# Scaling Charging for Parking-Constrained Customers Report

**DRAFT VERSION 3**

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CADMUS

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# Acronym List

| Acronym | Definition |
|---|---|
| ADA | Americans with Disabilities Act |
| AHJ | Authority Having Jurisdiction |
| BTM | Behind-the-Meter |
| BYOC | Bring Your Own Cord/Charger |
| CaaS | Charging-as-a-Service |
| CAP | Climate Action Plan |
| CBG | Census Block Group |
| CBO | Community-Based Organization |
| CPUC | California Public Utilities Commission |
| CTEP | California Type Evaluation Program |
| DAC | Disadvantaged Community |
| DCFC | Direct current fast charger |
| DOE | Department of Energy |
| EJ | Environmental Justice |
| EPIC | Electric Program Investment Charge |
| EV | Electric Vehicle |
| EVCS | Electric Vehicle Charging Station |
| EVSE | Electric Vehicle Supply Equipment |
| EVSI | Electric Vehicle Supply Infrastructure |
| HOA | Homeowners Association |
| ICE | Internal Combustion Vehicle |
| IOU | Investor-Owned Utility |
| kW | Kilowatt |
| kWh | Kilowatt-hour |
| L1 | Level 1 Charging |
| L2 | Level 2 Charging |
| LI | Low-Income |
| LDV | Light-duty vehicle |
| MF | Multifamily |
| MFH | Multifamily Home or Housing |
| NLR | National Laboratory of the Rockies |
| O&M | Operations and Maintenance |
| PEV | Plug-in Electric Vehicle |
| PCC | Parking-Constrained Customer |
| PPP | Public-Private Partnership |
| PROW | Public Right-of-Way |
| RMI | Rocky Mountain Institute |
| ROW | Right-of-Way |
| SLA | Service Level Agreement |
| SF | Single Family |
| SFH | Single Family Home or Housing |
| TCO | Total Cost of Ownership |
| TE | Transportation Electrification |
| TTM | To-the-Meter |
| ZEV | Zero Emissions Vehicle |

# Terminology

| Term | Definition |
|---|---|
| **AHJ** | AHJ is defined and used in this report broadly to refer to local municipal government authorities, both cities and counties, collectively in general terms (including all AHJ departments such as planning, building, and public works), as the research team interviewed and consulted with a variety of different AHJ departments, with departmental specificity provided in the report when relevant. AHJs are the primary local governments examined in this report, as they have the authority to administer permits for electric vehicle (EV) charging stations in their jurisdictions. |
| **Concessions** | When a public authority (municipality, city, or state) grants a private operator the right to use public space or infrastructure for a defined period (often 10 to 20 years). The concession acts as an easement or exclusive right to operate in a location that the public authority controls.<br>*Examples: Curbside charging, streetlight charging, or highway rest stops in Europe. The operator invests in the infrastructure and shares revenue or pays a concession fee to the municipality.* |
| **EV-Adoption** | The cumulative number, or percentage share, of vehicles that are battery electric or plug-in hybrid electric vehicles in the total registered vehicle stock. |
| **EV-Adoption Rate** | The percentage of new vehicle sales that are battery electric or plug-in hybrid electric vehicles. |
| **EV Power Ready (Electric Rule 29)** | EV Power Ready (Electric Rule 29)[1] is Pacific Gas and Electric Company's tariff governing utility-side infrastructure (i.e., to-the-meter) required to serve EV charging projects. The rule establishes the process, cost responsibility, and timelines for evaluating, designing, constructing, and energizing utility-owned distribution infrastructure, such as service extensions, transformers, and metering. As of the time of this report, PG&E is addressing the applicability of Rule 29 to projects in the public right of way. |
| **EVSE** | For the purposes of this report, electric vehicle supply equipment (EVSE) refers to dedicated charging equipment that provides control, protection, and communication functions for EV charging and does not include receptacles energized by smart outlets. |
| **Parking-Constrained Customer** | Drivers living in multi-family housing as well as drivers living in single-family housing without dedicated parking. |
| **Private EV Charging Provider** | Includes both electric vehicle service providers (EVSPs) and charge point operators (CPOs). |

1 Electric Vehicle Power Ready Program

| Term | Definition |
| --- | --- |
| **PROW EV Charging Solutions** | A catch-all term for EV charging solutions sited in the public right-of-way for the purposes of this report to group together both streetlight charging technology solutions and curbside charging technology solutions.<br>Streetlight charging is defined and used in this report as pole-mounted EVSE or pole-integrated EV charging that taps into the existing streetlight electrical service for dispensing power to the end customer.<br>Curbside charging is defined and used in this report as a broader set of technology solutions, typically encompassing pedestal-style EVSE not mounted on a pole and installed directly in the curbside street furnishing zone,[2] either tapping into an existing building electrical service or an existing/new dedicated utility service.<br>This grouping is maintained for simplicity in discussing high-level barriers to deploying EV charging in the PROW, while streetlight and curbside terminology are used to discuss details specific to pole-mounting versus EVSE pedestals installed curbside. |
| **Soft Costs** | Soft costs, as defined by the Department of Energy, are "The full cost of installing EVSE includes the hardware, software, and construction that make up EV charging infrastructure, as well as additional costs not directly related to EVSE hardware and grid-tied installation. These non-equipment costs are collectively known as soft costs." |

[2] Sidewalk Zones - NACTO

# 1. Executive Summary

This report is designed to help local governments (Authorities Having Jurisdiction [AHJ], including city and county departments), state and local regulators, community-based organizations (CBOs), and other utilities and load-serving entities (including Community Choice Aggregators) advance electric vehicle (EV) charging availability for parking-constrained customers (PCC). PCCs are defined as drivers living in multi-family housing as well as drivers living in single-family housing without dedicated parking. As EV adoption expands beyond early adopters with garages and driveways, charging access for PCCs, especially renters and residents in disadvantaged and low-income communities, becomes a critical equity, affordability, and public-health issue. Without near-home charging options, PCCs often rely more heavily on public fast charging and other less convenient alternatives, which can increase cost and reduce confidence in EV ownership.

> This public report equips AHJs, regulators, CBOs, and other utilities/load-serving entities with practical, scalable approaches to expand equitable near-home EV charging for PCCs across PG&E's service territory.

The report synthesizes market segmentation, policy and permitting considerations, technology and program benchmarking, and insights from customer and stakeholder engagement to identify practical pathways for scaling near-home EV charging for PCCs. It highlights what tends to slow projects (e.g., administrative and coordination soft costs across permitting, design, interconnection, and operations) and outlines approaches stakeholders can use to reduce customer pain points and speed up processes while improving equitable outcomes.

## 1.1. Objectives

This report serves four key objectives:

- **Quantify and describe the PCC market across PG&E's service territory,** including the size, characteristics, and geographic distribution of customers lacking dedicated home parking or access to home charging.
- **Identify cross-cutting deployment barriers,** with emphasis on process and coordination costs (soft costs) that drive delays and total installed cost.
- **Access practical charging technology deployment models,** including smart outlets, public right-of-way (PROW) options, and community hubs, based on feasibility, cost, scalability, and user experience.
- **Provide actionable recommendations by stakeholder role** to support faster, more predictable, and more equitable deployment.

## 1.2. Defining the PCC Segments

Parking constraint segments describe the degree to which a household has reliable access to a consistent parking location where EV charging could feasibly be installed. For the purposes of this report, the research team defines **low-constrained** parking as properties with dedicated, assigned on-site parking (e.g., single-family housing [SFH] with driveways or garages or condominiums [condos] with assigned garages or parking spots), where installing home charging is generally feasible. **Medium-constrained** parking includes properties with on-site parking that are unassigned, shared, or otherwise non-dedicated, most commonly multifamily housing (MFH) and condos, where charging access is possible but limited by proximity to power, electrical capacity, and coordination barriers. **High-constrained** parking applies to households that rely exclusively on public or on-street parking with no on-site parking available, making private home charging infeasible and requiring near-home public solutions, such as curbside or streetlight charging, or community charging hub infrastructure. As discussed in the Housing section of the report, in PG&E's service territory, low-constrained properties account for the vast majority of properties at nearly 86%, with medium-constrained properties accounting for just over 14%, and high-constrained properties accounting for just 0.27%.

## 1.3. Key Findings

**Demand Is Present; Charging Access Is the Constraint.** Survey findings indicate a strong interest in EV adoption among PCCs, but the lack of practical near-home charging options is a significant barrier. For example, among PG&E customers surveyed who do not yet own an EV, 72% indicate their next vehicle will likely be electric. This interest remains strong among those without dedicated off-street parking, with 65% reporting the same intention. Where near-home options exist (multifamily-oriented solutions, neighborhood public charging, or charging hubs), PCC adoption barriers can be meaningfully reduced.

**The Largest PCC Need Is Concentrated in Multifamily Property Types.** Parking constraints are most commonly associated with MFH and condo properties, which means that solutions targeted at MFH properties are central to scaling. In PG&E's service territory, more than 17% of light-duty vehicles (LDVs) are associated with MFH, and nearly all PCC-driven vehicles, about 98%, are tied to MFH residents, concentrating the charging-access challenge in apartments and condos rather than SFH. In addition, over half of high-PCC households (those with no on-site parking) are located in low-income census tracts, elevating both equity and affordability challenges.

**Equity Gaps in Charging Access Persist and Should Guide Future Siting and Design.** Disadvantaged and low-income communities often face compounded barriers, lower feasibility of home charging, fewer convenient public options, and greater sensitivity to price and reliability. Equity outcomes improve when projects explicitly prioritize these areas and track whether benefits (e.g., sessions, access, pricing) are reaching intended residents. The studies summarized in this report show that disadvantaged community (DAC) neighborhoods have 64% to 73% fewer public charging stations per capita than non-DAC areas, experience lower reliability and longer wait times, and depend more public DC fast charging, which is typically more expensive than residential EV charging rates (approximately 66% higher than home charging), because home charging is rarely available.

**Soft Costs and Process Uncertainty Frequently Determine Speed to Deployment.** Across interviews and benchmarking, soft costs, particularly permitting, design iteration, PROW approval pathways (including dual permits), ADA integration, and multi-agency coordination, are the primary drivers of delay and cost escalation, making process improvements as important as infrastructure investment. Staffing constraints, non-standardized permitting processes, and lengthy energization reviews further contribute to schedule risk. Variations across more than 40,000 AHJs and more than 3,000 utilities across the U.S. lead to inconsistent permitting and interconnection timelines, while PG&E energization timelines, especially under EV Power Ready (Rule 29), often define the critical path.

**No Single Solution Fits All PCC Conditions.** Solutions vary meaningfully by built environment, power availability, total cost to deploy and operate, community needs, and governance context, as outlined below. While multiple technology solutions can serve parking-constrained customers, smart outlets are generally best suited for medium-constrained settings, whereas the remaining solutions, while applicable to some medium-constrained cases, are most critical for serving high-constrained customers without access to on-site parking.

- **EV charging smart outlets**: Smart outlets are intelligent, network-connected sockets that let MFH property owners offer controlled, metered, and user-friendly level 1 (L1) and/or level 2 (L2) charging without installing full EV charging stations. These smart outlets often provide the lowest cost solution. In medium-PCC MFH settings, smart outlets can share circuits/daisy-chain to defer panel upgrades and expand access with less design and permitting friction. Sites may still need make-ready work, especially when attempting to electrify beyond a small handful of parking spots and must address bring your own cord (BYOC) interoperability, California Type Evaluation Program (CTEP) certification, and basic operations and maintenance (O&M)/parking policies.
- **Streetlight charging**: Defined as pole-mounted L2 charging drawing power from existing streetlight circuits, provides near-home access for medium- and high-PCC customers by reusing poles and electrical service, often avoiding trenching and new utility service work. When circuit voltage, ownership, tariff design, and metering align, it can be the lowest-disruption, most cost-efficient PROW option; however, scalability is highly condition-dependent in PG&E service territory due to non-standard voltages, fragmented ownership, metering/tariff constraints, PG&E Greenbook requirements, ADA siting needs, and O&M/vandalism risks. Early programs in other jurisdictions demonstrate feasibility at scale within their unique market conditions (e.g. LADWP as a municipal utility and the UK's Highways Act of 1980 mandating local authority responsibility for the streetlight system), as Los Angeles has deployed approximately 750 pole-mounted chargers, and UK lamppost schemes (ORCS/LEVI) have expanded rapidly, but remain untested in PG&E's service territory.
- **Curbside charging**: Involves pedestal-mounted L2 chargers installed in the PROW, can be fed from either an adjacent building's service (this is rare, as many buildings will not have excess capacity to support EV charging in the PROW) or a new dedicated utility service (the more common solution), extends near-home access in dense areas, and is often the only practical option for high-PCC neighborhoods without on-site parking. When delivered through Public-Private Partnerships (PPP) or other concession-style models, which refer to delivery approaches where public agencies grant private entities the right to finance, install, and operate charging infrastructure, typically with defined performance, pricing, and equity requirements over time, curbside charging can improve equitable coverage but typically carries higher costs than streetlight charging due to the often-necessary PROW make-ready infrastructure. Similar to streetlight charging, curbside charging also often entails dual permitting (e.g., electrical and encroachment permits), ADA requirements, multi-agency coordination needs, metering and enforcement challenges, and O&M/security issues.

- **Community charging hubs**: Neighborhood-scale clusters of L2 and/or high-power direct current fast chargers (DCFC) placed near everyday amenities offer reliable, 24/7, near-home options for medium- and high-PCC areas where on-site charging is limited, serving as anchors for equitable access in PCC-dense corridors. Compared with streetlight or curbside solutions, hub-based deployments concentrate throughput and simplify operations but typically require higher upfront capital. These costs are driven by to-the-meter (TTM) upgrades, including potential distribution capacity upgrades, and the need for enhanced security. As a result, soft costs and EV Power Ready (Rule 29) energization timelines often define the critical path. Recent examples, including IONNA's San José Rechargery (eight DCFC, up to 400 kW), Revel's Mission District site in San Francisco (12 DCFC, up to 320 kW), and Gravity's NYC DEAP center (24 stalls, up to 500 kW using building capacity), demonstrate feasibility and user appeal while reinforcing the need for standardized designs, PPP/concession-style agreements, and clear utility-AHJ workflows to scale.

**Equity Considerations Must Guide PCC Charging Deployment.** In the absence of near-home charging options, PCCs disproportionately rely on public DC fast charging for their primary charging needs, which is substantially more expensive than home charging and more prevalent in non-DAC areas, undermining affordability and equity and eroding the total cost-of-ownership advantage of EVs. Historic redlining, zoning, and infrastructure disinvestment have concentrated PCCs in DACs, where environmental burdens and health risks are already highest. These neighborhoods also tend to have older building stock and outdated electrical infrastructure, which increases make-ready costs and complicates MFH retrofits relative to SFHs. At the same time, DAC residents rely most on public charging yet remain the least served, facing fewer chargers per capita, lower reliability, and longer wait times, which elevates cost and undermines confidence in EV ownership.

## 1.4. Recommendations for Scaling Solutions

Cadmus offers stakeholder specific recommendations to translate the analysis into practical actions that accelerate equitable charging access for PCCs, particularly in MFH and PROW settings where soft costs often drive delays and cost overruns. The recommendations support near term scale by aligning deployment models with parking and power conditions and clarifying where utility leadership and cross sector partnerships can most effectively enable repeatable, scalable deployment.

## Recommendations for Utilities and Program Administrators

The recommendations below focus on treating energization as the critical path while strengthening utility–AHJ coordination through clear roles and responsibilities with internal documentation and transparent tracking and systematically measuring key soft-cost drivers to reduce schedule risk and redesign churn.

- **Publish "Getting Started" toolkits that reduce rework and confusion**, especially for MFH site hosts, installers, and AHJs. PG&E's Electric Vehicle Power Ready program website[3] provides several of these resources (e.g., roadmap, fact sheets, application guide, FAQs) and serves as a good example for other utilities.
- **Create a single point-of-contact (Utility Champion) and clear internal roles and responsibilities** to reduce cross-department email chains and inconsistent guidance when coordinating with multiple AHJ departments (Fire, Planning, Building, Transportation, Public Works). PG&E provides EV Advisors for its non-residential electric customers through its EV Advisory Services.[4]
- **Standardize contracting for emerging delivery models** (PPPs, tolling agreements, concession models) by developing reusable contract templates (terms, land lease structures, insurance/indemnification clauses, performance clauses).
- **Treat energization as a critical-path performance metric**: measure days from application to energization and benchmark against internal/legislative targets; track performance at the *step level* rather than only aggregated averages. PG&E is advancing faster EV project energization timelines through the CPUC-mandated Rulemaking R.24-01-018[5], which include eight standardized steps with a clear distinction between utility-controlled, customer-controlled, and AHJ-controlled steps with average and maximum durations timelines established. PG&E should continue to seek a pathway for projects installed in the PROW to participate in EV Power Ready (Rule 29).
- **Consider utilizing available utility funding to support ongoing costs:** pass on grant funding, LCFS funding, or other funding channels to AHJs and/or site hosts for soft costs or O&M. Phase 2 of EPIC 4.03 and future programming should test which provisions should be included.

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[3] https://www.pge.com/en/clean-energy/electric-vehicles/ev-power-ready-program.html

[4] https://www.pge.com/en/clean-energy/electric-vehicles/ev-fleet-program/advisory-services-program.html

[5] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/energization

## Recommendations for Authorities Having Jurisdiction

The recommendations below focus on standardizing and streamlining permitting, building code enforcement, and internal review workflows, especially in the PROW, by using consistent packets/checklists, consolidating duplicative permits where feasible, and reducing sequential, cross-department bottlenecks (with expedited pathways for LI/DAC sites).

- **Establish and scale PPP or concession delivery models for PROW charging**: Develop and implement standardized public-private partnership (PPP) or concession frameworks that enable private charging providers to finance, install, and operate infrastructure in the PROW, while meeting public goals for equity, access, and performance (e.g., uptime, data-sharing, pricing).
- **Enforce EV-ready building codes for MFH** by requiring EV-capable electrical capacity and EV-ready raceways/panel space in new construction and major alterations to reduce costly retrofits and accelerate equitable charging deployment.
- **Bundle requirements early to prevent wasted design spend and repeated resubmittals**: for example, San Francisco's approach, where vendors first obtain an Office of Emerging Technology permit that bundles pricing, O&M, data-sharing, and community engagement up front, triggering cross-agency review and reducing over-investment in infeasible designs.
- **Shift from sequential, stage-gated reviews toward more parallel processing**, as this report notes that interdepartmental coordination can consume "most of the project timeline," often more than permitting itself (e.g., traffic safety, tree preservation, fire clearances, curb-use conflicts).
- **Improve predictability by having an approved vendor list and standardizing packages/product offerings in programs** so deployments become repeatable and scalable, especially beneficial in MFH-heavy districts where demand is high, but coordination is complex.
- **Invest in site-screening tools and transparent siting criteria** (e.g., GIS-based mapping that integrates PCC density, LI/DAC indicators, existing charging access, grid capacity, and permitting constraints) to reduce infeasible site proposals, objections and repeated design cycles.
- **Operationalize equity rather than only acknowledging it**: many AHJs lack resources/data systems to track PCC needs, and this report points to practices like multilingual resources and interactive mapping to ensure PCC residents are included, while cautioning outreach should be timed so feasibility is confirmed before raising expectations.

## Recommendations for Installers/Private EV Charging Providers

The recommendations below focus on scaling through PPP/concession-style delivery with standardized agreements and clear performance expectations (uptime, data-sharing, O&M realism), paired with vandalism-resistant designs and equity-oriented pricing to protect affordability as deployments expand.

- **Design proposals to clear the hurdles up front** by packaging commitments on pricing, O&M, data-sharing, and community engagement early in the process (mirroring the bundled permitting approach highlighted in San Francisco), which improves proposal quality and reduces downstream redesign churn.
- **Pursue scalable PPP/concession deployments by using standardized template agreements** (e.g., clear terms, uptime requirements, equitable siting, data-sharing, and O&M roles) and aligning the business model to site type (e.g., vendor-owned curbside/pole-mount in the PROW and hub concessions where throughput/security justify capex) to enable repeatable rollouts across jurisdictions.
- **Proactively account for multi-agency constraints in the PROW and reduce iteration cycles**: incorporate early coordination with AHJs, use available screening tools and siting criteria, and validate proposed sites against known planning constraints (e.g., bike/bus lane projects, street redesigns) to minimize redesign and resubmittals.
- **Support low-income affordability through vendor-administered discount structures**: AHJs emphasized the need for discounted charging rates for low-income residents and for vendors to handle verification/administration of those discounts.
- **Make O&M and vandalism mitigation real in the operating plan**: ongoing theft/vandalism and out-of-warranty repairs can be a long-term risk for smaller jurisdictions, vendors should show durability measures, operations planning, and coordination with safety/public works to keep access reliable (especially after hours).

## Recommendations for Community-Based Organizations

The recommendations below focus on leading multilingual, trust-based engagement timed to occur after feasibility is confirmed, while helping track and communicate equity outcomes such as LI/DAC utilization and customer pricing relative to home-charging benchmarks.

- **Use trusted relationships to align siting with community priorities**: as the report describes how EV charging can be perceived as less urgent than immediate needs (safety, lighting, parking) in underserved neighborhoods, and that well-timed engagement anchored in trusted partners can mitigate resistance.
- **Prioritize multilingual outreach and inclusive feedback mechanisms**: as the report explicitly calls out the value of multilingual resources and interactive mapping tools to ensure residents without off-street parking are included in planning.
- **Coordinate engagement timing with feasibility**: as the report notes, outreach before confirming utility feasibility can backfire by creating false expectations if sites later prove infeasible, so engagement should be staged to match the technical pipeline.

