent years, Tesla has invested in developing charging stations with DCFC charging that is only accessible with a Tesla connector. However, with the opening of access to their NACS charging connector in late 2022, accessibility to Tesla chargers is expanding among non-Tesla owners. Figure 39 illustrates the prevalence of Tesla charging stations in SCE's service territory.

Figure 39. Tesla-Only Public DC Fast Charging Sites in 2024



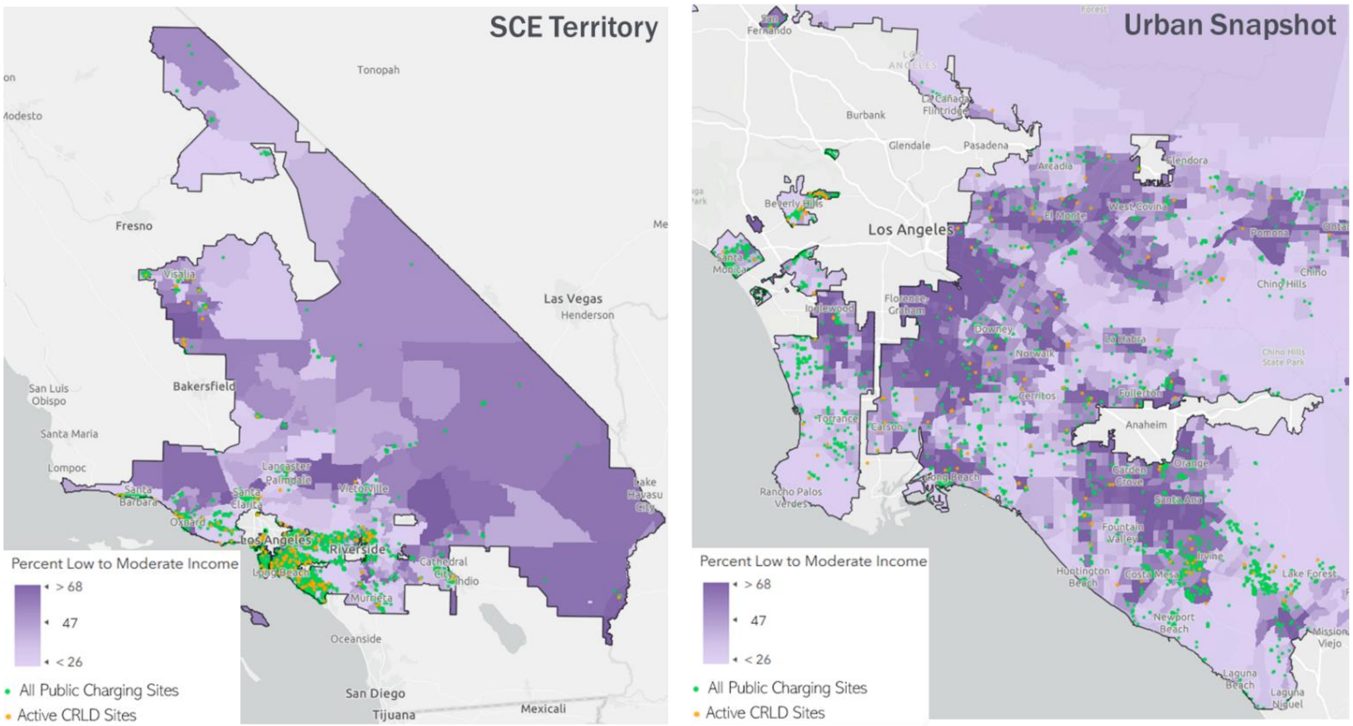
Public Charging Availability by Customer Segment

We also explored demographic trends as they relate to public charging availability and EV adoption. This section summarizes findings from comparisons of public charging availability by customer segment.