## 1.5. Conclusion

PCC customers represent a significant, underserved, and strategically important segment for California's and PG&E's transportation electrification goals. While customer interest in EV adoption is strong, the lack of practical, affordable, and scalable charging solutions remains the limiting factor. Success will require a coordinated set of actions, including the following:

- Targeted investments in MFH and DAC neighborhoods
- Deployment of cost-effective and user-friendly solutions tailored to PCC severity
- Systemic improvements in permitting, utility coordination, and soft-cost management

This report represents the conclusion of Phase 1 of the EPIC 4.03 project focused on identifying barriers and potential scalable solutions to bring EV charging to PCCs. In Phase 2, PG&E will identify demonstration projects that are designed to not only deploy infrastructure, but to systematically measure soft-cost drivers, utility energization timelines, equity outcomes, and operational performance, producing standardized permitting tools, design details, and process playbooks to support scalable deployment across PG&E's service territory. Because the primary barriers to PCC charging are procedural and institutional rather than technological, EPIC is uniquely suited to fund demonstrations that generate transferable process improvements, rather than one-off infrastructure deployments. By aligning Phase 2 demonstration projects with these insights, PG&E can play a pivotal role in expanding equitable access to EV charging, accelerating EV adoption, and supporting California's climate and equity commitments.

# 2. Introduction

This report presents the findings from Phase 1 market research for PG&E's EPIC 4.03 project, including the policy context, stakeholder landscape, benchmarking of existing PCC charging solutions, detailed customer segmentation and market sizing, identified pain points, soft-cost analysis, and the foundation for recommendations on Phase 2 demonstration projects.

## 2.1. Report Version 1 (v1) Context and Objectives

The Scaling Charging for Parking-Constrained Customers Report v1 presents market research conducted by the research team to inform PG&E's decisions towards Phase 2 demonstration projects. This research also aims to provide AHJs, local and state regulators, community-based organizations, staff from other utilities and load-serving entities, other stakeholder groups, the EV charging industry, and the broader public interested in understanding approaches to advance charger availability for PCCs. With EPIC 4.03 funding, demonstration projects will be deployed to enable direct experience with emerging solutions that advance charger availability for PCCs.

### 2.1.1. EPIC 4.03 EV Solutions for Parking-Constrained Customers

The California Energy Commission's (CEC) Electric Program Investment Charge (EPIC) [6] is a ratepayer-funded grant program established under the California Public Utilities Commission (CPUC) in 2012. EPIC allocates over $130 million annually to support scientific and technological research and development (R&D), demonstration, and market facilitation across the electricity sector, with a focus on innovations in renewable energy integration, electric transportation, clean grid technologies, and equitable access in low-income and DACs.

The CPUC established the EPIC to "invest in innovation to ensure equitable access to safe, affordable, reliable, and environmentally sustainable energy for electricity ratepayers." The original EPIC Guiding Principles focused on increasing safety, reliability, and affordability for customers. In 2022, with EPIC 4, the latest iteration of the program, the CPUC expanded these Guiding Principles to include improving environmental sustainability and equity. The EPIC program is critical to helping California achieve its energy and environmental policy goals and support key CPUC proceedings. PG&E's EPIC 4.03, branded as EV Solutions for Parking-Constrained Residences, slots under EPIC 4's TE Initiative in the Efficient Transportation Electrification and Charging Technologies Innovation.[7]

As the EPIC administrator, PG&E has launched projects that provide significant value to its utility customers by facilitating and accelerating the integration of new technologies into the electric grid and into utility operations. PG&E's current EPIC 4 Portfolio includes over 20 projects that advance technology and solutions that support California's progress toward an equitable clean energy future. Specifically, the current portfolio focuses on advancing toward carbon neutrality, expanding the potential benefits of

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[6] Electric Program Investment Charge Program - EPIC | California Energy Commission

[7] https://www.energy.ca.gov/publications/2021/electric-program-investment-charge-2021-2025-investment-plan-epic-4-investment

distributed energy resources, and creating a more resilient grid to impacts from climate change and other emerging threats. Picking up from the Near-Term Priorities Decision Advice Letter, this is where EPIC 4.03 slots in, as it gives PG&E directed funds to demonstrate and test the scalability of solutions for near-term priority number 2. EPIC 4.03 is designed to improve the EV charging experience for PCCs by identifying and testing approaches that reduce barriers to access. Subsequent demonstration activities are intended to generate practical insights into which solutions and delivery models can scale effectively. These activities align with EPIC 4.03 and streamline the customer experience across customer segments to encourage EV adoption. The EPIC 4.03 research directly supports the EPIC 4 Guiding Principles outlined in Table 1.

**Table 1. EPIC 4.03 Guiding Principles**

| EPIC 4 Guiding Principle | CEC Description | PG&E EPIC 4.03 Principles Supported |
|---|---|---|
| Safety and reliability | The foundational technologies supported through this research topic have many grid applications, and this research topic will inform and advance power electronics applicable to other end-use applications (for example, solar PV and energy storage). Efficient charging innovations will be developed to ensure safety and reliability for drivers and operators. | Indirectly through demonstration projects with an eye towards building collective knowledge on innovative technology solution safety and reliability to the public and the utility. |
| Affordability | Technologies developed through this research topic will reduce the costs of charging PEVs, which will contribute a growing fraction of the state's electrical load, as well as reduce the cost of enabling technologies for transportation electrification and grid decarbonization. | Increase adoption rates for EVs among renters. A high percentage of renters are in LI/DAC areas, so this would enable them to adopt EVs and save on total energy costs compared to internal combustion vehicles. |
| Environmental sustainability | Technologies supported through this research topic will improve the efficiency of charging PEVs and support electrification of challenging transportation segments, simultaneously reducing emissions from the transportation and electric systems. | EV uptake in the PCC-heavy areas contributes to localized air quality benefits, displacing emissions from continued ICE-vehicle adoption. |

Ultimately, the research here positions PG&E to explore and validate scalable approaches for providing hard-to-reach customers with dependable charging access through real-world demonstrations of promising technologies and business models.

## 2.2. Problem Statement: The Parking-Constrained Customer

In PCC-heavy areas, households that have not overcome the significant customer pain points to adopt EVs present an unmet, latent demand for EV adoption. Latent demand refers to underlying or unrealized demand that exists but is not currently observed because of constraints or barriers, such as limited infrastructure, high costs, lack of access, and/or a poor customer experience. In other words, it is demand that would show up if conditions improved. For PG&E, meeting this demand achieves two objectives: accelerating EV adoption and promoting more equitable access to charging.

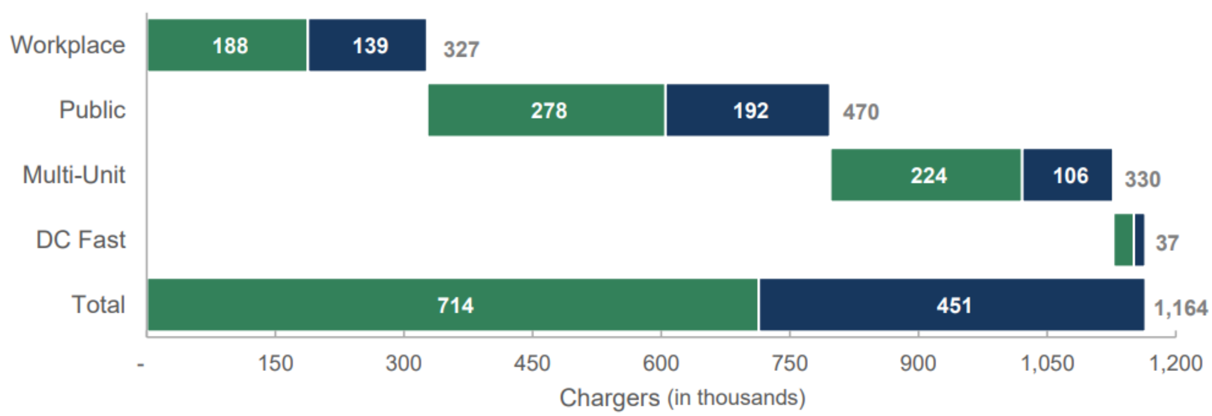
PCCs face structural barriers to adopting EVs, which results in significant market gaps due to a lack of reliable access to at-home charging. Unlike early EV adopters, who are disproportionately SFH homeowners with garages, many Californians live in housing types where locating and installing a private home charger is difficult or infeasible. This constraint fundamentally alters the convenience and cost advantages that typically drive EV adoption. For PCCs, the lack of a consistent overnight charging option limits customers' ability to rely on home-based charging and increases dependence on public infrastructure.

Existing EV charging programs and market investment patterns have not fully addressed these conditions. Utility make-ready programs and private charging deployments have historically prioritized sites with clear ownership, dedicated parking, and straightforward electrical upgrades. As a result, charging solutions that serve PCCs, such as curbside, streetlight, or shared community charging, remain limited in scale and unevenly implemented across jurisdictions.

> The core challenge is not customer interest, but the absence of scalable, practical charging solutions for PCCs, an issue that demands a clear understanding of the market's size and the regulatory, technical, and programmatic barriers that currently limit their access.

Critically, supporting equitable charging access to PCC will also necessitate the development of supplemental workplace charging in addition to at-home and near-home charging solutions. While the Research Team is aware of the CEC's projections in the AB 2127 Second EV Charging Infrastructure Assessment[8], workplace charging is out of scope of the EPIC 4.03 Phase 1 research presented in this report.

**Figure 1. CEC's AB 2127 Second EV Charging Infrastructure Assessment Projected 2030 Charger Counts to Support 5 Million and 8 Million LDV ZEVs**




The central challenge addressed in this report is not a lack of interest in EV adoption among PCCs, but rather a lack of scalable, practical charging pathways that meet their needs. Addressing this gap requires a clear understanding of the size of the parking-constrained market and the barriers embedded in current

[8] Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035 | California Energy Commission

regulatory, technical, and programmatic approaches. The following sections quantify this market and examine the conditions under which alternative charging solutions could expand access for PCCs in PG&E’s service territory.

## 2.3. Stakeholder Influence in Scaling EV Charging for PCCs

This section provides an overview of the stakeholder groups that influence the scalability of solutions for PCC EV charging in PG&E’s service territory. Table 2 summarizes the influence matrix on California PCCs. The table plays a very important role in scaling PCC needs and unlocking the potential latent demand for EV adoption in this market. It is imperative that each stakeholder group upholds its commitment to continuous improvement within its sphere of influence to facilitate an equitable EV transition. These stakeholders influence permitting, policy, funding, and community engagement, all of which are essential to overcoming barriers to these hard-to-serve customers. Collaboration and coalition-building between the parties is necessary to synergize their important roles and responsibilities within the system.

**Table 2. California Stakeholder PCC EV Charging Influence Matrix**

| Stakeholder Group | PCC Interest in EV Charging | Issues Impacting Decision Making |
|---|---|---|
| State Regulators and Legislators | • High | • Long-term scalability of results, barriers, and opportunities |
| Investor-Owned Utilities (e.g., PG&E) | • High | • Long-term scalability of results, barriers, and opportunities |
| Council of Governments | • Higher for those with climate action plans and ease of permitting | • Existing regional policies<br>• Long-term scalability of results – barriers and opportunities |
| Load Serving Entities in PG&E Service Area (e.g., Sonoma Clean Power) | • Higher with ease of installation, access, and ongoing O&M<br>• Lower if too many difficulties are present | • Long-term scalability of results, barriers, and opportunities<br>• Clarity of approval/permitting process |
| Public and Community Housing Authorities and Organizations | • Higher with ease of installation, access, and ongoing O&M<br>• Lower if too many difficulties are present | • Cost to install<br>• O&M cost<br>• Safety risks and vandalism<br>• Utility or state incentives<br>• Infrastructure constraints<br>• Proximity to power<br>• Utility/Vendor delays |
| City and/or County (AHJ) Planning Department | • Higher for those with climate action plans and ease of permitting | • Ease or difficulty of permitting<br>• Climate Action Plan (CAP) in effect<br>• PROW issues |
| MF Housing Manager | • Higher assuming ease of cost, permitting, installation, ongoing O&M, and owner interest<br>• Lower if too many difficulties are present | • Open or allocated parking, and number of unallocated spaces<br>• Difficulty of installation (trenching, proximity to electricity)<br>• Ongoing O&M<br>• Ease of port access<br>• Utility/Vendor delays |
| MF Housing Developer/ Owner | • Higher with ease of installation, access, and ongoing O&M<br>• Lower if too many difficulties are present | • Cost to install<br>• O&M cost<br>• Safety risks and vandalism<br>• Utility or state incentives<br>• Utility/Vendor delays |
| Private EV charging providers (e.g., ChargePoint) | • Higher with ease of installation, access, and ongoing O&M<br>• Lower if too many difficulties are present | • Long-term scalability of results, barriers, and opportunities<br>• Utility or state incentives<br>• Clarity of approval/ permitting process<br>• Utility delays |
| PCCs | • Higher if larger number of EV PCCs on site. | • Number of EVs on site at facility<br>• Number of EV charging ports available<br>• Port access<br>• Unassigned parking spots |

# 3. Existing Research and Benchmarking Pilots/Programs

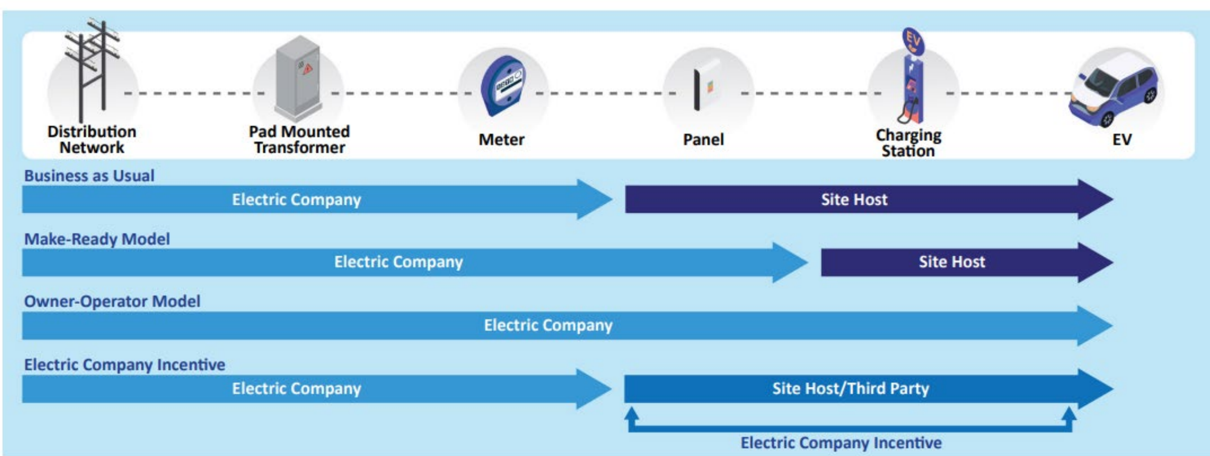
This section presents current research and available technology solutions for PCCs, with examples from both domestic and international markets. These sources provide the context, concepts, solutions, pilots, and programs referenced throughout the report. The research team used this foundation to ensure its analysis and recommendations are grounded in proven frameworks, findings, and business models, positioning PG&E to deploy scalable solutions that overcome the unique barriers to EV adoption for PCCs.

## 3.1. Literature Review

### 3.1.1. Ownership Models and Impact on Charger Availability

EVSE ownership models shape charger availability for PCCs. In the U.S., site-host owner-operator and third-party models, such as Charging-as-a-Service (CaaS), dominate most non-utility-owned installations, shifting capital and O&M risk between property owners and private EV charging providers. Utility participation ranges from the traditional make-ready model (i.e., utility funds upgrade up to-the-meter and, in some cases, the customer-side make-ready) to full utility-owned EVSE, with cost recovery typically occurring through the rate base where permitted. For PCCs, the make-ready model reduces interconnection hurdles at MFH and public sites, while third-party or service-based models can accelerate deployment when site hosts lack upfront capital but accept higher lifecycle fees. Adapted from EPRI, Figure 2 outlines the primary ownership structures from the perspective of a U.S. electric utility.

**Figure 2. U.S. Investor-Owned Utility Ownership and Financing Models**




Source: EPRI's Interoperability of Public Electric Vehicle Charging Infrastructure

Emerging models include the PPP with concession agreements. [9,10] The PPP model is a formal collaboration between the public sector (e.g., public authorities/governments, municipalities, regulatory bodies) and the private sector (e.g., businesses, charging service providers, other private entities) to jointly finance, design, build, operate, and maintain EV charging infrastructure while aligning to the

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9 PPPReferenceGuideVersion31

10 Electric vehicle charging concessions - A contract guide for public authorities

government entity's accessibility, equity, and reliability public interests, which are typically linked to performance.

Internationally, many markets restrict utility ownership of competitive assets, so municipalities often use concessions or PPPs to grant access to the PROW. Under long-term concessions, private operators finance, install, and operate chargers while meeting performance conditions (e.g., uptime, equitable siting) and sharing revenue or paying fees. These models have supported curbside and streetlight deployments and illustrate ways to scale public charger access relevant to PCC needs.

For PG&E's planning, comparing U.S. utility-owned make-ready approaches with concession-oriented international models clarifies the trade-offs in risk allocation, financing, and speed to deploy. The ownership model affects where and how quickly the EV chargers will appear (e.g., on-street vs. on-site), who pays for and maintains them, and the feasibility of equitable coverage in areas with limited off-street parking. Clear role definitions, standardized agreements, and transparent performance expectations are crucial to improving EV charger availability for PCCs across all ownership models.

Table 3 provides a high-level comparison of how PCC-relevant charging solutions are owned and financed across different markets, highlighting the structural differences between models used in the U.S. and those used internationally. Together, these distinctions help illustrate why certain technology solutions scale differently across regions and set the context for understanding the opportunities and constraints facing PG&E's strategies. PROW next-generation solutions that EPIC 4.03 is aiming to test are also highlighted, underscoring the range of ownership and financing structures that PG&E may need to consider as the market evolves.

**Table 3. PCC Technology Solutions and Ownership Models (U.S. vs. International)**

| Technology Solution | U.S. Ownership/Financing Models | International Ownership/Financing Models |
|---|---|---|
| Traditional IOU-Owned Make-Ready EVSE | (TTM, BTM, EVSE) Make-Ready and utility-Ownership:<br>• Utility funds panel upgrades and sometimes owns chargers; costs recovered via rate base. This model is a major part of utility programs, as regulators allow cost recovery through the rate base.<br>(TTM, BTM) Make-Ready Only:<br>• Utility pays for site prep; site host or third-party owns chargers | • Traditional Utility-Owned Make-Ready EVSE is not common in Asia and not really dominant in Europe. Globally, rate-based EV infrastructure is generally not allowed or is very limited outside the U.S.<br>Asia:<br>• Charging infrastructure is usually driven by private EV charging providers, automakers, or PPPs, not utilities.<br>• Similar restrictions in Japan, South Korea, and China, as utilities focus on grid capacity, while private EV charging providers or PPPs handle chargers. State-owned enterprises may invest, but it is not through retail rate-basing; it is treated as a strategic infrastructure investment.<br>Europe:<br>• Utilities sometimes play a role in site prep, but municipal concessions and private EV charging providers' ownership dominate.<br>• Utilities are often unbundled (grid vs. retail vs. generation), so regulators prohibit them from owning competitive assets like EV chargers.<br>• EVSE ownership is considered a competitive market activity, so utilities can't rate-base it. |
| Smart Outlet | Site Host Owner-Operator:<br>• Building owner buys and maintains outlets; often uses rebates or tax credits.<br>CaaS:<br>• Vendor installs and operates for a monthly fee; common in MF retrofits. | • Similar models, often bundled with energy management services in Europe and Asia. |
| 3rd-Party Owned EVSE | Full Ownership & Operation (Classic Private EV Charging Providers Model):<br>• Dominant for public and semi-public sites (retail, workplaces), private EV charging providers like ChargePoint, EVgo, Electrify America fund, own, and operate chargers. Revenue from driver fees; sometimes the site host gets a small share. Common due to a | Concession/Long-Term Lease:<br>• Very common in Europe for curbside and streetlight charging (UK, Belgium).<br>• Municipalities grant easements for the PROW; private EV charging providers invest and share revenue. Concession models are strongly associated with PROW or public assets.<br>CaaS:<br>• Strong adoption in Europe for multi-unit dwellings and small and medium-sized enterprises. Often bundled with energy management services. |

| Technology Solution | U.S. Ownership/Financing Models | International Ownership/Financing Models |
|---|---|---|
| | clear business model, supported by federal/state incentives.<br>• Hybrid Ownership (Shared CapEx):<br>• Common in fleet and large commercial sites (i.e., Pilot Flying J and EVgo ), but rare in MFH, viable in large apartment complexes where property owners co-invest with a private EV charging provider to reduce upfront costs. | Aggregator Models:<br>• Popular in Nordic countries and parts of Asia for community-based charging. |
| **PROW (Streetlight, Curbside)** | PPP or pilot concessions:<br>• City provides easement, operator funds, and hardware. | Concession/Long-Term Lease:<br>• Municipalities grant easements; private EV charging providers invest and share revenue (e.g., Ubitricity, Connected Kerb, etc.).<br>• Often includes data-sharing and uptime guarantees from municipalities. |
| **Community Hubs** | PPP:<br>• City provides land, private operator funds, and runs hubs.<br>• Grant and Private Capital:<br>• Federal/state grants plus private investment. | PPP:<br>• City provides land, private operator funds, and runs hubs.<br>• Common in Europe, PPP models dominate hubs financed by energy companies or municipal concessions.<br>• Common in Asia, hubs are integrated with smart grid and V2G services. |
| **Innovative Parking Partnerships** | High-density urban areas (e.g., NYC, SF) in luxury developments or smart parking pilots, with property developer-led financing and integration with private EV charging providers; sometimes paired with CaaS for operations. | Europe:<br>• Similar developer-led model but often integrated with green building certifications and ESG financing.<br>• Some PPP involvement if projects are in municipal-owned garages.<br>Asia:<br>• Developer-led but often tech-heavy (robotic carousels, V2G integration).<br>• Financing sometimes includes government incentives for smart city projects. |

### 3.1.2. Lack of Charger Availability for PCC

PCCs, particularly MFH and DAC residents, have significantly less access to reliable and affordable charging than SFH residents. In 2020, the CEC conducted the Residential Parking Facility Survey among California residents (California's Home Parking Survey), summarizing the findings in their Home Charging Access report.[11] The findings show that even under the most optimistic scenario that considers changes to parking behavior, 120V electrical infrastructure upgrades, and educational gaps addressed, when EV adoption reaches a hypothetical 100% future, no more than 71% of survey respondents aggregated for all housing types, income levels, and races have access to home charging. As presented in Figure 3, in the most optimistic scenario, Californian MFHs are expected to provide no more than 40% access to home charging (i.e., approximately 60% of MFHs in California lack potential access to home charging). This survey focuses on L1 home charging access and builds upon the recent report, Third SB 1000 Assessment: Barriers to Home Charging and Access to Public Near-Home Charging report.[12]

In the latest SB 1000 report, CEC staff's model results indicate that, across all housing types, approximately 88% of EVs in 2024 are likely to have access to at-home charging. In a hypothetical 100% EV future, estimated access to home charging declines to about 52%. Among MFHs, roughly 55% of EVs in 2024 have home charging access (representing approximately 7% of all EVs), compared with approximately 26% in the full EV scenario (representing approximately 6% of all EVs in a full EV future). In contrast, SFHs show higher access levels: an estimated 92% of EVs in 2024 can charge at home (approximately 81% of all EVs), falling to about 60% in the full EV scenario (representing 46% of all EVs in a full EV future). As illustrated in Figure 4, this home charging access discrepancy is differentiated when looking at DAC or LI community statuses, in which DAC and LI communities have less access to home charging in 2024 and in a hypothetical 100% EV future than communities not designated as disadvantaged or low-income.

Overall, the reality of home charging access for Californians creates a discrepancy with industry expectations that 80% to 90% of EV charging occurs at home. Limited home-charging access forces PCCs to depend heavily on public charging, which is typically more expensive, less reliable, and significantly less available in DACs. Peer-reviewed studies and national analyses indicate that DACs have substantially fewer public chargers per capita, and both the distribution and reliability of public chargers are extremely unequal in the U.S., with DAC renters experiencing the greatest gaps in access and service.[13] These disparities contribute to a self-reinforcing cycle where LI communities, already lacking private charging, face higher costs, reduced convenience, and greater uncertainty when adopting EVs. Together, these factors suppress adoption and highlight the need for targeted investment and equitable siting strategies.

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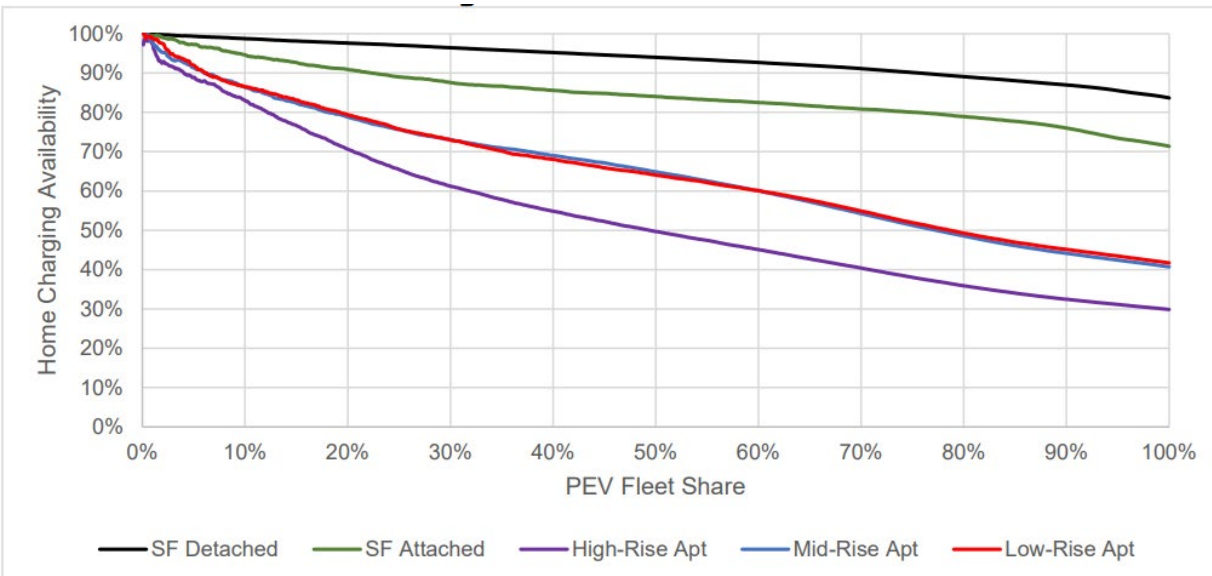
11 California Energy Commission, January 07, 2022. "*Home Charging Access in California*." https://www.energy.ca.gov/sites/default/files/2022-01/CEC-600-2022-021.pdf

12 Access to Public Near-Home Charging Among Electric Vehicles Without Home Charging

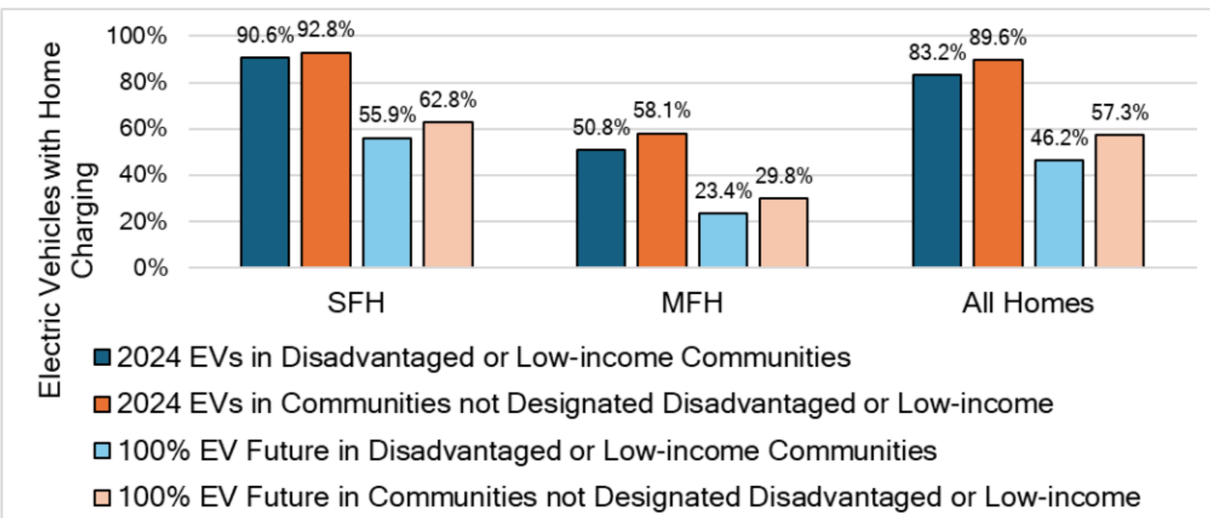
13 New research reveals stark inequities in EV charger access - UCLA Institute of Transportation Studies

**Figure 3. Evolution of Home Charging Access by Housing Type Potential Access with Parking Behavior Modification Scenario**




Source: CEC and National Laboratory of the Rockies (NLR) Home Charging Access 2022 Staff Report Figure B-4

**Figure 4. Third SB-1000 Report: Electric Vehicles Estimated to Have Home Charging by DAC or LI Designation**

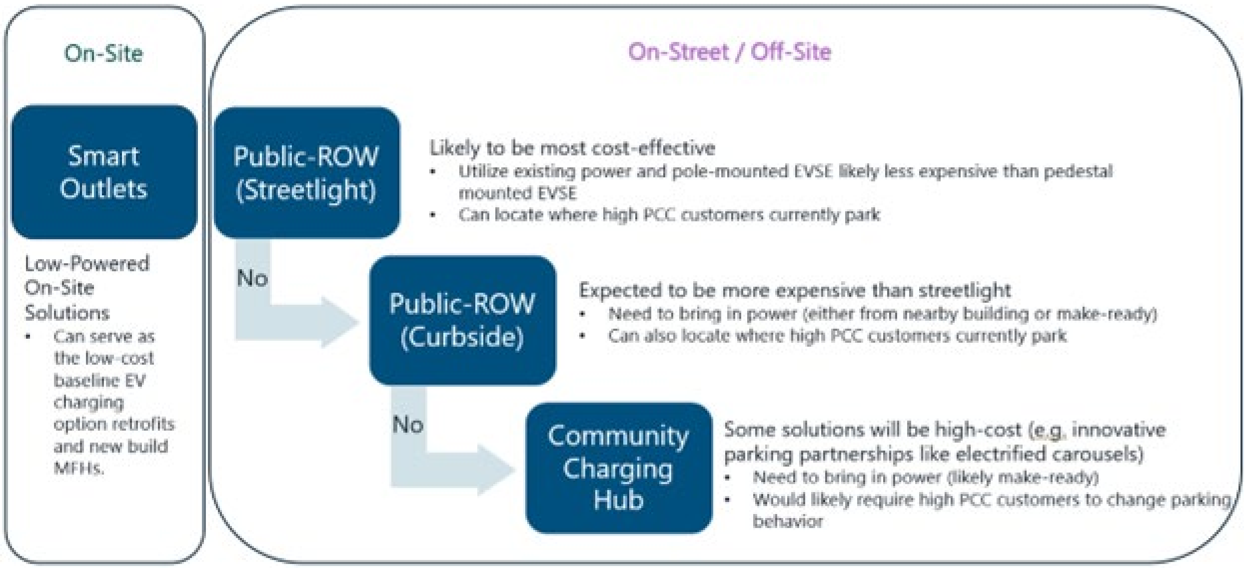



Source: CEC

### *Constrained Technology Solutions*

Preferred technology solutions for PCCs include smart outlets, streetlight charging, curbside charging, and community charging hubs. Figure 5 illustrates the theoretical global solution framework for serving PCCs at scale. This framework conceptualizes the prioritization of options that stakeholders can deploy to reach these hard-to-serve customers, particularly high PCCs.

**Figure 5. Theoretical Global Solution Framework for Serving PCCs at Scale**




Benchmarking indicates that smart outlets offer the lowest-cost option for medium-PCCs but may require make-ready upgrades and present interoperability challenges. Streetlight charging provides medium- to high-PCC coverage with lower civil-work requirements by leveraging existing electrical infrastructure; however, PG&E's non-standardized streetlight voltages, ownership fragmentation, metering complexities, and differing AHJ requirements limit scalability. Curbside charging offers wider access but entails substantial soft costs from make-ready needs, permitting complexity, and multi-stakeholder coordination. Community charging hubs can serve multiple PCC groups but face high upfront and operational costs, security concerns, and limited commercial maturity. Overall, each technology addresses specific PCC constraints but encounters structural impediments to scale without coordinated policy, permitting alignment, and financial support as detailed in Table 4.

**Table 4. PCC Technology Solutions**

| Technology Solution | PCC Impacted | Primary Barriers Addressed | Challenges to Scaling |
|---|---|---|---|
| **Smart Outlet** | Medium | • Cost to Install Charging Equipment<br>• Proximity to Power<br>• Vandalism (BYOC) | • Most scalable solution from a total lifecycle cost standpoint but still poses the potential need for make-ready infrastructure upgrades.<br>• Potential interoperability issues between BYOC and smart outlets.<br>• Smart outlets sit in a regulatory and permitting gray zone as Many AHJs struggle with whether a smart outlet is an EVSE, a metered receptacle, or a non-EVSE building outlet with software controls. If treated as a receptacle, building inspectors may question CTEP, billing legality, or revenue collection, as an application or a display screen in the EV cannot be used, and the EVFS itself must have a primary indicator or a payment terminal (kiosk). Additionally, non-standardization among smart outlet vendors often raises questions around load calculations and inconsistent recognition of software-based load management during site planning and electrical permitting. |

| Technology Solution | PCC Impacted | Primary Barriers Addressed | Challenges to Scaling |
|---|---|---|---|
| **Streetlight** | Medium and High | • EVSE Proximity to Power<br>• Cost to Install Charging Equipment<br>• Equity & Resident Concerns | • Many streetlight circuits in PG&E's service territory lack the voltage for L2 charging. While LED retrofits have significantly reduced streetlight power demand, existing PG&E-owned streetlight circuits are generally limited to 120V single-phase service at 15-20A. This voltage and amperage profile is insufficient for L2 charging, which requires 208–240V service, resulting in an infrastructure mismatch.<br>• Inconsistent ownership model (AHJ-owned, utility-owned, etc.) means a one-size-fits-all approach is unlikely to succeed, as each has challenges:<br>• PG&E-Owned (LS-1): Modifications to streetlight infrastructure must comply with PG&E Greenbook requirements or pursue a formal variance with supporting design documentation. Additionally, Pole-mounted EV charging introduces operational challenges, including maintaining safe climbing clearances, accommodating additional equipment weight, and ensuring access for both streetlight and charger maintenance over assets with long service lives.<br>• For Customer (AHJ)-owned (LS-2): Electric Schedule LS-2 restricts non-conforming loads to 150W per circuit and was not designed to serve EVSE as L2 charging is typically ≥2.4 kW, which severely limits the feasibility of direct connections without significant upgrades or tariff revisions.<br>• Regardless of ownership model, accurate metering of EV charging is essential for billing, monitoring, and grid management. While certified submetering protocols were approved by the CPUC [14], implementation remains limited, and each submeter must meet certification requirements, hampering scaling and increasing costs; alternatively, installing pole-mounted revenue meters introduces GO-95 clearance, constructability, and safety challenges.<br>• Multistakeholder coordination problem (soft cost driver) |
| **Curbside** | Medium and High | • Cost to Install Charging Equipment<br>• Equity & Resident Concerns | • New make-ready infrastructure in the PROW required (easement, space constraints, etc.)<br>    ▪ Building-load power source (e.g., It's Electric)<br>    ▪ Dedicated make-ready<br>• Unique AHJ requirements and permitting processes in the PROW<br>• Ongoing maintenance and vandalism concerns<br>• Multistakeholder coordination problem (i.e., soft cost driver) |

[14] CPUC Decision Adopting Plug-In Electric Vehicle Submetering

| Technology Solution | PCC Impacted | Primary Barriers Addressed | Challenges to Scaling |
|---|---|---|---|
| **Community Charging Hub** | Medium and High | • Equity & Resident Concerns<br>• Cost to Install Charging Equipment | • Higher upfront costs and potential for TTM upgrades for higher powered DCFC hubs in comparison to other technology solutions<br>• Land use and siting constraints, particularly in high-PCC urban core areas. |

## *Existing Constraints to PCC Build Out*

PCC-focused charging deployment faces intertwined legal, technical, cultural, and economic barriers. Fragmented AHJ authority over the PROW, ADA requirements, sidewalk clearance rules, unclear AHJ permitting pathways, and uncertainty around the legality of the BYOC model underscore current and future urban planning challenges. [15] Additional challenges revolve around the lack of consensus on who should retain priority for the future PROW, adding soft costs and risks to new projects. Technical limitations, including legacy streetlight circuits designed for lower-voltage lighting loads rather than higher-voltage L2 EV charging and constrained building-level electrical capacity, complicate curbside and pole-mounted solutions. Public charging also imposes greater time burdens on users and raises reliability and vandalism concerns, which disproportionately affect LI residents relying on these options. These impacts can be compounded by overcrowded public charging stations, resulting in longer wait times, as shown in Figure 6.[16] These structural and cultural constraints reinforce uneven access and limit the development of scalable pathways for PCC charging solutions.

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[15] While BYOC is common in Europe; U.S. ADA, Tort Liability, and ROW Law does not equate to Europe's regulatory environment regarding EVSE-use in the PROW. Alternative Fuels Data Center: ADA Compliance for Electric Vehicle Charging Infrastructure Sharing the Sidewalk with EV Charging Cords - Legal Planet, Clean Cities and Communities: Project Lessons: Curbside EV Charging Administrative Guidance Edited (263329).DOCXEV-Charging-Crossing-the-PROW_Guidance.2025.2.25.pdf

[16] Electric vehicle charging dissonance: Exploring how renters and multi-unit dwelling residents navigate limited charging access - ScienceDirect

**Figure 6. Self-Reinforcing PCC EV Charging Access Private Market Failure**


### *High Upfront Costs*

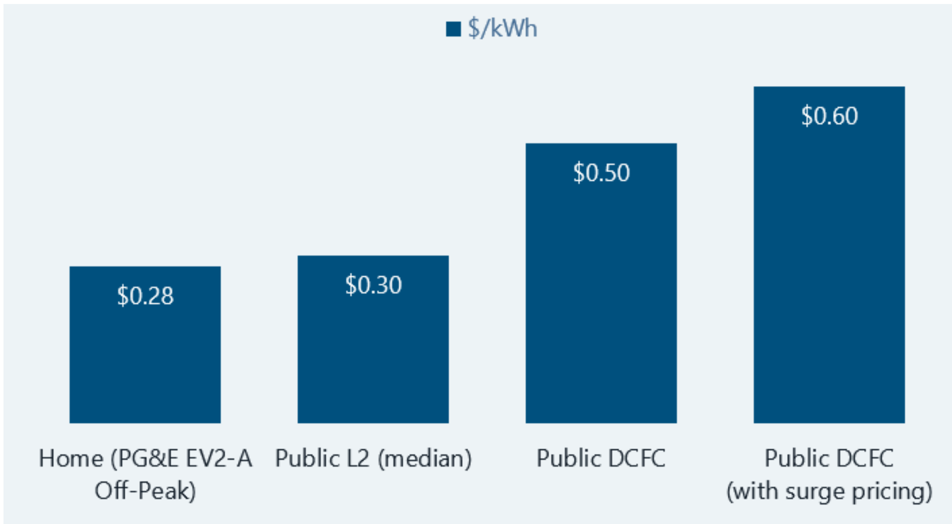
High upfront costs arise from recurring friction points across utilities, AHJs, local and state regulators, community-based organizations, installers, charging providers, and property owners. This includes insufficient site electrical capacity, unclear regulatory precedent for roles and responsibilities between private EV charging providers and IOUs, inconsistent permitting and PROW requirements across AHJs, and limited workforce familiarity with EVSE. MFH property owners also lack clear valuation frameworks for EV charging projects. These structural barriers reinforce reliance on traditional approaches and limit the rapid expansion of PCC-oriented charging infrastructure.

## 3.1.3. Increased Cost for PCC Customers

The current status quo leads to PCC EV drivers incurring higher charging costs as they rely primarily on refueling at public and workplace charging stations rather than lower-cost home charging.

Affordability compounds the challenge for PCCs, as public charging in California often costs the end user more per mile than home charging, as shown in Figure 7. Additionally, while market averages are shown here, public EV charging costs depend not only on charger speed and location, but also on the charging network's pricing structure, which can include per-kWh or per-minute rates, subscriptions, and additional fees to initiate a session. Some networks add session-initiation, transaction, or minimum fees when a charge begins, meaning the total cost can exceed the posted energy price, especially for short or partial sessions. Because pricing varies by network and site, drivers must check station-specific details in charging apps to understand the full, all-in cost before plugging in.

**Figure 7. Typical Pricing of PG&E Home Charging vs. California Public Charging**




Home Source: [PG&E Electric Schedule EV2 Residential Time-of-Use Rates]
Public Source: [Public Charging Station Costs. November 2025. Cartelligent]

While it is typically cheaper to charge at home in PG&E's service territory, for PCC EV drivers, this disparity can be compounded by overcrowded stations in charging deserts, which can push prices upward, particularly with demand charges and surge pricing. As a result, drivers from these areas are forced to travel to the closest high-demand corridors, where limited public chargers become overcrowded. This congestion creates queues and poor user experiences, while demand charges and surge pricing at these high-utilization sites push the electricity price even higher. Ultimately, these elevated charging costs erode the EVs' advantage of total cost of ownership (TCO) over internal combustion vehicles, slowing adoption in DACs and perpetuating the cycle of low utilization.

## 3.1.4. Global Partnership Models for EV Charging

To illustrate alternative EV charging deployment models, this section outlines examples of efforts to improve EV charging access in Europe. Table 5 details the five main partnering models that have emerged in the European Union, with local authorities involving PPPs and concession modeling.

**Table 5. European Investment Bank's EV Charging Concessions Partnering Models with Local Authorities**

| Partnering Models | Concessions |
|---|---|
| Public Contract | The public authority controls the specification, installation, operation and use of the infrastructure. It retains most of the project risks from installation through to exploitation (including user-demand risk), contracting these out as required. The public authority finances capital, operation, and maintenance expenditures and collects and retains user revenues. |
| Joint Venture | The public authority and private partner share control of the infrastructure through a joint venture company they create. The risks are shared by the parties according to their stakes in the joint venture. The model is flexible on arrangements for financing, which might come from one or both parties or from a separate third party. User revenues are also collected and shared by the parties according to their stakes. |
| Concession | The public authority retains some control over the specification, installation, operation and use of the infrastructure. The risks associated with installation through to exploitation (including user-demand risk) are typically transferred to the private partner, although risk allocation in the concession contract can be tailored to the specific circumstances. The private partner finances the capital and maintenance expenditure, with or without subsidies, guarantees or other financial support from the public authority. It also collects and retains user revenues, with or without sharing with the public authority. |
| Availability-based Contract | The public authority retains some control over the infrastructure, as in the concession model. Risks associated with installation through to exploitation are mainly transferred to the private partner, with the notable exception of user-demand risk. The private partner finances the expenditure, with or without financial support from the public authority, and is paid by the public authority over the duration of the contract only if the infrastructure is continually available for its intended use. |
| License | The private partner controls the infrastructure and retains most of the project risks from installation through to exploitation. It finances the capital and maintenance expenditure and collects and retains user revenues. A license might include conditions and limitations regarding the private partner's actions but typically allows more freedom than other partnering models (stating what the private partner may, rather than must, do). |

These models present additional options for AHJs and other stakeholders to support charging access. One key model, the concession model, is typically appropriate when an AHJ wants public EV charging deployed quickly without needing to directly own, fund, or operate chargers. This model enables private-sector solutions to EV charging needs, where the market can sustain it. This allows private-sector actors to shoulder the risk of charger deployment while also enjoying the benefits where the market can sustain chargers. Concessions can also be deployed to support charging where the market cannot support private-sector models, and where AHJs lack the expertise to build and maintain charging infrastructure through long-term structured contracts. These contracts can support reliable, equitable coverage while leveraging the private-sector cost and efficiency benefits, having significant benefits for performance metrics, through charger firm expertise and through required uptime guarantees.