Low-Income Residents

Figure 40 shows the distribution of publicly available and CRLD charging stations in relation to the percentage of the population living below 80% of the AMI by census tract. Across SCE's service territory, public charging sites are somewhat more concentrated in more affluent urban areas, with varying degrees of prevalence in lower-income census tracts. Many census tracts in the eastern (inland) portion of the state have high percentages of their population living below 80% of AMI. However, as previously mentioned, EV adoption is very low in these areas of SCE's territory relative to more urban, coastal areas. Many charging sites in SCE service territory are located in more affluent areas despite being near census tracts with higher percentages of low- to moderate-income populations. This coincides with EV adoption.

Figure 40. Public Charging Sites and Percent of Population Living Below 80% AMI



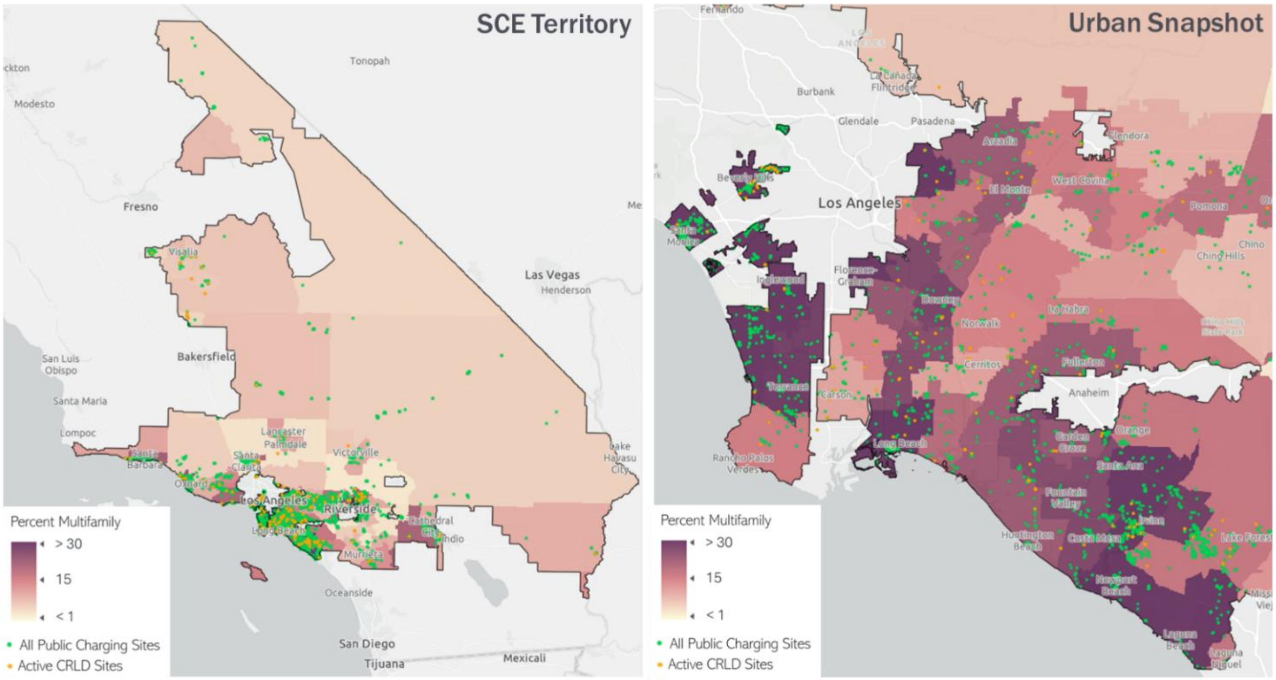
About two-fifths (41%) of all publicly available chargers in SCE service territory are in areas with an above-average incidence of population earning below 80% AMI. However, over half (57%) of all active CRLD chargers are in areas with above-average percentages of population earning below 80% of AMI. The CRLD program targets DACs, which have notable overlap with lower income areas.