## 3.2. Benchmarking of Existing Pilots and Programs for PCC

Table 6 shows recent pilots and programs that are focused on bringing charging to PCCs.

**Table 6. Existing Pilots and Programs for PCC Technology Solutions**

| Technology Solution | Pilot/Program | Location | Implementation | Summary of Description |
|---|---|---|---|---|
| **Smart Outlet** | Peninsula Clean Energy's EV Ready Program | San Mateo County, CA | CCA | Offers free technical assistance and provides rebates that can cover up to 100% of eligible project costs, capped at the maximum port incentive or applicable cost, based on measure type, building type, and affordable vs. market-rate property designation. |
| **Community Charging Hub** | IONNA Rechargery Hub | San José, CA | Third Party | The network's sites, branded as "Rechargeries," are designed around consistent hardware standards, dual-connector compatibility, strong lighting and safety, and locations proximate to everyday amenities such as retail, restrooms, and food options. Ensures interoperability for legacy and next-generation EVs, with available access 24/7. |
| **Community Charging Hub** | Revel Mission District DCFC Hub | San Francisco, CA | Third Party | Emphasizes public, high-reliability DCFC, building hubs in locations where urban residents, rideshare drivers, fleets, and visitors can charge quickly and safely. Unlike corridor-focused charging networks, Revel sites the hubs in urban cores, prioritizing neighborhoods with limited off-street parking, high EV growth, and strong daily trip activity. The hubs operate 24/7 and are accessible to any EV brand, without membership requirements. |
| **Community Charging Hub** | Gravity Technology DEAP Gravity Charging Center Hub | NYC, NY | Third Party | Developing Distributed Energy Access Points (DEAPs). DEAPs are a next-generation fast-charging platform engineered not simply as EV chargers, but as flexible, grid-integrated modular power nodes capable of delivering high charging speeds while reducing strain on local electrical infrastructure. Gravity frames EVs themselves as "mobile batteries" that can augment and stabilize distribution networks rather than burden them, positioning DEAPs not just as chargers, but as distributed grid assets. Pilot project in NYC includes 24 DCFC stalls, each specified for up to 500 kW with a floor of 200 kW continuous power during power sharing. Dispensers are ceiling-mounted within parking bays, designed for seven-day-a-week/extended-hour access. No utility upgrades were required, as existing building capacity was central to the DEAP architecture philosophy. |

| Technology Solution | Pilot/Program | Location | Implementation | Summary of Description |
|---|---|---|---|---|
| **Curbside, Streetlight** | City of San Francisco Curbside EV Charging Pilot | San Francisco, CA | Municipal | Pilot allows EV providers to install compact L2 chargers directly at the curb under an "emerging technology permit," informing a PROW permit for curbside EV charging. The three vendors are testing a curbside pedestal from the existing building service (e.g., It's electric), a streetlight pole-mounted unit (Voltpost), and a curbside pedestal from a new dedicated service through PG&E's EV Power Ready (Urban EV). |
| **Curbside, Streetlight** | City of Seattle Curbside Charging Initiatives | Seattle, WA | Municipal | Pilot installs publicly owned L2 chargers on pedestals, steel streetlight poles, and wooden utility poles to expand access for residents without off-street parking. These 9.6 kW chargers are installed, operated, and maintained by the utility itself to provide reliable, equitable neighborhood charging aligned with Seattle's electrification strategy. |
| **Curbside** | City of Portland Curbside Charging Initiatives | Portland, OR | Municipal | Portland's EV-ROW policy and initiative authorize utilities and private EV charging providers in the PROW under a Master Lease Agreement framework, with siting restricted to designated Centers and allowing either pedestal-mounted or pole-mounted L2 chargers. Portland General Electric (PGE)'s Neighborhood EV Charging program installs L2 pole-mounted chargers on utility poles; the utility designs, owns, and operates the EVSE. |
| **Curbside, Streetlight** | The UK's On-Street Residential Chargepoint Scheme (ORCS) and Local EV Infrastructure Funding (LEVI) | London, UK | Government | The ORCS program provides capital grants of up to 60% of installation costs to local authorities for installing residential on-street EV chargers.<br>The successor: The LEVI program provides capital and capability funding for local authorities. It is designed to accelerate and scale the ORCS through large-scale, commercially co-funded deployment of public EV charging infrastructure, supporting staffing, planning, and installation processes to ensure equitable access across communities. Several UK authority-funded examples include Merton, with over 500 lamp post charging installations, and Barnet, with over 500 lamp post chargers and approximately 800 ground-level curbside pedestal chargers. |
| **Streetlight** | LADWP BSL L.A. Lights Pilot | Los Angeles, CA | Municipal | Installed approximately 750 streetlight chargers, which they design, own, and operate all city-mounted L2 EV chargers placed on streetlight poles, using existing 240-volt streetlight electrical service, which requires no upgrades due to a prior citywide LED retrofit. |

| Technology Solution | Pilot/Program | Location | Implementation | Summary of Description |
|---|---|---|---|---|
| **Streetlight** | National Grid Utility Poles EV Charging | Melrose, MA | IOU | Deploys 16 pole-mounted L2 chargers on existing utility poles. The chargers, owned by the City of Melrose, use an app-activated lowering mechanism for drivers and represent the first elevated pole-mounted EV charging deployment by an investor-owned utility in the U.S. |
| **Streetlight** | Streetlight Charging in the Kansas City ROW | Kansas City, MO | Government | Retrofits 23 existing streetlight poles with L2 chargers under a U.S. DOE-funded demonstration led by Metropolitan Energy Center (MEC), designed to expand curbside access for renters and MF residents lacking home-charging options. The project combines technical siting analysis with community-driven location selection, emphasizing equity by prioritizing underserved neighborhoods and validating charger placement through extensive community engagement. |
| **Streetlight** | Streetlight Charging in Chinese Provinces | Shanghai, Shenzhen, Chengdu, Wuxi, etc. | Government | Multiple Chinese municipalities actively support low-cost, high-efficiency infrastructure. Initiatives in cities like Shanghai, Chengdu, Wuxi, and Shenzhen fund local pilot programs for smart street poles. In general, China treats curbside charging as a targeted solution for older neighborhoods, a supplement, not a backbone (i.e., Ultrafast Charging serves this), and something cities deploy only after exhausting streetlight and off-street options. |
| **Curbside** | NYC Curbside L2 EV Charging Pilot | New York, NY | Municipal | Deployed 118 FLO SmartTWO L2 curbside pedestal chargers across 35-plus locations across NYC's boroughs to test demand, reliability, community acceptance, and business feasibility in dense urban right-of-way conditions. The Q3-2025 closeout shows surging utilization and uptime, and strong reliance by residents and professional drivers. The closeout also highlights challenges such as parking pressures, high O&M costs without scale, and mixed neighborhood sentiment. |
| **Curbside** | ComEd Curbside Charging Beneficial Electrification Pilot | Chicago, IL | IOU | Partners with Chicago metropolitan area AHJs to test a modular, scalable public-ROW L2 curbside charging model, with site designs led by HBK, construction by MJ Electric, and evaluation by Electric Power Engineers. The pilot aims to develop equitable siting, streamlined permitting, and best-practice utility-municipal workflows, generating cost-effectiveness insights and tools to support broader curbside deployment across northern Illinois. |

| Technology Solution | Pilot/Program | Location | Implementation | Summary of Description |
|---|---|---|---|---|
| **Curbside** | City of Boston Curbside EV Charging Initiative | Boston, MA | Municipal | Two delivery models were tested in this program:<br>• PPPs with It's Electric and Greenspot to install and operate curbside L2 chargers at no cost to the city, typically using BTM building power or dedicated utility service.<br>• City-owned curbside pedestal FLO SmartTWO L2 charging stations installed and maintained by Better Together Brain Trust in partnership with FLO.<br>These models support Boston's "Recharge Boston" strategy to place every resident within a 5-minute walk of an EV charger and expand access for households without off-street parking by deploying hundreds of curbside chargers throughout neighborhoods. |
| **Curbside** | Washington D.C. Curbside Charging Initiatives | Washington, D.C. | Municipal | Led by the District Department of Transportation (DDOT), the establishment of a public-space permit framework allows only commercial vendors to install L2 chargers in eligible areas, with strict requirements for utility coordination with Pepco, ADA-compliant siting, community notification, and an annual permit fee of $2,400 per two-port installation. The program runs alongside an L1 cord-cover guideline for residents without driveways.<br>DDOT's sustainability pilot portfolio includes the Neighborhood Curbside EV Charging Station Pilot, in partnership with It's Electric, to install, operate, and maintain 16 L2 curbside pedestal chargers. |
| **Curbside** | LADOT: L2 Curbside EV Charging in Residential Neighborhoods | Los Angeles, CA | Municipal | Deployed 90 new public It's Electric L2 curbside pedestal chargers across Los Angeles over 12 months, beginning with 15 chargers installed in Koreatown, replacing former BlueLA car-share chargers and expanding 24/7 neighborhood access to public EV charging |
| **Curbside** | Seattle EV Charging in the ROW Permit (EVCROW Permit) Pilot | Seattle, WA | Municipal | Permitted curbside EV charging in the PROW, and ultimately, Seattle City Light installed two DCFCs after receiving 68 applications, with evaluation findings highlighting permitting challenges, high utility-connection costs, and conflicts with other street uses. |

| Technology Solution | Pilot/Program | Location | Implementation | Summary of Description |
|---|---|---|---|---|
| **Curbside** | NYDOT Studio: EV Charging Solutions to Ready New York City for EV Use at Scale | New York, NY | Municipal | Collaboration with Newlab brought three curbside-charging vendors, Connected Kerb, Char.gy, and Voltpost, into a pilot program to test retrofit and modular curbside charging technologies adapted for NYC's utility, permitting, and streetscape constraints. Through iterative field installations, user testing, and agency-vendor co-design, the pilots generated insights on U.S. electrical adaptation, UL certification needs, siting feasibility, utility coordination, and community acceptance. |
| **Curbside** | City of Berkeley Residential Curbside EV Charging Pilot | Berkeley, CA | Municipal | Early residential curbside charging pilot sought to test whether resident-installed curbside chargers could expand EV access while preserving the PROW, with only seven installations being completed despite high initial interest. High permitting and installation costs, public access requirements that discouraged participation, and the private-use nature of most installations led to minimal uptake, suggesting that resident-funded curbside charging is not a scalable model and that governments or third-party providers are better suited to delivering public-space EV infrastructure. |
| **Curbside** | UK OZEV: Subsurface Technology for Electric Pathways (STEP) Project | London, UK | Government | Deployed 150 flush-mounted curbside ChargePoint's across Brent and Camden, using Trojan Energy's in-ground, cable-free streetscape system that leaves the pavement fully unobstructed and supplies power through shared underground cabinets. |

Across U.S. and international deployments, PCC-oriented pilots demonstrate diverse siting models, smart outlets, curbside, streetlight, and community hubs, with varying scales of feasibility, cost, and permitting complexity. Common themes include: the need for AHJ–utility coordination, challenges with interconnection timelines, community engagement sensitivities, vandalism and O&M burdens, and reliance on concession or PPP frameworks for financial viability. These pilots collectively show that PCC charging expansion is technically feasible but requires aligned ownership models, standardized permitting, and streamlined electrical integration to scale effectively.

# 4. Segmenting the Parking-Constrained Market

The primary goal of segmentation is to develop metrics to support measuring concrete impacts of EV charging availability on EV adoption in high-PCC areas. The research team aimed to provide details on the parking-constrained market in PG&E's territory beyond the commonly held assumption that PCC is generally associated with the MFH segment. This report broadly refers to MFH as inclusive of multiple segments, including duplexes, triplexes, apartments and condominiums; however, in this section of the report MFH is more distinctly defined from condominiums to provide more granular segmentation.

The segmentation of the PCC market is based on data derived from classifying a sample of the housing stock in PG&E territory at the parcel level into a set of parking characteristics. Data drawn from the Zillow website, acquired from BrightData provided a parcel-level snapshot of properties:

- Parking Characteristics: Drawn from listing agent-entered descriptions where available.
- Housing type: Drawn from listing agent-entered values, simplified into the composite housing type fields discussed in this report.

The research teams' approach to classifying properties into these categories is outlined in detail within the Parking Constrained Segmentation Methodology section in the Methodology Appendix. Table 7 summarizes the market segments used throughout the Phase 1 analysis for PG&E's EPIC 4.03 project.[17]

**Table 7. Market Segments**

| Parking Constrained Classification | |
|---|---|
| Low | Has dedicated parking available on site. |
| Medium | Has non-dedicated parking available on or off-site. |
| High | Has only street parking available. |
| **Housing Classification** | |
| SFH | Parcels marked as Single family or Town House in the parcel level data set. |
| Multifamily (MFH) | Parcels marked as Multifamily or Apartment in the parcel level data set. |
| Condo | Parcels marked as Condo in the parcel level data set. |
| **Demographic Classification** | |
| LI | If a parcel is within a CBG classified as Low-Income. |
| Non-LI | If a parcel is not within a CBG classified as Low-Income. |

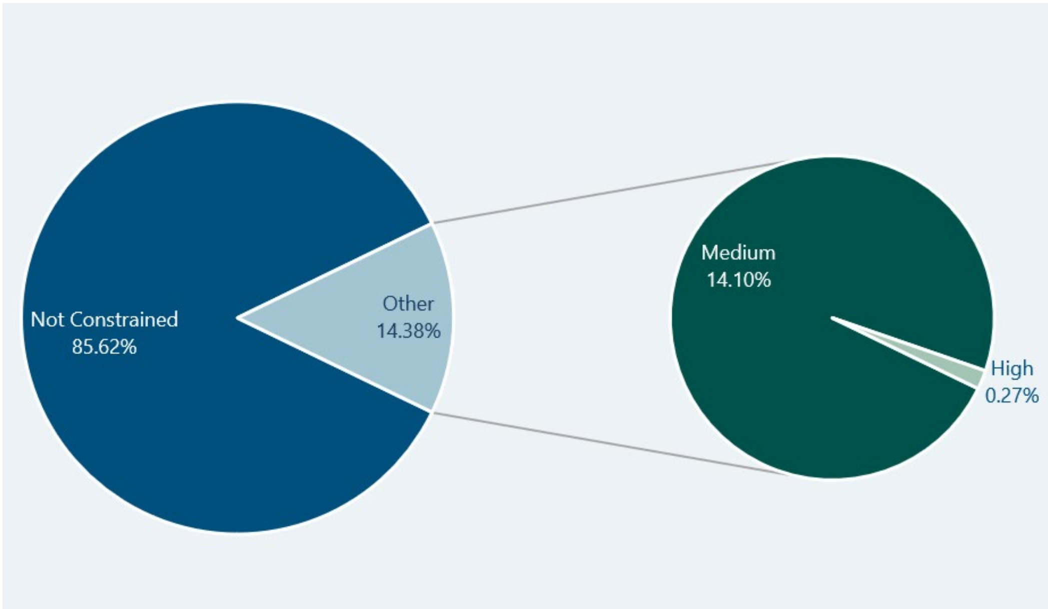
## 4.1. Housing

Figure 8 depicts the distribution of sampled parcels by their parking-constrained characteristics, not constrained, medium-, and high-constrained. As expected, a significant share of the sampled parcels are

[17] This data was generated at the parcel level, with individual housing units as a single data point. The statistics presented in this report on these characteristics are based on the underlying data, which serve as a representative sample of the populations they represent. It is critical to note that parcels that were not classified under the housing classification or did not have a parking classification were not included in the reported statistics.

not parking constrained at 85.62%. Of the remaining 14.38% of the sample, 98% are medium-constrained, while only 2% are classified as high-constrained, making up only 0.27% of the total sample.

**Figure 8. Split of Parking Constrained Characteristics by Parking Constrained Nature**




Diving deeper into the sampled parcels, Figure 9 presents the distribution of housing types across parking-constraint categories (not constrained, medium, and high), showing the share of each housing classification within the sampled population for each constraint level. As this report focuses on PCC, analysis of the “not constrained” population is not included in this report. The medium category is dominated by the MFH and condo housing classifications. In the high category, MFH still plays a dominant role at 63.76% while SFH parcels make up 29.84%, and condos represent only 6.4%.

**Figure 9. Share of Parking Constrained Parcels by Property Type**

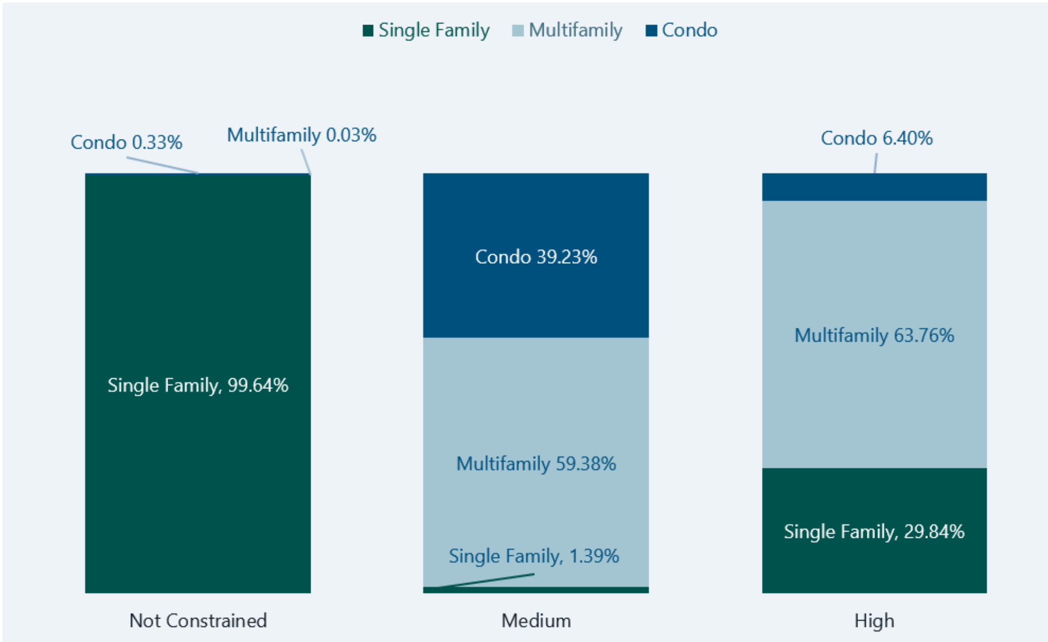
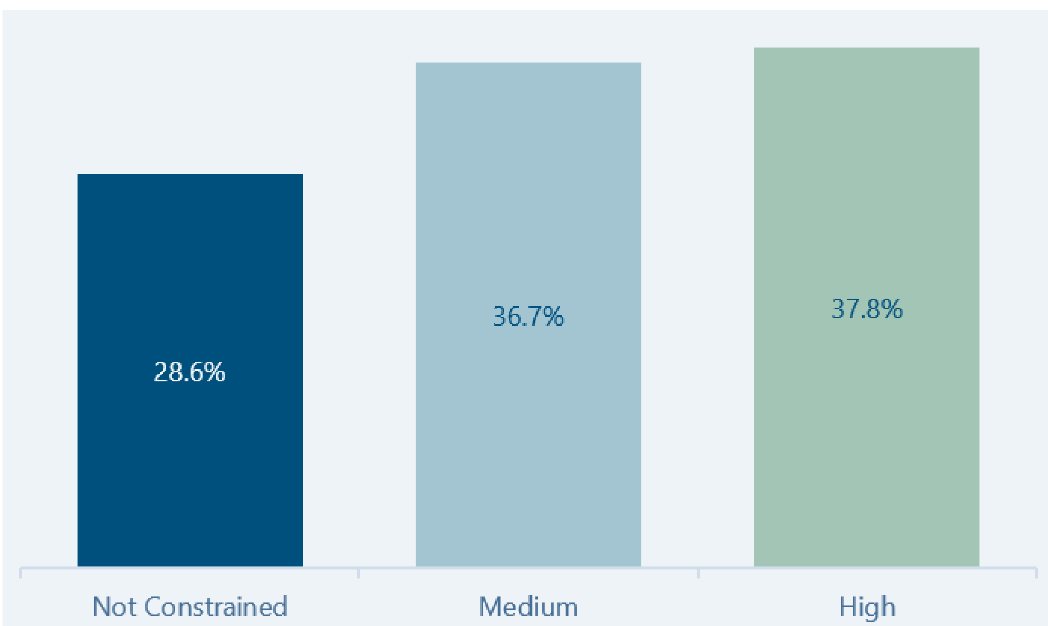



Figure 10 further segments these PCC categories and looks specifically at what share of each category is comprised of parcels within LI CBGs. As illustrated in the figure, a relationship between a parcel's presence in a LI CBG and the likelihood that it is parking constrained. Critically, this figure also highlights that the majority of the sampled PCC parcels were not within an LI CBG.

**Figure 10. Share of Parcels within a LI Designated CBG**



### 4.1.1. Top 4 Metro Area Segmentation

Table 8 presents the market sizing analysis for priority AHJs, which this subsection examines in relation to historical housing planning inequities. San Francisco is the most urban and the most parking-constrained, as approximately 58% of the approximately 444,000 LDVs belong to MFH households compared with approximately 42% SFH households. LDVs in low-income census tracts are approximately 35% of the total, and approximately 29% fall into PCC segments. San José has the largest vehicle base of the four cities at approximately 804,000 LDVs. LDVs in low-income census tracts account for approximately 38% of the total, and approximately 21% of vehicles are in PCC segments. Additionally, San José's MFH-to-SFH split is approximately 29% MFH drivers and 71% SFH drivers. Fresno is similar in scale to San Francisco in terms of vehicle base, with approximately 438,000 LDVs. LDVs in low-income census tracts make up approximately 58%, while approximately 9% of vehicles are in PCC segments, the lowest of the group, emphasizing the sprawled development patterns. This is corroborated by Fresno's MFH to SFH split, with the lowest associated MFH LDVs at approximately 15% to approximately 85% SFH of LDVs driven by SFH households. Lastly, Oakland blends high equity needs with elevated parking constraints, though not quite at the same level as San Francisco. The city is estimated to have a vehicle base of approximately 308,000 LDVs; LDVs in low-income census tracts make up approximately 65%, the highest amongst the four cities, while approximately 25% of vehicles are in PCC segments. Furthermore, the split of MFH to SFH in Oakland is flipped, with approximately 43% LDVs for MFH households and 57% for SFH households.

**Table 8. Expected Vehicles Driven in PG&E Service Territory [a]**

| AHJ | MFH 2025 | SFH 2025 | LI 2025 | SFH No Dedicated Parking | Condo Medium-PCC | Condo High-PCC | MFH Medium-PCC | MFH High-PCC |
|---|---|---|---|---|---|---|---|---|
| San Francisco | 259,208 | 184,460 | 154,728 | 840 | 28,327 | 631 | 93,893 | 6,618 |
| San José | 231,272 | 572,581 | 306,184 | 340 | 92,881 | 124 | 73,682 | 464 |
| Fresno | 64,595 | 373,222 | 252,250 | 79 | 15,491 | 5 | 22,491 | 104 |
| Oakland | 131,436 | 176,205 | 199,353 | 846 | 16,046 | 104 | 56,567 | 1,792 |

[a] 2025 Zillow Proxy

## 4.2. Vehicle Market

Alongside the customer segmentation, the market-sizing analysis estimates the share of vehicles attributable to these segments, and the geographic distribution of target indicators to guide PG&E's decisions on which technologies to deploy and at what scale. The Vehicle Market Analysis section presents insights into the total market, broken into SFH and MFH, in PG&E's territory. The vehicle market, with the segmented housing categories, draws on the segmentation presented in the housing section to present this market within the context of the segments identified by the research team.

### 4.2.1. Vehicle Market Analysis

The potential total addressable market estimates the latent charging demand among parking-constrained vehicles across PG&E's service territory. This estimate asks three questions:

- How many vehicles belong to MFH residents?
- How many belong to SFH residents without dedicated parking?
- How do these totals vary for LI households?

Together, these insights establish the 2025 baseline size and composition of PG&E's hard-to-serve PCC market and provide a snapshot of how this market is expected to evolve by 2030.

The research team estimates this market by integrating available data at the CBG level, on housing characteristics, including parking and vehicle registration. The analysis classified the distribution of parcels into five primary data inputs:

- Distribution
- Parking characteristics
- Vehicle registrations
- Public charging infrastructure
- Population demographics

The research team aggregated datasets to quantify both the size and geographic distribution of the PCC market, with the capacity to scale down to parcel-level data to select specific sites for internal PG&E planning purposes. This approach produces a scaled market-sizing snapshot for PG&E, including the following figures and an accompanying GIS map that can directly inform the selection and prioritization of the demonstration project.

According to registration data acquired by the research team in 2024, PG&E's territory contains just over 13 million LDVs, representing close to half of the 27.4 million vehicles in California.[18] According to registration, ZEVs represent only 5% of the total LDV population in PG&E's territory, demonstrating the significant growth potential for EVs.

The research team split the vehicle population into the two high-level categories, MFH[19] and SFH,[20] using the share of sampled parcels present in each CBG, assuming vehicle ownership was similar across these categories. The figures below depict the segregation of the LDV vehicle population across the two high-level housing types, SFH and MFH, with individual values reported for the income classifications (All CBGs, CBGs in LI Census Tracts). As with parcel data, Figure 11 shows that SFH are expected to comprise a majority of vehicle ownership at 83%, with MFH accounting for 17%. In Figure 12, the relatively even split between census tracts within SFH ownership is shown, with LI reflecting 45% and non-LI at 55%. The MFH vehicle population is less evenly split in Figure 13, with 36% attributed to LI, and 64% attributed to non-LI.

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18 California Energy Commission. "Light Duty Vehicle Population in California." Accessed 3/11/2026. https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/light

19 MFH, Apartment housing, Condo housing

20 SFH, Townhouse housing

**Figure 11. Share of Vehicles Attributed to SFH vs. MFH**

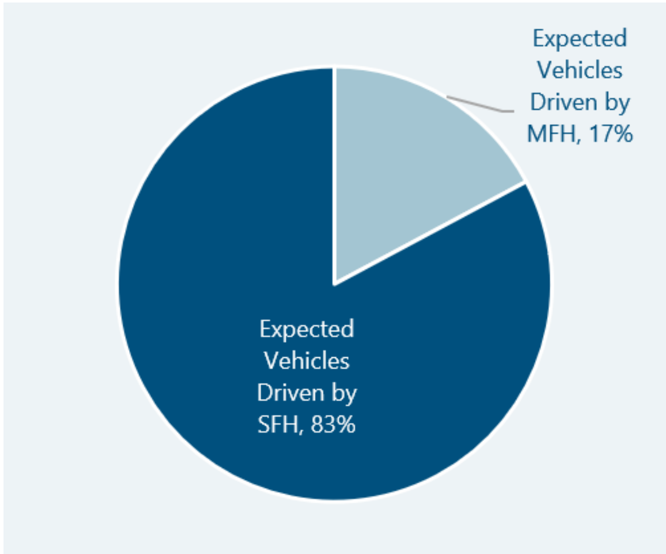



**Figure 12. Share of SFH Vehicles by Income Defined Census Tracts**

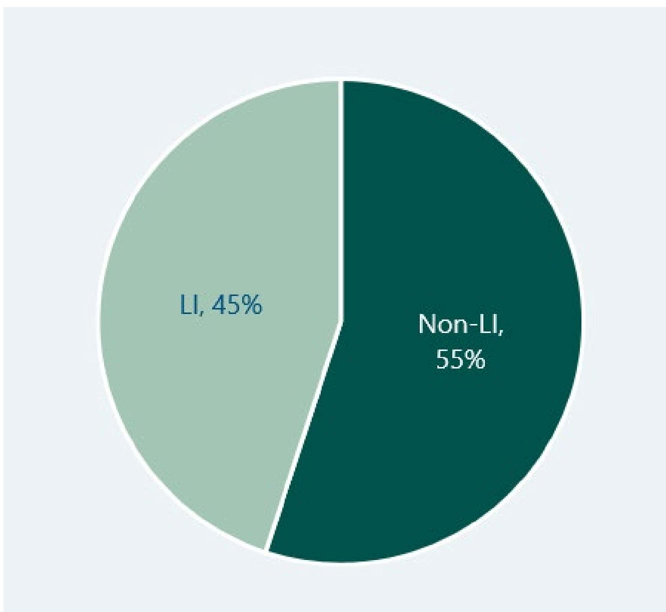
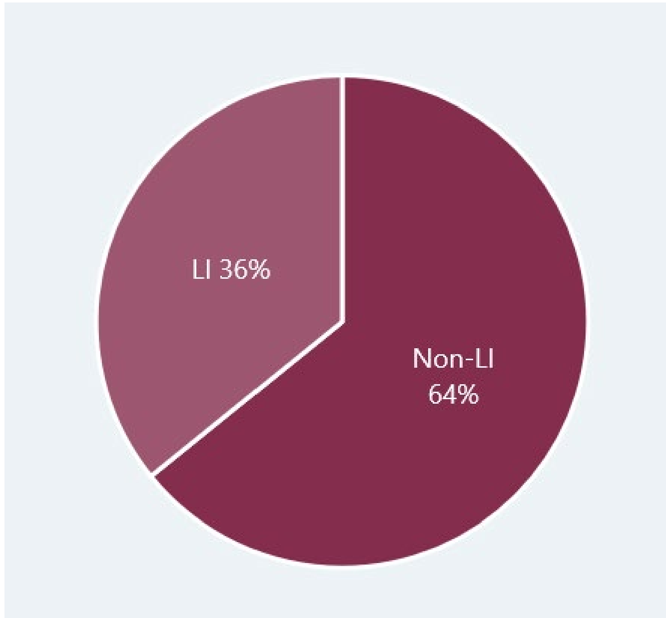
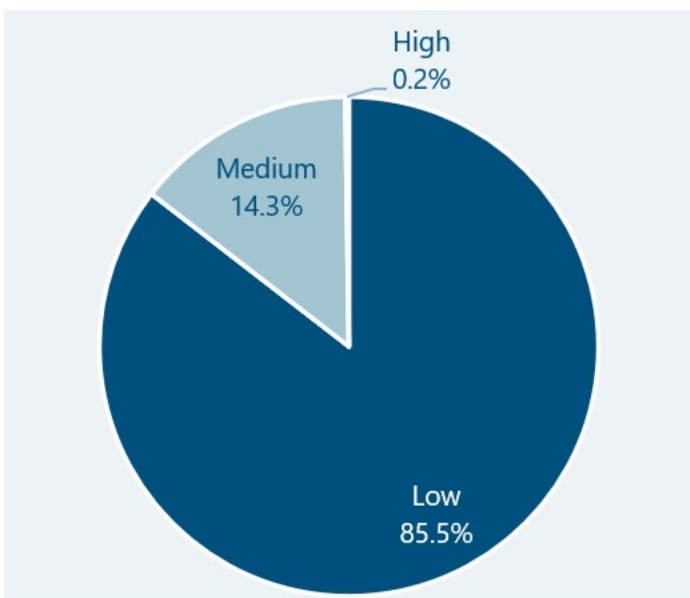


**Figure 13. Share of MFH Vehicles by Income-Defined Census Tracts**




Using the classification of parcels into parking-constrained and not parking-constrained, the research team further segregated the vehicle population into constrained and not constrained. As demonstrated by Figure 14, on the right, 14.3% of registered vehicles are attributed to medium parking constrained parcels, and only 0.2% of registered vehicles are attributed to high parking constrained parcels.

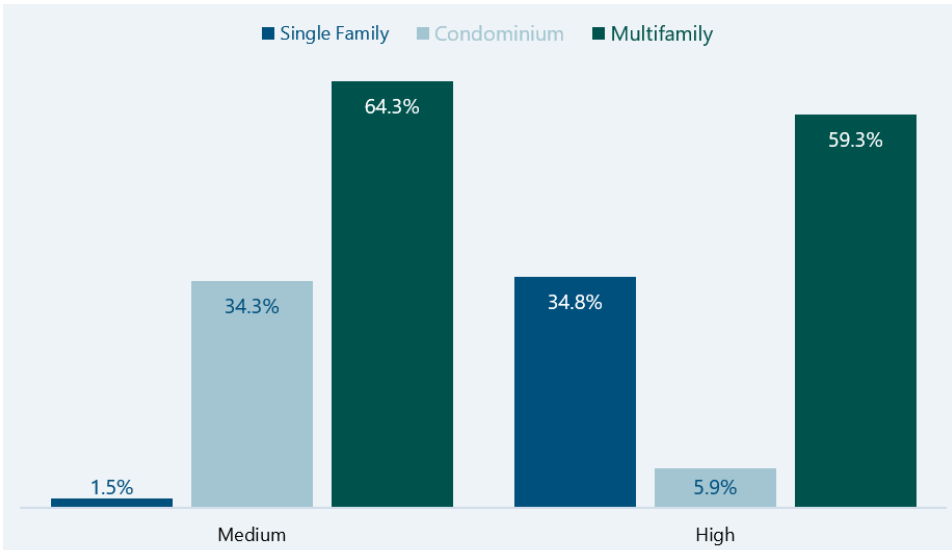
**Figure 14. Registered Vehicles Across Parking Constrained Segments**




## 4.2.2. Vehicle Market Within the Segmented Housing Market

In 2025, after the research team's classification and scoring of parcels from Zillow, the estimated PCC vehicle market is 1,529,541, representing roughly 12% of the classified latent demand. Figure 15 provides the expected distribution of vehicles driven by medium- and high-PCC by housing segment. These values must be interpreted within the overall context that vehicles in the medium-PCC comprise 14.3% and high-PCC comprise 0.2% of the vehicle population, as depicted in Figure 14 in the *Vehicle Market Analysis* section above.

**Figure 15. Distribution of Vehicles by Housing Segment**




This data highlights a key position for medium-PCC households, as they constitute the largest hard-to-serve market, while high-PCC households hold a much smaller market share but face more significant barriers to at-home or near-home EV charging.

## 4.3. Geospatial Distribution of PCC

Geospatial representation of data provides a critical perspective on the spatial relationships between PCC customers across PG&E's territory. As Figure 16 illustrates, PCCs are concentrated in larger cities, with the Bay Area region holding the highest share of both medium- and high-PCCs; the figure shows PG&E territories within a snapshot of the Bay Area.

**Figure 16. PCC Spatial Relationships in PG&E Territory**

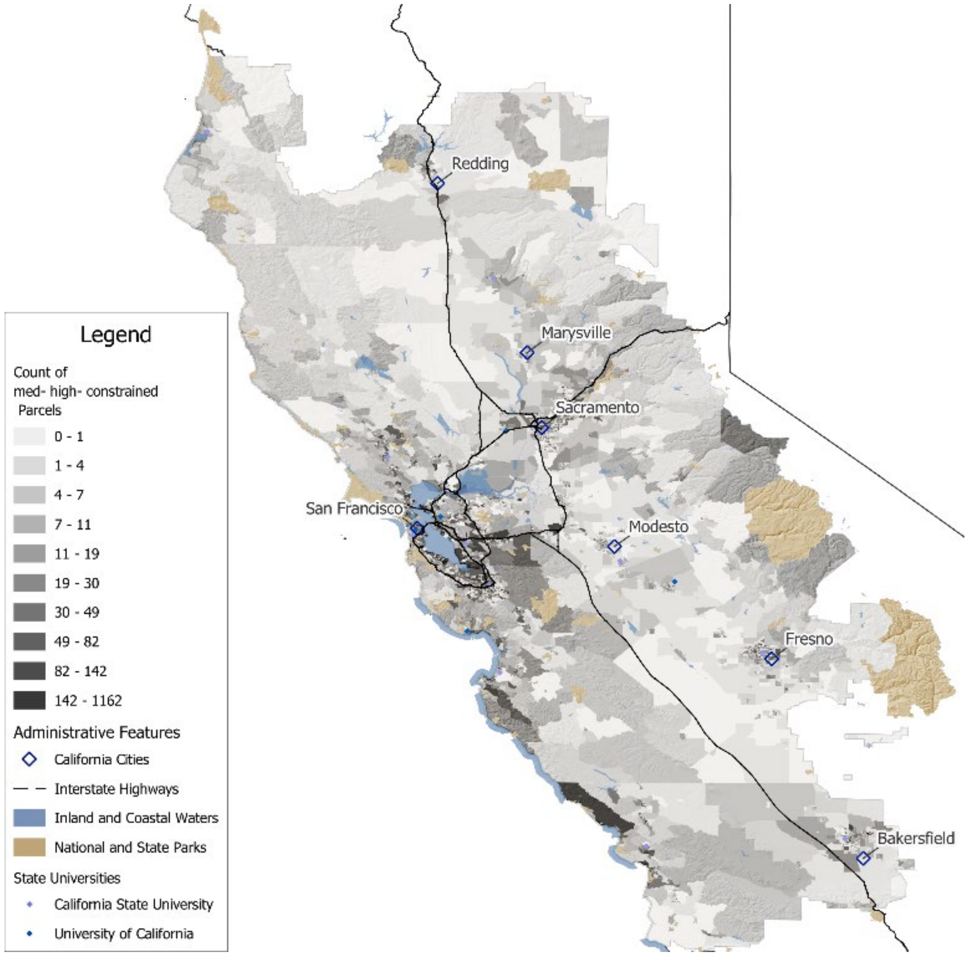
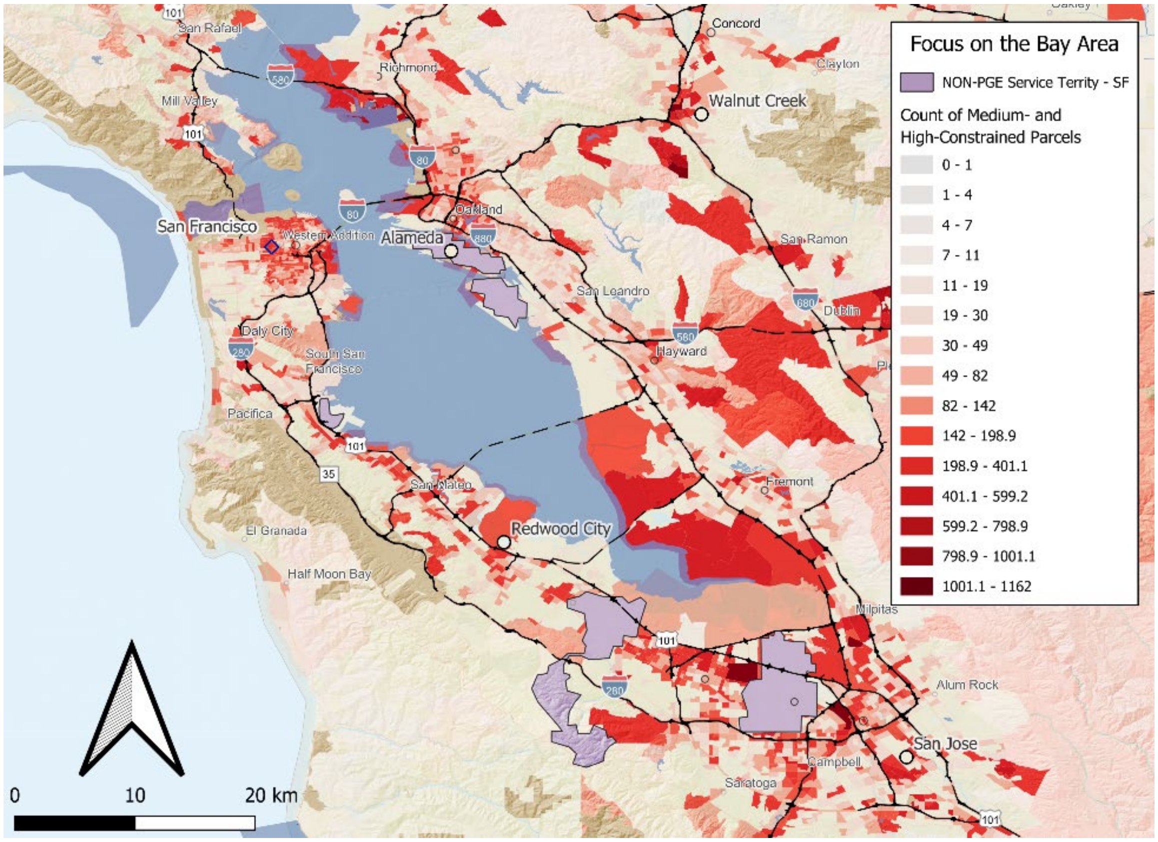


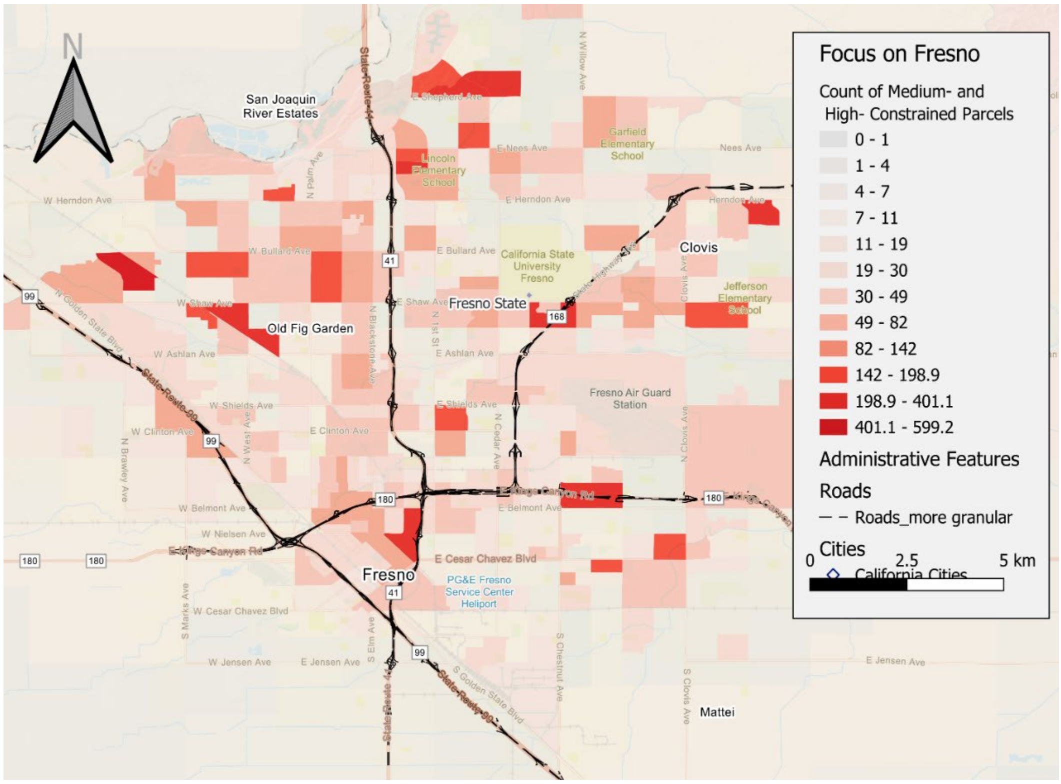

Figure 17 focuses on the medium- and high-PCCs, in absolute terms, in the Bay Area. As the figure illustrates, there is considerable variation among CBGs in total PCC customer numbers, indicating there is a need to target charging access programs to PCC populations.

**Figure 17. PCC Spatial Relationships in the Bay Area**




To provide additional context on less dense cities in the central valley, Figure 18 presents the absolute counts of medium- and high-constrained parcels in Fresno. Compared to the higher-density Bay Area example, there is a lower cap on the total counts of PCCs in CBGs; CBG maximum is 1, with 162 in the Bay Area and 599 in Fresno. Despite differences on scale, Fresno mirrors the Bay Area in that PCCs are dispersed rather than concentrated in a specific area or community, indicating the need for targeted solutions that address diverse community needs.

**Figure 18. PCC Spatial Relationships in Fresno**



# 5. Segmented Customer Pain Points

## 5.1. Primary and Secondary Barriers to EV Charging

Although parking exists for medium-PCC households, the lack of assignment creates uncertainty around charger access and limits residents' ability to install or rely on home charging, even with California's right-to-charge laws.[21] As a result, these customers face partial but persistent barriers to home charging, making them sensitive to shared-charging solutions and property-level interventions.