Multifamily Housing

CRLD has historically prioritized applications for charging stations at MUDs. As previously mentioned, public charging sites tend to be in more densely populated areas which tend to have higher levels of multifamily housing. Three-fourths (75%) of all public charging sites in SCE's service territory are in areas where at least 15% of the population lives in multifamily housing, while just over two-thirds (68%) of active CRLD chargers are in areas where at least 15% of the population lives in multifamily housing. SCE's focus on serving customers residing in MUDs is well-aligned with existing research, including one NREL study that underscores the importance of developing EV charging infrastructure solutions tailored for households lacking reliable overnight home charging, which disproportionately includes renters or apartment dwellers without off-street parking.[123] Figure 41 shows publicly available and CRLD charging stations relative to the percentage of the population living in MUDs.

[123] NREL. There's No Place Like Home: Residential Parking, Electrical Access, and Implications for the Future of Electric Vehicle Charging Infrastructure.

Figure 41. Public Charging Sites and Percent of Population Living in MUDs



Forward-Looking Market Outlook

A recent study from UC Davis explored the potential limitations of public charging density in driving EV adoption. This research found that the density of public EV charging infrastructure alone doesn't significantly impact people's awareness of EV options or their likelihood of purchasing EVs. This suggests that charging infrastructure development should be paired with strategies to raise consumer awareness and engagement to increase EV adoption. This dual approach may prove necessary to influence a wider audience beyond early adopters, ensuring that EVs and their infrastructure become more relevant and appealing to the broader population.[124]

The CEC identified three critical gaps in supporting future EV adoption: 1) education regarding EVs and EV charging, 2) installation of necessary electrical infrastructure, and 3) changes in parking behavior to facilitate greater charging access. The CEC emphasizes that maximizing charging access will require significant adjustments in drivers' typical parking patterns, a challenging endeavor that depends on widespread behavioral change. Public charging options must become more comparable to at-home setups in reliability, convenience, and cost to support broader EV adoption for those unable to charge at home.[125]

Following CPUC's December 2023 rulemaking suspending ratepayer-funded support of TEF initiatives, SCE continues to evolve its offerings. Prior to the 2023 ruling, TEF policy helped drive EV infrastructure investment by California IOUs, and with the uncertainty created by the suspension of that funding, SCE should continue to explore all possible state and federal funding sources in support of EV adoption and charging infrastructure development. Funding from federal initiatives, including the 2022 Inflation Reduction

[124] UC Davis. Transportation Research Interdisciplinary Perspectives.

[125] CEC. Home Charging Access in California

Act (IRA) and 2021 Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Law), is also in question given the shift in priorities between the Biden and Trump administrations, leaving state policy and IOUs to determine direction and funding sources for developing EV-related infrastructure and encouraging EV adoption.[126],[127] IRA funding also included emphasis on reaching underserved rural communities, leaving a potential gap in rural EV charging infrastructure development that may benefit from SCE prioritization.[128]

Programs like the Low Carbon Fuel Standard (LCFS)[129] and Electric Program Investment Charge (EPIC) Fund represent potential avenues for additional funding to support wide-ranging efforts to engage with customers and promote EV adoption. In April of 2024, SCE submitted a request for an Exemption to the Public Utilities Code and Implementation Plan for programs funded by LCSF for 2024-2027. As part of this request, SCE proposed several efforts in support of the light-duty EV market:

4. Continuing to fund the pre-owned EV Rebate Program
5. Expanding the Charge Ready Home Rebate Program to support individual circuit installations in single-family homes
6. Providing income-qualified EV drivers with subsidized public charging to effectively access the discounted rates when publicly charging their EVs by enabling affordable charging wherever the driver decides to go, using subsidized EV charging through preloaded debit cards.

Diversification of SCE's campaign to encourage EV adoption is critical to addressing the wide-ranging challenges associated with driving changes to consumer preferences around personal vehicles. This effort will benefit from continued support of public charging infrastructure development that includes DCFC charging and targets DACs, lower-income areas, MUD housing, and rural areas. Pairing infrastructure development with high-visibility signage and educational awareness campaigns that highlight EV benefits, charging availability, and available vehicle incentives all have potential to help encourage widespread EV adoption.