Without dedicated or shared parking, high-PCC residents have little to no opportunity to install home charging infrastructure. This complete reliance on off-site or public charging fundamentally alters the economics and convenience of EV ownership for these customers, making targeted PCC charging solution offerings critical.

To better understand the barriers experienced by PCCs, the team collected insights from 469 PG&E residential customer surveys and 10 interviews with MFH property decision-makers. The analysis produced the primary and secondary barriers for both residential PCCs and property decision-makers. The primary barriers are defined here as fundamental challenges that directly affect the ability to install, access, and use charging infrastructure. Secondary barriers are compounding factors that further exacerbate the primary barriers but are not the main obstacles themselves.

The research team conducted a complete analysis of survey and interview feedback and identified the following key takeaways:

- **Installation cost, parking proximity to power, and lack of dedicated parking** are the primary barriers affecting PCCs' ability to install, access, and use charging infrastructure.
- **MFH properties require targeted solutions**, including expanded funding for electrical upgrades, streamlined permitting, and proactive technical assistance.
- **Educational resources and multilingual outreach** are critical for supporting equitable EV adoption in DACs.
- **EV-ready building codes and dynamic pricing models** for reducing retrofit costs and improving charger utilization.

### 5.1.1. Customer Barriers Identified by Surveys

The residential customers surveyed were asked to rate multiple barriers to identify which were the top barriers for them. The survey presented top market barriers from existing market research, and respondents independently ranked the severity of each barrier on a sliding scale to assess its importance in installing EV charging at their place of residence for both SFH and MFH. In Table 9, the barriers are listed from top to bottom based on respondents' ranking. Note, results for medium- and high-PCC survey respondents should be interpreted with caution due to small sample sizes (medium-PCC: n=22; high-PCC:

[21] Right to Charge Policies. April 2025. https://pluginamerica.org/policy/right-to-charge-policies/

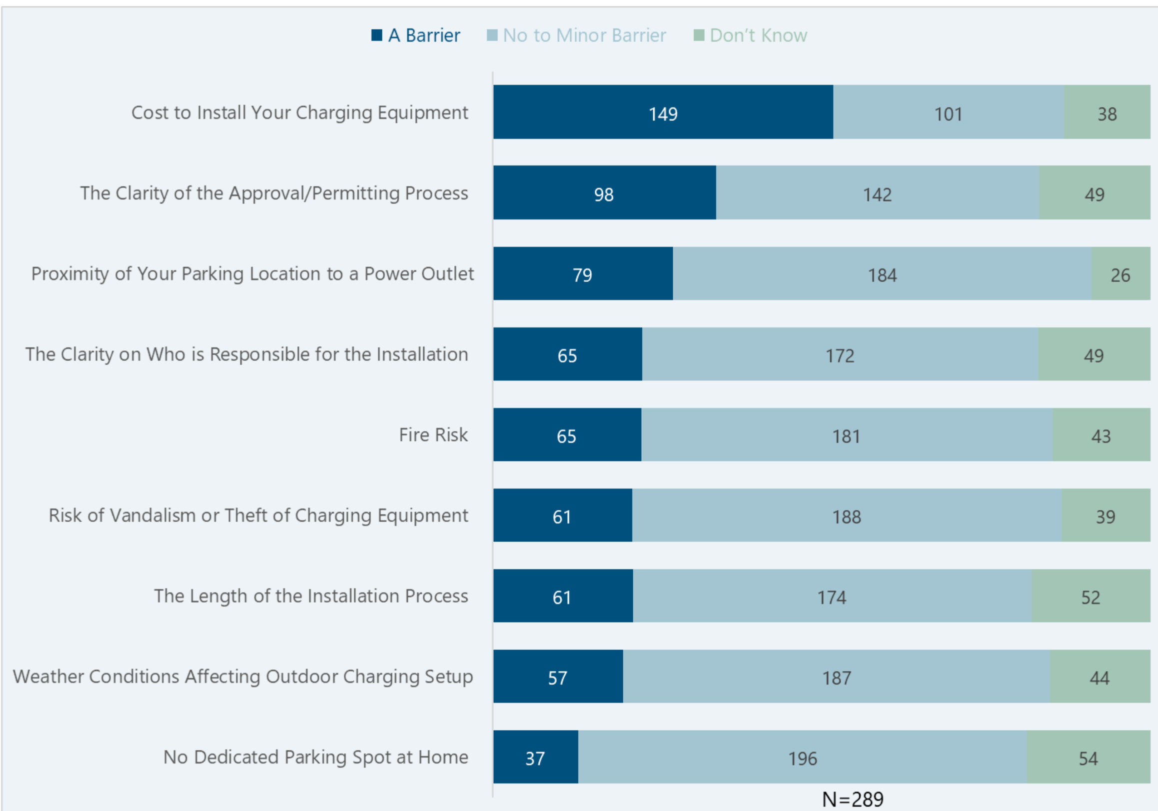
n=52). Findings are presented for directional context only and are not intended to be statistically representative.

**Table 9. Top Barriers Reported by Survey Respondents**

| SFH | MFH |
|---|---|
| Cost to install your charging equipment | Cost to install your charging equipment |
| The clarity of the approval/permitting process | Proximity of parking location to a power outlet |
| Proximity of parking location to a power outlet | The clarity of the approval/permitting process |
| The clarity on who is responsible for the installation | Risk of vandalism or theft of charging equipment |
| Fire Risk | No dedicated parking spot at home |

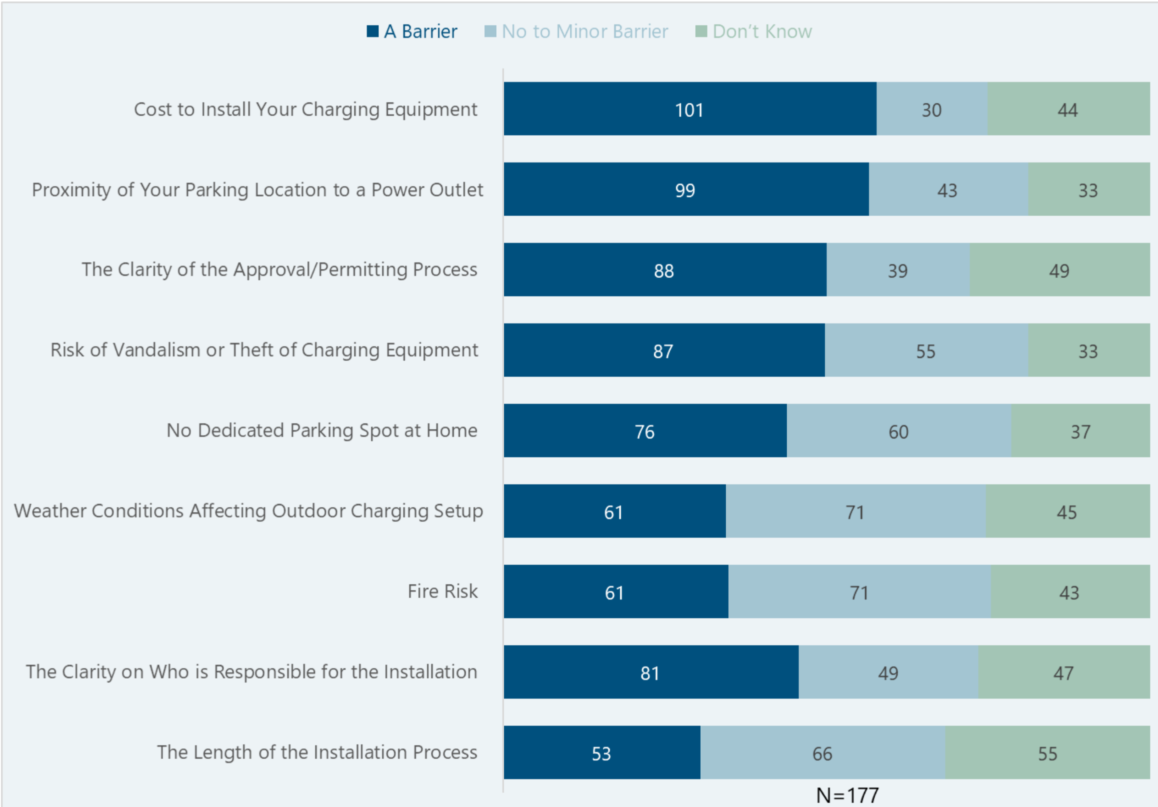
As shown in Figure 19, across all SFH respondents, 52% rated the cost to install charging equipment as a top barrier, 34% rated the clarity of the approval/permitting process as a top barrier and 27% rated the proximity of the parking location to a power outlet.

**Figure 19. Barriers to EV Charging for SFH**




Similarly in Figure 20, the primary barriers for MFH respondents were the cost to install charging equipment (58%), the proximity of the parking location to a power outlet (57%), the clarity on who is responsible for the Installation (50%), and the risk of vandalism or theft of charging equipment (50%).

**Figure 20. Barriers to EV Charging for MFH**




When looking at survey responses by EV ownership across all respondents, the cost to install charging equipment remained the top barrier, followed by clarity of the approval/permitting process and the proximity of the parking location to a power outlet. Among EV owners, the fourth most common barrier is the risk of vandalism or theft of charging equipment, whereas for non-EV owners, it is uncertainty around clarity of who is responsible for the installation.

Among the 22 medium-PCC respondents and 52 high-PCC respondents surveyed, the most frequently cited barriers included the cost to install charging equipment with 11 of 22 medium-PCCs and 29 of 55 high-PCCs and the proximity of the parking location to a power outlet with 10 of 22 medium PCCs and 28 of 55 high PCCs. As shown in Figure 19, medium-PCCs' third-ranked barrier was uncertainty around clarity of who is responsible for the installation, whereas for high-PCCs, it was the lack of a dedicated parking spot at home (Figure 20).

**Figure 21. Barriers to EV Charging for Medium-PCC**

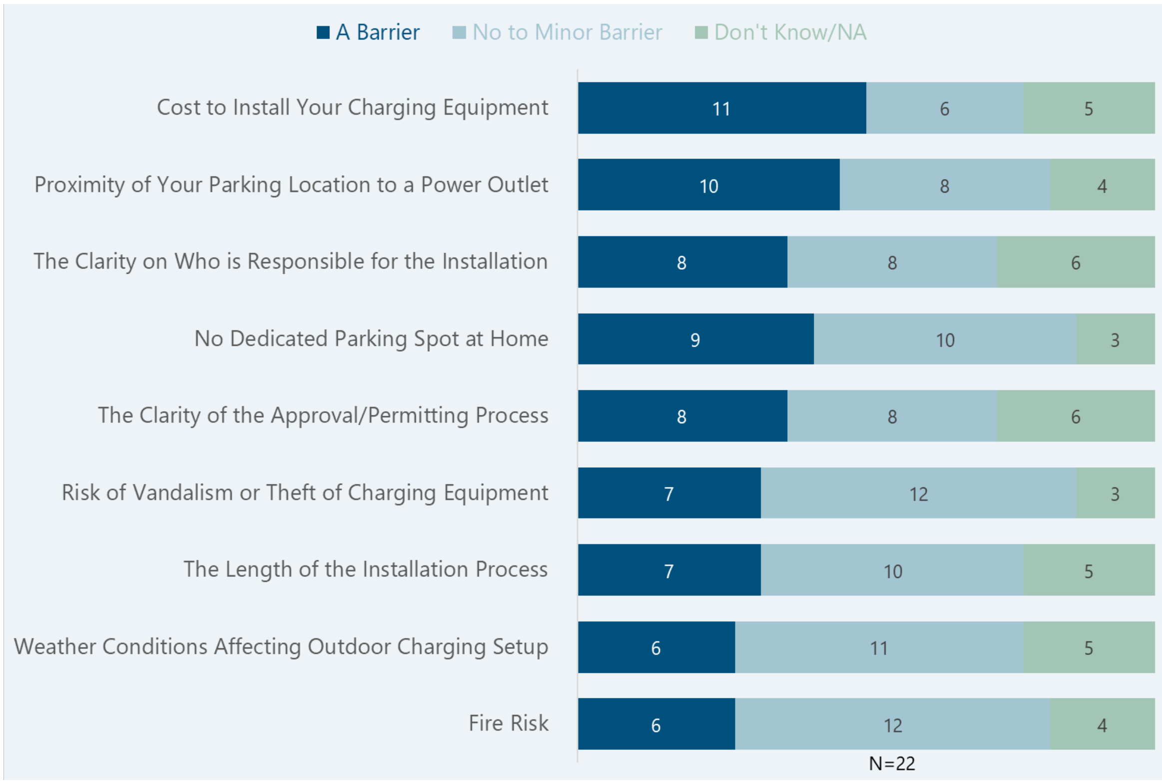
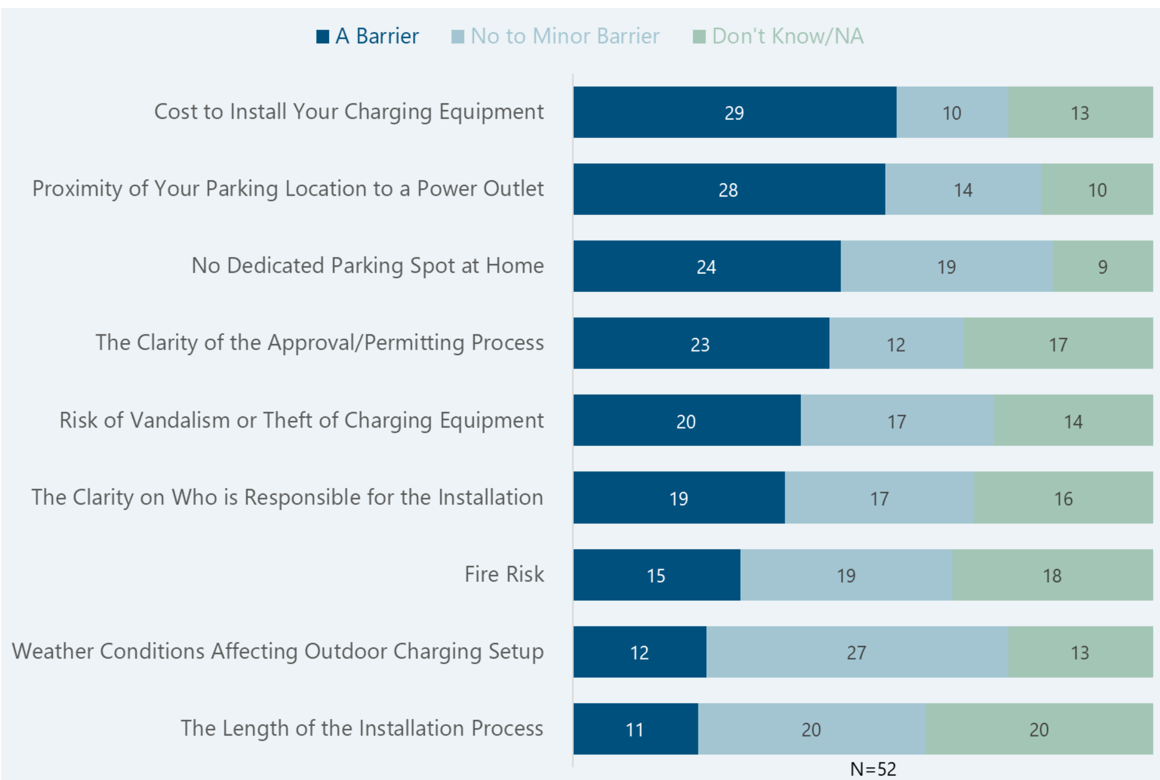



**Figure 22. Barriers to EV Charging for High-PCC**



### 5.1.2. Customer Barriers Identified by Interviews

The in-depth interviews revealed additional insights that reinforced and expanded on the barriers identified from the surveys. Note, interview findings are qualitative and illustrative only, based on a limited number of interviews (n=10), and are intended to contextualize survey findings and provide directional context for PCC pain points. The barriers identified from in-depth interviews with property owners, managers, and developers affiliated with PG&E properties, including both those with existing EV charging and those considering or previously screened out of PG&E programs, are summarized below. These findings are intended to highlight customer-communicated sentiments and provide insights relevant to other interested stakeholders.

- **Insufficient electrical capacity in existing buildings:** Older buildings lack electrical capacity to support EV charging without substantial upgrades.
- **Upfront costs:** High upfront costs for electrical upgrades limit project feasibility with competing budgetary priorities. When incentives are accounted for, interviewees noted that incentives were insufficient to cover costs.
- **Vendor delays:** Switching vendors midway and poor coordination cause project timeline setbacks.
- **Permitting delays:** Some AHJs have slow permitting processes; additionally, processes vary significantly between AHJs creating an inconsistent experience, which proves difficult for property managers operating in multiple-AHJs.
- **Identifying and navigating EV charging resources:** A reported lack of targeted educational resources and the administrative burden to identify EV charging resources available for small or resident-managed properties.
- **High staff turnover in property management:** Disrupts EV project timelines and results in lost institutional knowledge, requiring repeated onboarding and re-education as projects progress.
- **Competing priorities:** Property managers often wear multiple hats, making it difficult to prioritize EV charging amid competing operational, financial, and tenant demands.
- **O&M logistics:** Uncertainty about long-term operations, maintenance, vandalism, cost recovery, and residual EV charging asset valuation.
- **Parking management:** Resident resistance to parking spot changes; small and resident-managed properties face compounded barriers to consensus-building around parking management policy planning and implementation. This is particularly acute for properties with ADA needs.
- **Other resident concerns:** Inconsistent language accessibility in resident communications, unauthorized use of EV charging stalls, and L1 EV charging speed limitations.

Interviewees consistently identified infrastructure limitations as the primary barrier to EV charger deployment, especially in buildings from the 1940s to the 1970s that lack adequate electrical capacity. They described the required upgrades, such as trenching, transformer replacements, and new panels, as cost-prohibitive, often exceeding what incentives cover and undermining project feasibility. Interviewees noted that some utilities have also deemed older panel types ineligible or unsafe for participation. They further explained that additional permitting, inspection, and safety compliance expenses further strain budgets, particularly in jurisdictions that charge per-panel inspection fees or have permitting processes.

To address these challenges, interviewees called for expanded funding, particularly for panel upgrades, along with clearer communication from utilities and state agencies, centralized guidance on incentives and permitting, dedicated technical assistance, and more clearly defined O&M expectations tailored to properties with assigned parking.

## 5.2. Participant Recommendations

The majority of recommendations from the survey and interviews came from SFH survey respondents who reported no or low installation costs, no permitting issues, and availability of nearby outlets.[22] MFH respondents reported generally relying on public or workplace charging as alternatives. Interviewees also provided qualitative insights and suggestions to overcome some barriers, with a focus on improving EV charging installations for the MFH parking-constrained markets. In Table 10, the recommendations shared by survey respondents and interviewees are detailed next to the barrier each recommendation is meant to address.

**Table 10. Participant Recommendations to Address Barriers**

| Participant Source | Barrier Addressed | Survey Participant Recommendations |
|---|---|---|
| **Surveys** | Limited Charging Access | Approximately 70% of respondents expressed the need for more curbside and at-home charging solutions. |
| | | Expanding EV charging infrastructure at workplaces, highway corridors, shopping centers, and gas stations. |
| | Cost of Charger Installation | Hiring low-cost, reliable independent installation services or self-installation (primarily for homeowners) |
| | | Relying on public EV charging stations (primarily for those renting) |
| | | Utilizing standard electrical outlets |
| | | More third-party funding through utility programs, CEC grants, etc., for electrical panel upgrades to improve project viability |
| | Parking Spot Proximity to an Outlet | Utilizing long charging cords to reach accessible power outlets |
| **Interviews** | Limited Resources for Research | Clear value proposition communication for both properties and tenants |
| | | Simplified compliance for HOAs |
| | | Step-by-step guidance to understand cost recovery for EV charging, highlighting indirect benefits like tenant satisfaction and retention. |
| | | Targeted outreach and a central resource platform to help properties stay current on incentive programs, code requirements, and best practices. |

22 The sample size extended to non-PCCs as well, with the majority of recommendations being reported by this customer segment.

| Participant Source | Barrier Addressed | Survey Participant Recommendations |
|---|---|---|
| | | Educational materials to be available in multiple languages for equitable understanding and engagement. |
| | Utility & Vendor Delays | Dedicated utility staff and consistent utility/vendor information for customers |
| | Permitting Delays | Streamlined permitting processes for technical assistance |
| | O&M Logistics | Available ongoing support with clear communication of post-grant responsibilities for operations and maintenance logistics. |

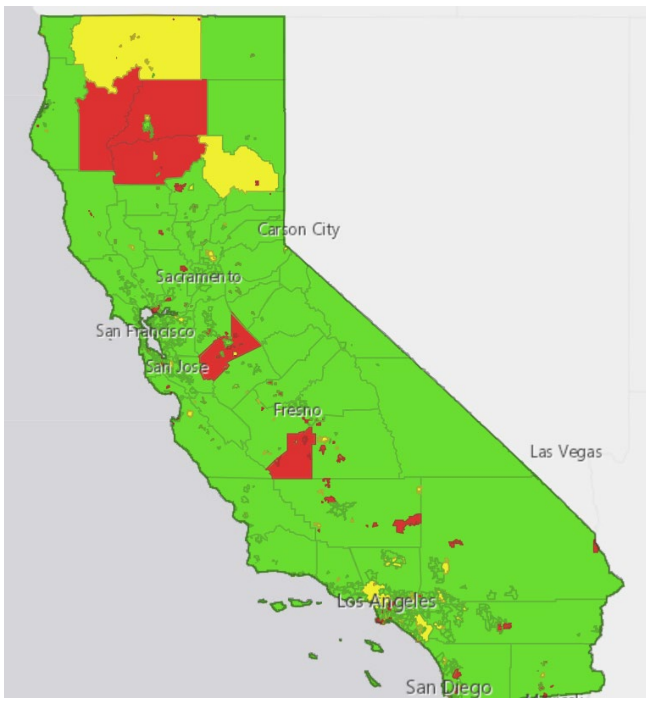
# 6. Insights from Authorities Having Jurisdictions

This section presents insights from interviews with AHJs along with desk research, focusing on how AHJs are currently enabling EV charging for PCCs.