[126] https://www.thomsonreuters.com/en-us/posts/corporates/ira-uncertain-future/

[127] https://www.brookings.edu/articles/what-the-trump-administration-might-mean-for-the-future-of-the-bipartisan-infrastructure-law/

[128] https://e2.org/wp-content/uploads/2024/01/E2-IRA-Rural-Report-23-12-A_06_locked.pdf

[129] California Air Resource Board. Low Carbon Fuel Standard. https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard

Appendix B. Methods

Market Characterization Methods

The market characterization study consisted of a geographic analysis, a landscape analysis of existing literature, and industry actor interviews. This section details the methodological approach to each of these three research activities. The market characterization study sought to address the following research objectives:

- Characterize the current EV market landscape and development since 2020
- Understand public charging availability geographically by customer segment and relative to EV adoption
- Explore factors driving changes to the EV market over time, including customer preferences, policy, utility programs, public funding, and industry advancements
- Identify key considerations for maximizing future influence on EV adoption

Geographic Analysis

The geographic analysis examined the relationship between EV adoption, public charging availability, and key customer segments including underserved customers and disadvantaged communities across SCE's territory. As part of this effort, we assembled several publicly available secondary data sources reflecting historical and current information on public charging stations (and their characteristics), EV and non-EV registrations, census-based demographics, and areas designated as underserved or disadvantaged communities. The following describes each data source and the analysis entailed to prepare these databases for geographic analysis. We aimed to maximize cross-compatibility to draw meaningful conclusions regarding how the availability of public charging and incidence of EV adoption compare across communities and over time.

- **Historical and Current Public Charging Sites:** Annual U.S. Department of Energy data inclusive of all publicly accessible charging locations as of December 2020 (prior to CRLD) and December 2024 (latest available), by address. This comprehensive dataset from the U.S. Department of Energy contains address-level information on every publicly accessible charging station in the United States. In addition to physical location in the form of address and latitude-longitude coordinates, this dataset also contains the name of each station and its count of level 1, level 2, and DC fast charging ports. Less populated fields in this dataset include the type of facility in which each station is situated, the price to charge, and the hours in which the station is accessible to the public. This data contains charging stations open by September 30, 2024.
- **Historical and Current EV Adoption:** California DMV EV registrations as a percentage of total light duty vehicles, as of December 2020 (prior to CRLD) and December 2023 (latest available) as a percent, by ZIP code. These yearly datasets include information on all vehicle registrations in California by zip code, fuel type, and vehicle type. This is open data from the California DMV, and there is a separate dataset for each year containing all vehicles registered as of 2020, 2021, 2022,

and 2023. We used this data to calculate the percentage of total vehicles in each zip code that are battery electric across these four years.

- **Active CRLD Sites:** SCE CRLD program tracking data indication of currently active CRLD charging sites, as of December 2024, by address. This data from SCE contains geocoded (latitude/longitude) CRLD sites by market sector (type of charging location) since 2020. We filtered this data down to sites that were active by September 12, 2024.
- **Low-to-Moderate-Income Populations:** U.S. Department of Housing and Urban Development data reflecting incidence of households below 80% of Area Median Income (AMI) from 2015 American Community Survey data, by census tract. The U.S. Department of Housing and Urban Development published this feature layer to ArcGIS Online in 2018. It contains the percentage of the population of each census tract in California that lives below 80% of AMI of the census tract. The income information in the feature layer comes from the 2011-2015 American Community Survey and uses Census 2010 geography.
- **Multifamily Housing Prevalence:** IPUMS data reflecting the incidence of multifamily housing based on 2022 American Community Survey data, by Public Use Microdata Area (PUMA). This dataset contains geographic and demographic information from the 2022 5-year census. We downloaded this data from IPUMS and calculated the portion of the population in each area living in multifamily housing.
- **Disadvantaged Communities:** CalEnviroScreen 4.0 indication of areas disproportionately burdened by pollution or with median incomes under 60% of statewide levels or tribal lands, by census tract. CalEnviroScreen 4.0 is the screening tool recognized by the 2022 CPUC Environmental & Social Justice Action Plan Version 2.0 to identify DACs, which include California communities disproportionately burdened by multiple sources of pollution, designated tribal lands, or areas with median incomes below 60% of statewide levels.[130]

Landscape Analysis

The review of existing research and available secondary sources informed an understanding of the various factors driving EV adoption, the role of public charging, and the CRLD Program in supporting and aligning with broader TE market developments. The evaluation team assembled and reviewed existing research and secondary data sources directly applicable to characterize the EV market in SCE's territory. The evaluation team identified more than fifty secondary data sources, prior research findings, and policy documents directly related to market characterization study research objectives.

Industry Actor Interviews

The evaluation team conducted two in-depth interviews with SCE staff from the CRLD program team and transportation electrification market incubation team to explore current and forward-looking priorities for SCE TE efforts and gather SCE staff's perspective on current EV adoption drivers, barriers to adoption, policy

[130] CPUC. Environmental & Social Justice Action Plan Version 2.0. April 2022. esj-action-plan-v2jw.pdf

implications, and anticipated market developments. The interviews addressed the following research questions:

- What major trends have materialized in the EV market over the past couple of years?
- What are leading barriers that customers face in adopting electric vehicles?
- What federal or state policies have most influenced EV adoption and public charging development?
- What potential market trends or anticipated policy changes are likely to prompt program design changes or considerations?

Costs Analysis Literature Review

Table 27. Alternate Utility Costs by Sub-Program

Utility Name	Citation	Derivations Notes (if applicable):
Xcel Energy	Xcel Energy. 2024-2026 Transportation Electrification Plan Annual Report. October 2024. https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan	Xcel Energy's per port average includes EVSI and charging equipment (doesn't include rebate costs). Multifamily only includes L2 chargers, while commercial sites includes a few DCFCs.
National Grid (Massachusetts)	National Grid. Massachusetts Phase 1 EV Charging Station Program Evaluation: Program Year 3 Evaluation Report. 2021.	Only per-station costs were reported in the evaluation report. To derive the number of ports, the ratio of stations to ports (from Table 4-11) was applied to the number of stations for each segment. Then, the total costs were divided by the number of ports.
Connecticut Statewide Electric Vehicle Charging Program	Connecticut Department of Public Utility Control. Connecticut Statewide Electric Vehicle Charging Program: Program Cycle I EM&V Report. June 2024	Connecticut's average cost per port was derived from the original report by adding together the EVSE Cost, Make Ready Cost, future Proofing cost, and Rebate Cost of the two utility districts (UI and Eversource) and dividing them by the ports installed in each program and utility. The total number of ports was derived by adding the 'Ports' with the 'FP ports'.
Duke Energy Florida	Duke Energy Florida, LLC. Electric Vehicle Charging Station Pilot Program and Park & Plug: 5th Annual Report (December 2022). Florida Public Service Commission, 2023. https://www.psc.state.fl.us/library/filings/2023/00015-2023/00015-2023.pdf	N/A

Customer Research

The evaluation team interviewed 16 participating site hosts with electric vehicle (EV) charging sites in two rounds, conducted in April 2023 and September to October 2024. A third round of site host interviews will be conducted in Spring of 2025, the results from this round will be reported in the next evaluation report. We conducted these interviews to gather insights into participant experiences with the CRLD program that may help SCE meet the evaluation objectives set out in California Public Utilities Commission (CPUC) Decision 20-08-045 (D.20-08-045) as well as the standard reporting requirements for SB 350 Transportation Electrification (TE) programs while continuously monitoring its program performance. Additionally, we explored customers' decisions to participate and their experiences post-installation.