## 6.1. AB 1236 and AB 970 California EVCS Permit Streamlining

California AB 1236 and AB 970 require cities and counties to adopt an expedited, streamlined permitting process with defined timelines for reviewing and approving electric vehicle charging stations (EVCS) to accelerate statewide charger deployment. Figure 21 shows the AB 1236 and AB 970 California EVCS Permit Streamlining Map, which highlights streamlined AHJs in green, in progress of streamlining AHJs in yellow, and non-streamlined AHJs in red. [23]

**Figure 23. CA EVCS Permit Streamlining Map**




According to Go-Biz materials, "AB 1236 and AB 970 apply to all charging station installations, including L1, L2, and DCFC; public and private charging stations; light-, medium-, and heavy-duty electric vehicle charging stations; and stations that are installed as the accessory or primary use of a site." Additionally, to be in compliance[24] with AB 1236 and AB 970, all California cities, including charter cities, and counties must adopt a streamlining ordinance and online checklist, limit EVCS project review only to health and safety requirements, and follow binding EVSE permit approval timelines tied to project size, shown in Figure 22.

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[23] AB 1236 and AB 970 CA Electric Vehicle Charging Station Permit Streamlining Map

[24] Legal Alert OAG-2025-01: Electric Vehicle Charging Station Permit Streamlining Requirements

All of this is tracked through the EVCS Streamlining Map and Scorecard to ensure expedited permitting for all Californian EVCS installations.[25]

**Figure 24. Go-Biz's EVCS AB 970 Scorecard Mandated Timelines by Project Size**

**AB 970 timelines:**

**AHJs are required to meet the EVSE permit review and approval timelines established by AB 970:**

- **Projects with 1-25 stations**—5 business days zx to deem an application complete or incomplete, once application is complete, 20 business days to issue an approval to build.
- **Projects with 26 or more stations**—10 business days to deem an application in/complete, 40 business days to issue an approval to build.

**AB 970 implementation dates:**

- January 1, 2022 for cities/counties above 200,000 residents.
- January 1, 2023 for cities/counties below 200,000 residents.

While the research was initially designed to identify strategies for improving streamlining scores, subsequent findings revealed that streamlining status does not consistently translate into faster permitting timelines, as originally assumed. The AB 1236 and AB 970 scorecard provide the steps to comply with the laws, but it does not standardize the processes that actually determine project timelines across AHJs. Critically, outside of the seven items outlined in the EVSE scorecard, the statutes do not dictate a strict method of streamlining. Instead, each AHJ decides how to implement it within its existing residential and/or commercial permitting structure, which are variable, not standardized, and lack transparency across U.S. and California AHJs. This is where the nuance arises in meeting the AB 970 timelines within the existing fueling station land use definitions and idiosyncratic permitting processes across California.

Furthermore, this is particularly true for emerging PROW EVCS projects, as the statutes apply to all EVCS installations but do not carve out a separate PROW category. The presumption is that if the installation is an EVCS, it is subject to the streamlined permitting requirements. However, AHJs may still have separate encroachment, utility, or public works requirements for PROW work. In essence, the PROW is not explicitly stated in AB 1236 or AB 970. The exact legislative language in AB 970 states that, "Existing law requires a city, county, or city and county to administratively approve an application to install an electric vehicle charging station through the issuance of a building permit or similar nondiscretionary permit subject to a limited review by the building official of that city, county, or city and county."

Additionally, although AB 1236 and AB 970 require jurisdictions to streamline permitting for all EVCS installations (i.e., residential, commercial, and public), some AHJs may initially focus on streamlining permits for SFH residential detached L2 chargers, as these projects are the most common, lowest-risk, and

25 Permitting-Electric-Vehicle-Charging-Stations-Scorecard_Updated_8-12-2022.pdf

easiest to standardize. As some AHJs use separate residential and commercial building or electrical permitting portals and processes, they often launch streamlined EVCS processes first in the residential system, creating a misconception that streamlining applies only to SFH detached installations.

## 6.2. Findings from AHJ Research

Throughout the in-depth interviews with AHJs in PG&E's service territory, the research team identified several findings that could be grouped into themes relatively consistent across AHJs. These findings are presented below by theme to highlight common challenges, structural conditions, and process-related factors influencing permitting outcomes. Note, interview findings are qualitative and illustrative only, based on a limited number of interviews (n=10), and are intended to contextualize survey findings and provide directional context for AHJ initiatives, pain points, and processes for serving PCCs in their communities.

### 6.2.1. Outdated Built Environment Lacking Suitability for EV-Readiness

California's older MFH and civic building stock presents significant, systemwide barriers to retrofitting sites for EV charging, as most properties were constructed decades before modern EV-ready standards and therefore lack adequate BTM electrical capacity, compliant EV-capable infrastructure, and site layouts conducive to cost-effective installation. Across numerous AHJs, insufficient panel and transformer capacity routinely forces projects to undertake substantial electrical upgrades before permitting can even meaningfully begin, while the forthcoming 2025 CALGreen standards introduce additional compliance challenges that aging buildings, already out of alignment with current EV-capable space requirements, will struggle to meet. These technical and regulatory hurdles are further compounded by the physical characteristics of many MFH sites, where surface lots, carports, and dispersed garden-style layouts increase trenching distances, conduit needs, and overall construction costs, often requiring complex redesigns to navigate site constraints, such as tree preservation and distant electrical rooms.

#### *Existing Building Stock Lacks the Electrical Capacity Needed for EV charging*

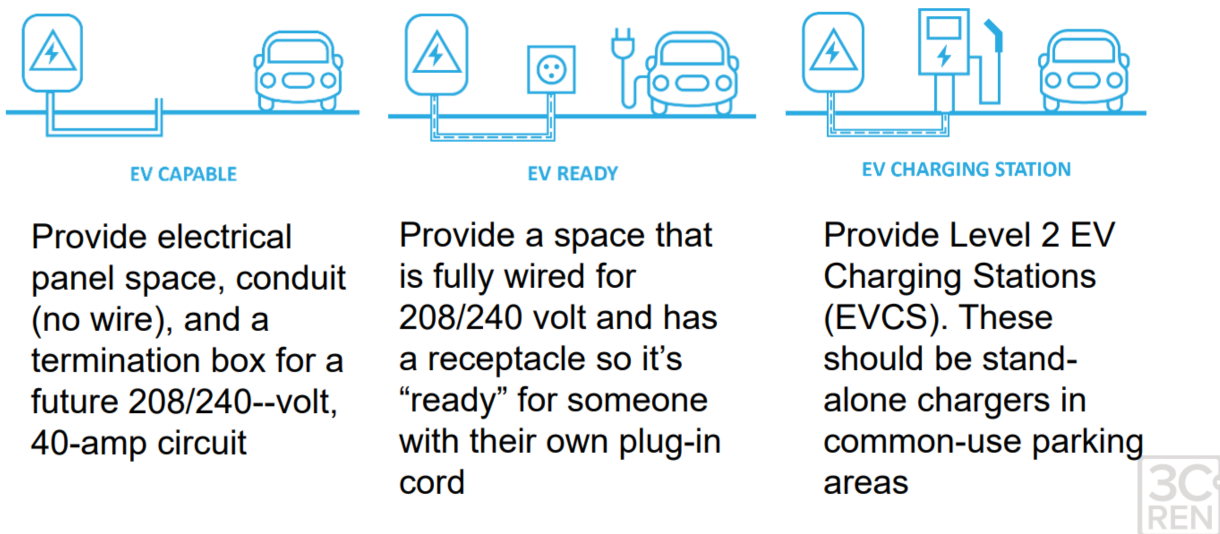
Across AHJs, existing MFH properties and legacy civic sites typically lack spare main-panel capacity or transformer capacity (i.e., BTM electrical capacity), creating a first-order barrier and increasing upfront costs for EV charging projects. Even in AHJs with fast, ministerial permitting, projects stall because sites must first be made EV-capable (i.e., BTM panel upgrades, dedicated EV circuits, and metering) before they can become EV-ready or EV-installed.

For example, one interviewee shared that properties in one town, often constructed in the 1960s and 70s, require panels, meter, or electric service upgrades (TTM constraints explored in the next theme that add cost and complexity). Planners in the town anticipate service and meter upgrades to support EV charging, noting that even 100-amp to 200-amp residential panel upgrades can face long timelines. Another interviewee noted their city faces the same issue with older MFH sites routinely requiring on site electrical upgrades, which place a burden on site hosts when attempting to add EV charging to their properties. One interviewee explained that while their city's permitting process is efficient, transformer capacity and legacy main panels remain a recurring technical hurdle in EV projects.

### *Existing Building Stock Not Up to Electrical Code*

Much of the existing building stock within California AHJs lacks the capacity on legacy main panels to support L2 EV charging and may also be noncompliant with the state code.[26] The 2025 CALGreen Building Standards Code expands[27] EV-readiness requirements[28] for all new construction and many major alterations. Buildings submitted on or after January 1, 2026, must comply with the new 2025 EV charging requirements. The requirements apply to SFH, MFH, hotels/motels, and non-residential buildings, including new work for alterations over $200,000, additions over 1,000 square feet, or parking lot alterations or additions. Figure 23 shows the difference between the capabilities for code compliance and EV charging.

**Figure 25. EV Charging – Code Requirements Definitions**




According to CALGreen, an EV-capable space is "a vehicle space with electrical panel space and load capacity to support a branch circuit and necessary raceways (sized to allow the installation of a dedicated 208V/240V 40-amp branch circuit), both underground and/or surface mounted, to support EV charging."

As CALGreen is a building code, noncompliance has standard code-enforcement consequences, including the risk of building permit application rejections, correction notices, and redesign requirements, which add cost and delays, and construction stop-work orders if installed infrastructure does not match approved plans.

Many AHJs mentioned that their building stock is not in compliance with the code. A smaller northern California AHJ notes that building approvals from earlier decades do not reflect today's parking and electrification codes, and when projects are finally built years later, they must "meet the new code,"

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26 2025 California Green Building Standards Code, Title 24, Part 11

27 Sacramento Clean Cities Guide for 2025 CALGreen EV Charging Updates

28 3C's CALGreen Code with 2025 Update Presentation Slide Deck

meaning updated CALGreen EV-readiness requirements often trigger redesign and loss of parking spaces. Additionally, a smaller jurisdiction explained that many major alterations involve scraping and rebuilding because existing nonresidential parcels often cannot be retrofitted to meet today's code efficiently, suggesting older structures fall short of 2025 CALGreen standards even before considering EVSE integration.

### *Expensive to add EV charging to buildings not designed for it*

Compounding the issues are BTM upgrades and code compliance, as seen in the smaller jurisdiction example above, which, under major alterations, often require significant trenching, conduit extensions, and new power distribution, substantially increasing cost and complexity, especially as these electrical rooms are often located far from parking areas. These factors translate into higher construction costs, increased site disturbances, and greater coordination with planning and public works.

In a smaller northern California AHJ, these site layout challenges are amplified by environmental considerations such as tree-preservation requirements, which frequently require applicants to redesign trench routes to avoid damaging street and parking lot trees. During plan review, the planning department routinely requests tree locations and verification that trenching and pedestal placement will not impact protected vegetation, adding iterations and modest delays.

### *Load-Sharing Devices as Interim Solutions*

One AHJ reports that an older MFH building in the community "all have 100-amp panels," creating challenges for retrofit EVSE; the city has approved load-sharing devices as an interim workaround until the building undertakes a broader electrical upgrade.

## 6.2.2. Grid Constraints and Utility Processes

Across California jurisdictions, upstream utility-side electrical capacity has emerged as the defining factor in EV charging feasibility, often constraining projects long before local planning or permitting even begins and driving the need for programs such as PG&E's EV Power Ready. Many neighborhoods, particularly older MFH areas and rural communities, lack the grid capacity necessary to accommodate new EV loads without substantial TTM upgrades, leaving entire pockets of jurisdictions effectively "not EV-capable" until the distribution system is reinforced. As a result, AHJs consistently report that feasibility hinges first on utility capacity, with interconnection and energization delays posing the greatest timeline risks despite streamlined municipal permitting. While tools like PG&E's hosting capacity (GRIP) maps help identify broad grid constraints, they cannot replace site-specific feasibility studies, and many AHJs, especially smaller, less-resourced ones, struggle to navigate these processes without stronger utility advisory support. These constraints are further magnified in PROW charging, where unclear rules and the absence of standardized processes for innovations like pole-mounted EVSE introduce additional uncertainty and delay.

### *Upstream electrical capacity constraints determine site viability*

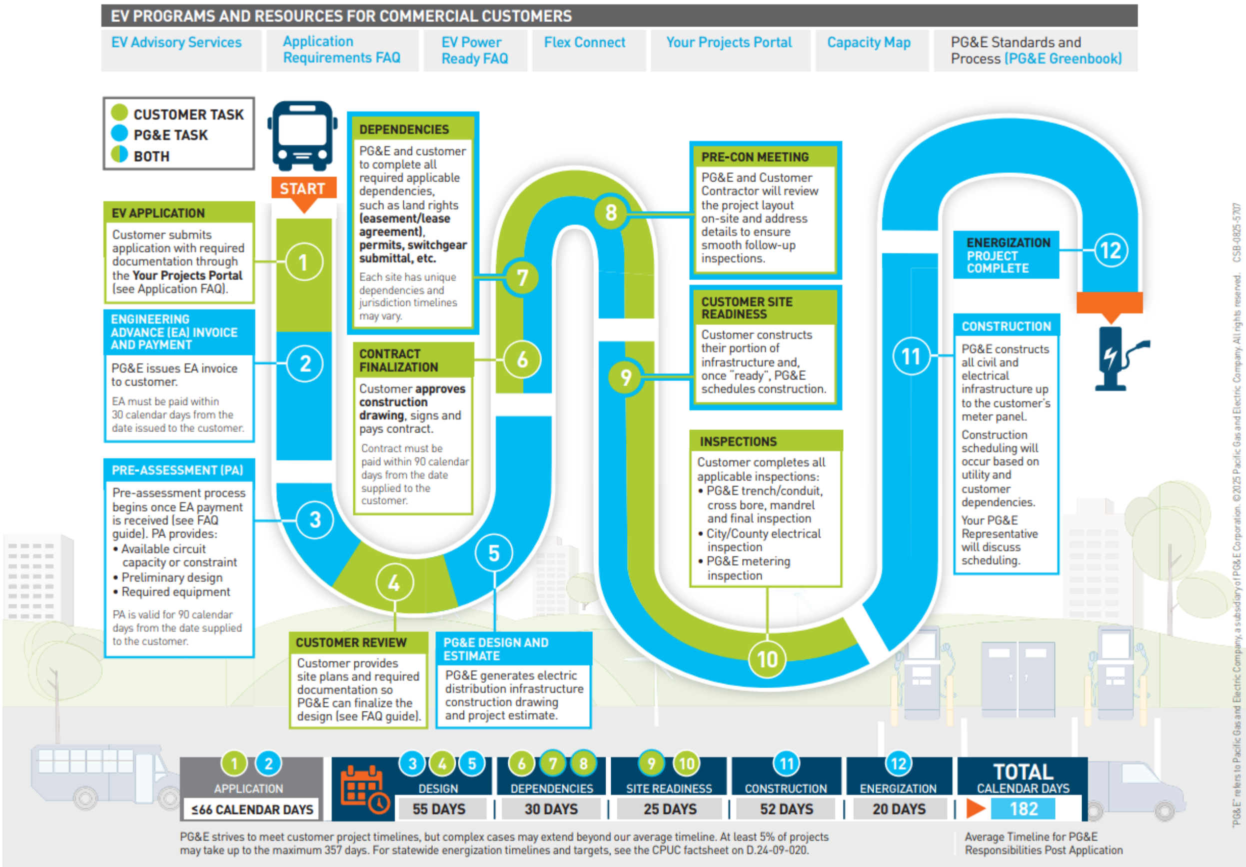
Across all AHJs interviewed, utility-side (i.e., TTM) electrical capacity is a primary determinant of EV charging feasibility, typically preceding feasibility assessments based on planning or building review. AHJs emphasized that many neighborhoods, especially older MFH residential zones and rural communities, lack sufficient grid capacity to support new EV loads without dedicated TTM utility upgrades. Before permit review begins, AHJs find that site viability hinges on the existing distribution system's ability to support EV load. Many areas within the AHJs interviewed are not even-EV-capable and facilitate TTM grid-capacity upgrades, especially in existing MFH residential areas and rural areas in the jurisdiction. Fresno COG highlighted the most acute upstream capacity issues. Rural Fresno communities noted that certain grid pockets cannot accept additional load without risk of "blocking out" neighboring areas. In one example, a new load at a transit facility risked "blocking out" an adjacent city and surrounding unincorporated areas until PG&E approved upstream grid capacity upgrades. A mixed urban/rural county in northern California reported that coastal and mountainous areas frequently lack sufficient grid capacity, instantly eliminating potential charging locations even when permitting pathways are straightforward. As grid constraints shape both siting and scheduling, AHJs are forced to treat utility capacity as the deciding factor long before planning review.

### *Utility Interconnection and Energization Delays Are the Primary Timeline Risk*

Decisively, even where AHJ permits are streamlined and ministerial, energization and upstream electrical work remain the number one source of delay for EV charging deployments in PG&E's territory. AHJ interviewees consistently framed efforts to bring areas of their jurisdiction up to an electrical capacity that could facilitate EV charging, notably in existing MFH buildings and rural public charging sites. AHJs cited fulfilling new-service applications, especially through PG&E's electric Rule 29,[29] as the critical path for both public charging projects, including PROW if explored, and MFH projects. Figure 24 shows PG&E's newly published EV Power Ready Customer Roadmap detailing the responsibilities and expected timelines for energization throughout the entire process

29 ELEC_RULES_29.pdf

**Figure 26. PG&E's EV Power Ready Customer Roadmap Process Flow**




Interviewees confirmed the current real-world EV Power Ready utility timelines match the impetus pain points behind the inception of the SB 410 "Powering Up Californians Act"[30] and have at times been lengthy enough to cause significant friction at the project level. Specifically mapping back to the customer journey in Figure 24, AHJs described several stages of the PG&E EV Power Ready process as recurring friction points, with most comments clustering around feasibility review, utility engineering, site readiness, TTM construction, and final energization.

For instance, in a Curbside EV Charging Pilot Program local to the Bay Area, curbside installations requiring new utility service or interacting with existing PROW streetlight service have led to major bottlenecks due to coordination with PG&E's EV Power Ready and Greenbook rules and the local Utilities Commission approval. Vendors are still awaiting energization of their proposed pilot sites due to long utility feasibility reviews and delayed approvals, while a different vendor has already reaped the reward of tapping into existing PG&E service. To note, PG&E is addressing these issues in Phase 2 of EPIC 4.03. In addition, FCOG noted that achieving their ZEV targets will require realistic utility energization timelines and technical assistance for smaller jurisdictions in the county. Central valley jurisdictions cited utility feasibility studies and new service applications as delaying projects long after AHJ permits are complete.

30 SB 410: Powering Up Californians Act. | Digital Democracy

Drilling down, Fresno Council of Governments (Fresno COG) noted that underestimated timelines create major issues for their cities because they submit those schedules to Caltrans and other agencies for grant compliance. When PG&E delays energization, jurisdictions must revise budgets and timelines, adding administrative burden and risking project delays. Ultimately, they recommended that PG&E set realistic utility timelines and communicate clearly. AHJs in their county report project schedules slip when energization takes longer than initially promised, creating grant and budget headaches; Fresno COG's request is for PG&E to set longer, more realistic schedules and maintain clear communications so partners can plan accordingly.

### *Utility Online Hosting Capacity Maps Highlight Upstream Grid Constraints in AHJs*

The utility's hosting capacity map can help AHJs identify areas of upstream grid constraint, but it cannot replace the need for a detailed, site-specific feasibility assessment. Throughout the interviews, AHJs strongly suggested continued utility partnerships and utility hosting capacity maps, such as PG&E's GRIP map, which is useful for identifying upstream grid-constrained areas in their jurisdictions. Although not universally used, jurisdictions that have worked with PG&E's GRIP map and/or other utility layers (e.g., CCAs' internal maps) noted that these tools are valuable for identifying broad, feeder-level constraints but do not eliminate the need for load studies. However, the PG&E GRIP map provides information only at the feeder level and not at the site level, which is required for interconnection planning.

Additionally, AHJs highlighted that the usability of resources like the GRIP map is impacted by the lack of real-time syncing between GRIP map data and AHJ planning resources (e.g., DOT GIS maps and CCA grid maps). For instance, the City of San José actively uses map layers to understand distribution-level capacity, but reported several issues: the available utility and SJCE maps are not up to date, they lack data granularity, and they are not synchronized with the city's DOT GIS systems. They emphasized that GRIP is useful for neighborhood-level screening but insufficient for project-level decisions.

### *Lack of awareness of utility advisory services*

PG&E offers utility-led transportation electrification advisory services (TEAS) to support AHJs with early project scoping, technical guidance, and coordination on EV-related upgrades. When discussing the importance of TEAS, several AHJs highlighted the importance of these services and suggested recommendations to improve them; however, interviews indicated that awareness and utilization of PG&E's services vary significantly across jurisdictions.

Several AHJs reported that they were unaware of PG&E's advisory services prior to the interviews, especially for jurisdictions that are slower to initiate EV charging initiatives. While larger AHJs have dedicated transportation electrification staff and established coordination channels, smaller or less-resourced AHJs said they struggle to access technical guidance, early utility engagement, and clear points of contact for EV-related upgrades. Suggesting that for these AHJs increased outreach and visibility of PG&E's advisory services could materially reduce early-stage planning friction.

For example, one AHJ does not administer formal programs or partnerships for EV charging, leaving local staff and property owners to navigate complex utility processes on their own. This often results in delays linked to uncertain utility upgrade requirements, limited awareness of available rebates, and inconsistent communication with PG&E. Similar concerns were echoed by a small planning staff that sees EV projects only when they trigger site-design changes, and in another smaller AHJ, where EV charging often collides with legacy infrastructure, ADA constraints, and complex coordination with Caltrans and utilities during downtown upgrades.