Table 28. Interview Site Host Methodology

Interview Rounds	Unique contacts	Number of Site-hosts associated	Number of conducted in-depth interviews	Response Rate
Round 1 - 2023	10	15	8	80%
Round 2 - 2024	15	21	8	53%
Total	25	36	16	64%

Table 29 presents a summary of the interviewed site hosts' characteristics. Most (12 of 16) interviewed site hosts reported that the properties where the charging infrastructure was installed were corporate-owned, with the remaining being government-owned (5 of 16) or leased (3 of 16). Notably, out of the 16 sites hosts, four are multi-unit dwellings (MUDs). Additionally, most site hosts interviewed reported having chargers installed at the time of the interview, with three indicating that the chargers were not operational yet.

Table 29. Interviewed Site Host's Characteristics

Property Usage	Property Structure[a]	Properties Owned	Property Ownership
MUD (4) Office Building (3) Airport (1) Car Dealership (1) Civic Center (1) Community Bank (1) Electric Vehicle Company (1) Healthcare Facility (1) Hotel (1) Public Library (1) Public Park (1)	Commercial (7) Government (5) MUD (4)	Over 1,000 (1) 100 or less (7) Only 1 (8)	Property owners (15) Property renter (1)

Another round of site host interviews will be conducted in the Spring of 2025.

AMI Data Analysis

Data Cleaning and Aggregation

The evaluation team relied on AMI electric consumption data to observe charging patterns at CRLD application sites. We received the AMI data monthly at the meter level and in 15-minute intervals. Our initial data ingestion and exploration processes confirmed that daylight savings and time zones were correctly applied. We reviewed the data for inconsistencies and then conducted data reformatting, cleaning, and aggregating. Table 30 summarizes the cleaning steps made to the AMI data as part of the data preparation and cleaning process. Notably, no applications were dropped through our data cleaning. We leveraged the cleaned AMI data in the charging pattern analysis.

Table 30. 2024 AMI Data Cleaning Steps

Cleaning Step	Cleaning Step Type	Number of Records Remaining	Total Records Impacted	Percent of Records Impacted	Number of Applications
Initial Count	NA	3,878,783	N/A	N/A	121
Perfect Duplicates	Drop	3,518,914	359,869	9.28%	121
Irregular Timestamps	Drop	3,518,914	0	0%	121
Missing or Null Usage	Drop	3,518,914	0	0%	121
Aggregate Imperfect Duplicates	Combine	3,511,367	7,547	0.19%	121
Impute Missing Intervals	Imputation	3,511,424	57	<0.01%	121
Roll Up to the Application Level	Combine	3,511,424	0	0%	121
Roll Up to the Hourly Level	Combine	874,073	2,637,351	67.99%	121
Final Count	**NA**	**874,073**	**3,004,824**	**77.47%**	**121**

Calculation of Load Management and Grid Integration Metrics

Table 31 provides calculations and descriptions of charging pattern analysis metrics.

Table 31. Metric Calculation Descriptions

Metric	Calculation Description
Average Demand (kW)	Average hourly demand across all applications
Max Demand (kW)	Maximum hourly demand across all applications
Total Usage (kWh)	The sum of total consumption across all applications
Total On-Peak Usage (kWh)	The sum of consumption during SCE on-peak hours (Weekdays from 4 p.m. to 9 p.m. PST)
Total Off-Peak Usage (kWh)	The sum of consumption during SCE off-peak hours (Weekends and Weekdays from 9 p.m. to 4 p.m. PST)
Percent On-Peak Usage (%)	On-peak usage divided by Total Usage
Percent Off-Peak Usage (%)	Off-peak usage divided by Total Usage

Contact:

Paul Wasmund
Director
pwasmund@opiniondynamics.com

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PORTLAND
SAN DIEGO
SAN FRANCISCO