Other AHJs reported that they do use PG&E's advisory services and value the support provided, particularly for navigating grid constraints and utility processes. At the same time, AHJs consistently stressed that programs like PG&E's TEAS or similar utility-supported technical assistance (TA) models would significantly improve collaboration, communication channels, and proactive outreach for projects in their jurisdictions. Some AHJs suggested that utilities could provide technical advisory services, standardized load-calculation tools, and early coordination for electrical upgrades to reduce delays and costs for property owners. These TEAS can help distribute information about available funding and technical assistance to MFH property owners and affordable housing developers. PG&E now has CPUC approval to expand its TEAS program, now known as EV advisory services (EVAS), which will extend eligibility to both MFH and commercial PG&E customers[31].

### *Lack of defined processes for EV charging infrastructure in the PROW*

AHJs consistently reported that PROW EV charging faces unique and unresolved challenges because utilities and AHJ departments lack standardized processes, approval pathways, and technical rules, particularly for innovative curbside technologies. This is particularly acute for technologies like pole-mounted charging. For instance, in a Bay Area city, pole-mounted charging has no established approval process with the local Utilities Commission and faces issues with PG&E's Greenbook. Without a formal approval process, this necessitates custom feasibility reviews that extend timelines and create uncertainty for both vendors and city's staff. These technical challenges complicate siting, design, and long-term scaling of curbside installations. The City of Oakland and the City of San José similarly described the need for case-by-case explorations with utilities and internal departments whenever a pole-based or streetlight EVSE concept is proposed, due to unclear ownership models (i.e., utility-owned vs. AHJ-owned poles), safety requirements, transformer loading, and conduit routing constraints.

## 6.2.3. AHJ Internal Staffing and Process Challenges

The AHJs interviewed, especially smaller and rural jurisdictions, face chronic staffing and budget constraints that limit their ability to plan, permit, operate, and maintain EV charging infrastructure, forcing them to rely on external funding, consultants, or regional technical assistance programs to move projects forward. These capacity limitations result in inconsistent permitting processes, even among jurisdictions technically compliant with AB 1236 and AB 970, leading to widely variable timelines, repeated resubmittals, and higher soft costs for applicants. Differences in internal structures, such as whether technical review is handled in-house or by county partners, further shape permitting outcomes, while PROW deployments add additional complexity due to the heavy inter-agency coordination required and the lack of standardized processes, particularly for technologies like pole-mounted charging. Larger jurisdictions like also struggle with resource bottlenecks that limit the scale of public charging programs, while smaller AHJs lack the capacity to develop PROW processes at all, amplifying dependence on utilities, CCAs, and external agencies. Across all interviews, AHJs emphasized that predictable processes, regional

[31] CPUC D.25-12-005

staffing support, and proactive utility advisory services (e.g., TEAS-like models) are critical to overcoming systemic resource gaps and enabling more consistent EV infrastructure deployment statewide.

### *AHJs Are Resources-Constrained Both in Staffing and Budget*

AHJs consistently reported limited staffing and insufficient budgets, especially in smaller or rural jurisdictions. Many have no staff with EV technical expertise, making EV program management, permitting, and O&M difficult. As heard across the interviews, each AHJ operates with different internal resources, shaping how they plan, permit, and maintain EV infrastructure. With a small staff and limited bandwidth to manage EV programs, permitting, and long-term operations and maintenance of EV charging infrastructure proves to be a challenge and a liability for staff. In smaller towns, planning departments with minimal to no EV technical training lack the resources and ability to service public EV chargers. For instance, one smaller AHJ mentioned that the planning department is small, which creates a burden on staff. Various staff members are not scoped to deal with chargers aside from turning breakers on and off (i.e., no training for staff on charger maintenance beyond this workaround), which creates a big liability for the town, as they do not have the resources, budget, and ability to service any customer issues with the chargers. As a result, there is a significant need across Californian AHJs for regional capacity building (i.e., staffing assistance), especially for smaller jurisdictions. Without dedicated staff, some AHJs lean on third-party consultants and suggest that creating a shared technical assistance pool or regional EV coordinator could move projects forward faster across multiple AHJs.

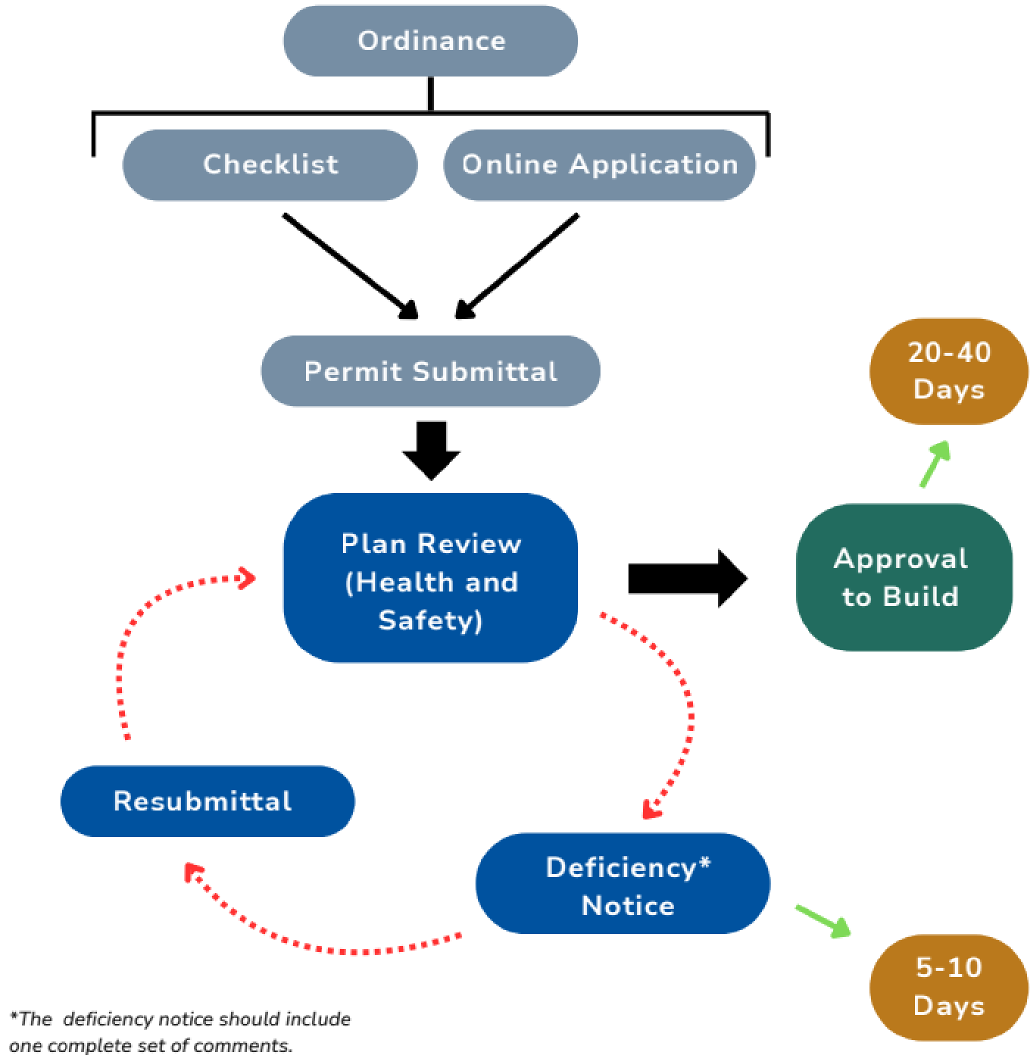
Fresno COG is a prominent example of under-resourcing, which emphasizes the need for more federal and state funding targeted to DACs in the San Joaquin Valley. Additional federal resources for the San Joaquin Valley, and continued state support, would enable more PCC-oriented projects, especially in rural DACs prioritized by Fresno COG and its member agencies. The MFH and SFH stock across the central valley is largely older and varies widely across jurisdictions; many smaller cities lack staff capacity to bring buildings up to modern energy-code compliance, let alone EV readiness. This creates a systemic gap where CALGreen EV requirements cannot be met until foundational code issues are addressed. Multiple jurisdictions rely on consultants and lack dedicated staff to implement compliance or upgrades, which slows or prevents adoption of new Title 24 Part 11 requirements. To resolve this, the COG suggested that TEAS provide structured, proactive technical assistance throughout the year, not just when a grant hits. Because many jurisdictions lack staff to even apply for grants, proactive advisory services (e.g., preapplication scoping, standard design packages, permit pathway guidance) would be more effective than *ad hoc* assistance after funding is awarded.

This burden is shared even in larger AHJs. For instance, a Bay Area city faces substantial staffing limitations, which directly constrain its ability to deploy city-owned and city-managed public charging. This city noted that the volume of staff time required for site reviews, feasibility assessments, interagency coordination, and vendor management forced them to limit the curbside pilot to one site per vendor at the time of the interview, despite higher initial interest. This staffing bottleneck slows project development and prevents them from evaluating more potential public charging locations. This city’s most persistent challenge in scaling curbside charging is insufficient staff capacity to manage the labor-intensive site selection, interagency coordination, permitting, utility engagement, and vendor oversight required for PROW installations. Altogether, staff noted that persistent staffing limitations remain one of the biggest barriers to scaling city-owned and city-managed EV charging infrastructure across the city.

### *Non-standardized AHJ Permitting Processes*

Even where AHJs comply with AB 1236 and AB 970, as shown in Figure 25, permitting timelines for EV charging projects vary significantly across jurisdictions due to differences in internal staffing, overlapping interdepartmental processes, local plan-review practices, and local workforce or consulting for inspections. The lack of standardization across AHJs results in multi-week to multi-month differences in timelines (i.e., 48-hour turnaround time in the City of Oakland vs. up to a year in the City of San José), uncertainty for vendors and private EV charging providers, higher soft costs for project sponsors, including utilities and AHJs, and ultimately difficulty planning EV charging at scale across multiple jurisdictions. The most frequent cause of delays heard from the interviewees is incomplete or improperly prepared permitting submittals, leading to resubmittals, additional plan-review cycles, and overall slower approvals, even in streamlined AHJs. Missing items often include ADA documentation, special inspection forms, trenching diagrams, or electrical load calculations. Private EV charging providers working with different AHJs have stated that non-standardized forms, workflows, and expectations lead to vastly different outcomes for otherwise similar EV charging projects across California.

**Figure 27. Go-Biz's AB 1236 and AB 970 EVCS Permit Process and Timeline Flow-Diagram**




## Differences in Building Divisions and Planning Department Permitting Processes

Despite limited resources, AHJs aim to keep EV charger permitting straightforward, especially for MFH projects, though processes vary widely. In one smaller northern California AHJ, permitting is fast and consolidated, and plan checks often take two days because the city bundles solar, storage, and EV reviews into a single workflow. In contrast, one smaller AHJ outsources all technical permitting to its county, handling only zoning clearances for site-design changes. Another smaller AHJ also has a simple, non-streamlined process: EV retrofits at MFH properties proceed through basic building permits with no additional entitlements, often “over the counter” when applicants provide complete plan sets that meet code, ADA, and tree-preservation requirements. Delays occur primarily when submittals are incomplete.

Both AHJs mirror each other’s permitting process simplicity but one relies entirely on the county for building, electrical, and encroachment permits, using the county’s EV permitting checklist and submittal system. A smaller northern California jurisdiction, also non-streamlined, reports consistently smooth EV permitting, with delays tied mainly to utility processes rather than city review; plan approval typically takes a week, and inspections one to two weeks. In one northern California county, MFH projects go through a merged land-use and permitting agency as the central permitting hub, with developers submitting plans for code compliance and inspections. county-led EV projects may involve additional internal steps, capital approvals, RFPs, and funding, which add complexity but keep the technical review centralized.

### Differences in PROW Public Works Department Permitting Processes

In contrast to the Building Divisions and Planning Department permitting processes, many AHJs are resigned to *ad hoc* reviews for PROW EV charging projects. Some AHJs do not even have a formalized permitting process for siting EV charging in the PROW. For instance, in a northern California county, for SFH limited to street parking, there is currently no distinct process beyond standard permitting, but future recommendations may include PROW solutions and partnerships with utilities and transit agencies. In some AHJs without a formal PROW EV siting process, they have resorted to workarounds with vendors, including handling permitting through a land lease. One smaller AHJ approved a lease agreement with their CCA for EV chargers located in designated city-owned street parking spaces, functionally similar to a PROW installation. The lease agreement details include a 10-year lease term, no rental fee to the CCA (e.g., the city leases the public street space at zero cost), while the CCA is solely responsible for installation, operation, and maintenance of the charging stations, while the smaller AHJ retains responsibility for general street and parking lot maintenance and parking law enforcement. The site consists of city-owned street parking spaces, meaning the agreement effectively governs use of the PROW.

In a Bay Area city's streamlined permitting, the current PROW process, informed by their Curbside Pilot Program, requires vendors to first obtain the Office of Emerging Technology permit. This has worked well for vendors as it bundles critical elements early (i.e., pricing, O&M, data-sharing, community engagement), triggers cross-agency review, and prevents over-investment in infeasible designs, streamlining later steps and improving proposal quality. Even though there has been early success with a vendor pulling from existing building service, the city's permitting structure introduces a complex series of reviews, including staff-level screening, interagency coordination (e.g., Public Works, Urban Forestry, Fire, Police, Transit), an engineering public hearing, and during the pilot needed Municipal Transportation Agency Board approval, which can delay installations by months. The city acknowledges that these sequential steps create bottlenecks, and while they intend to streamline the process in the permanent program, the current system remains a major challenge. Today's sequence is the following: staff screening proceeds to interagency review (e.g., Public Works, Fire, Police, Transit, Urban Forestry), proceeds to Engineering Public Hearing, proceeds to Municipal Transportation Agency Board approval, only during the pilot, which adds months and staging delays. The city is formalizing a permanent pathway to stop at the Engineering Public Hearing (e.g., no Board approval needed) and is using the Emerging Technology Permit to bundle requirements up front, cutting rework later. Lastly, they noted that they are focusing on developing streamlined, transparent criteria in PCC-heavy areas for meter vs. non-meter blocks and for residential blocks near MFH, which help de-risk objections and focus efforts where demand is highest.

#### *Multistakeholder Coordination Challenges, Especially in the PROW*

PROW EVSE requires extensive multi-stakeholder coordination, especially through interagency synchronization, most acute in large AHJs and particularly prominent in the PROW. Across larger AHJs, staff emphasized that interdepartmental coordination consumes most of the project timeline, often more than permitting itself. AHJs report that site selection becomes a slow, iterative process because each department has veto points (i.e., traffic safety, tree preservation, fire clearances, curb-use conflicts). For instance, in the Curbside EV Charging Pilot Program local to the Bay Area, the program staff reported that coordination is heavy in the PROW: multi-agency reviews, legislative steps, and where building-powered EV charging (i.e., It’s Electric model) requires fronting site host negotiations. More parallel processing, which is the city’s goal, program rules that limit vendor count to ensure repeatable, standardized packages, and a permanent curbside program to replace *ad hoc* pilots. Predictability especially benefits parking-constrained residents because it scales the number of sites in MFH districts. In addition, the City of San José's DOT and SJ Clean Energy collaborate monthly, but PROW projects require additional coordination with Public Works, which oversees all PROW assets. The City of San José's DOT noted that these PROW deployments also face further scrutiny with Public Works around bike lanes, mobility hubs, ADA ramp locations, and other city planning priorities, each requiring separate departmental reviews.

Smaller AHJs lack defined PROW processes and depend heavily on coordinating with external agencies. For instance, one smaller AHJ tends to act opportunistically when grant funding or code compliance triggers a project that has not yet been included in the PROW. Proactive PROW expansion in the town will likely depend on external resources, clear vendor offerings, and template agreements to keep staff and legal workload manageable. When an MFH property owner, HOA, or developer seeks to install EV charging, they bring the project to the town only if it affects site design, such as parking lot reconfiguration, new EV-dedicated stalls, and changes impacting circulation or zoning. If the proposal does not alter site layout (e.g., simply adding a charger within an existing stall), the town’s planning department may not see the project at all, and it may proceed directly to their county. In addition, the town has few planning staff to analyze the feasibility of streetlight charging internally, given the ownership of streetlights and tariff interactions with PG&E. As a caveat, they currently cannot install EV infrastructure in the PROW that public works does not own or manage, including streetlighting. As a result, the town has no active PROW curbside charging program today; EV activity has focused on town-owned sites (i.e., two chargers at town offices and one at a town park), delivered as capital projects when funding and code triggers aligned. That said, staff are interested in curbside/pole-mounted options and are actively evaluating feasibility, particularly how LS streetlight rate classes (LS1 PG&E-owned, LS2 town-owned) and standards/tariffs would affect deployment.

Emerging business models for PCC EV charging, including PPPs, are not insulated from the multistakeholder coordination problem. A northern California county stated that county-led projects often require navigating complex internal processes, including capital project approvals, RFPs, and securing funding. These steps add significant time and cost to implementation. Negotiating licensing agreements for PPPs can be time-consuming, as all agreements must go through county counsel for approval. This slows down collaboration with vendors. While most installations are well-received, some residents view EV charging investments as unnecessary or costly. Concerns typically diminish when projects are explained as grant-funded or settlement-funded. Requests for chargers at sites not owned by the county create challenges, as the county cannot easily install infrastructure on private property without agreements.

### 6.2.4. Equity and Community Engagement Considerations

Across the AHJs interviewed, agencies consistently emphasized the importance of expanding equitable EV charging access for parking-constrained and underserved residents. However, this recognition has largely outpaced implementation capacity. Most jurisdictions lack the staffing, funding, technical expertise, and data infrastructure needed to translate equity goals into coordinated planning, deployment, and sustained community engagement. As a result, equity considerations are widely acknowledged but rarely operationalized at scale.

### *Lack of Systematic Tracking for Underserved EV Charging Needs*

While AHJs recognize that residents without off-street parking face disproportionate charging barriers, none have a well-resourced, comprehensive system to track PCC or underserved communities' charging needs or manage deployment at scale. Most jurisdictions rely on fragmented, *ad hoc* data, including vendor logs, pilot surveys, 311 messages, and occasional community meetings, rather than systematic monitoring. A Bay Area city, for example, lacks a unified way to track charging behavior or unmet needs and relies on limited surveys and vendor reports, which inhibits its ability to plan future public charging strategically. Fresno COG similarly lacks funding for ongoing surveys, with its last comprehensive assessment completed as a part of the county's 2021 EV Readiness Plan.

Some jurisdictions are beginning to fill these gaps with targeted efforts. A Bay Area city's EV Ombudsperson is conducting a CEC-funded challenges assessment and community surveys in Bayview–Hunters Point, supplemented by monthly service-request logs from curbside pilot vendors, which together offer more actionable insight. San José, however, still receives only sporadic, inconsistent feedback and lacks a system to track charging needs in underserved neighborhoods. Smaller AHJs rarely track PCC needs at all, relying instead on complaint-driven processes and limited cross-department coordination, leaving data gaps that hinder planning.

Of all AHJs interviewed, only one is developing a dedicated, equity-focused planning effort: the Caltrans-funded Equitable EV Charging Plan, which prioritizes residents without off-street parking and will produce a siting and funding roadmap. Overall, most AHJs acknowledge the importance of equitable deployment but lack the staff, funding streams, and cross-department frameworks needed to act on it, resulting in slow, inconsistent progress and continued reliance on pilots rather than scalable equity-driven programs.

### *Siting EV Chargers in Underserved Areas: Navigating Competing Community Needs*

AHJs with strong equity and engagement practices still find that community priorities heavily shape EV siting in underserved neighborhoods, where EV charging is often viewed as less urgent than immediate needs like safety, lighting, or parking. This mismatch, described by San José as the gap between "what communities say they want now" and what will be needed for future equitable electrification, frequently leads to resistance when chargers appear to displace valued land uses such as scarce parking or community-center space. In San José, stakeholder engagement around proposed EV charging sites has highlighted significant concerns related to potential parking impacts, as well as questions about the relevance of EV charging relative to more immediate community priorities.

Effective community engagement can help mitigate these concerns when it is well-timed and rooted in trusted relationships. One AHJ highlighted their successful approach as integrating CBOs, focus groups, and equity-focused planning, which has built trust and identified high-impact sites, although many residents require early education before EV investments feel meaningful. Engagement must also reach beyond focus groups, using tools such as multilingual resources and interactive mapping to ensure residents without off-street parking are included. Still, engagement alone is not enough: several AHJs caution that outreach before confirming utility feasibility can backfire, creating false expectations or controversy if sites later prove infeasible. In dense, parking-constrained areas where EV charging is both most needed and most contested, AHJs must balance transparency with technical realities, requiring careful timing and substantial staff capacity.

### *Limited Access Issues*

AHJs report that public charging availability is heavily restricted not only by electrical capacity but also by limited site access, particularly outside business hours. Many government-owned lots close at night or place chargers behind gates or inside restricted yards, eliminating evening and overnight charging opportunities precisely when parking-constrained residents most rely on public infrastructure. In addition, widespread misuse of dedicated EV charging stalls by internal combustion engine (ICE) vehicles, along with EVs parked for long periods without actively charging, further reduces functional access. In San José, ChargePoint logs frequently show vehicles occupying stalls for over six hours without charging, often due to inadequate striping or enforcement in older civic lots and curb areas. These combined barriers make many public chargers unreliable for residents who lack private parking and depend on predictable, 24/7 access.

### *Challenges in Pairing Fleet Operations with Public Use*

Pairing government fleet operations with public charging needs introduces additional conflicts, as AHJ fleet vehicles often occupy chargers intended for community use, effectively privatizing public assets and limiting access for parking-constrained residents. Fresno COG and others note recurring situations where fleet vehicles park at civic-site chargers, leaving residents uncertain whether the chargers are available to the public, especially at city halls and administrative facilities. Addressing this requires coordinated policies between fleet managers and public-facing departments, clearer signage, and dedicated outreach to ensure the public knows when chargers are available. Without structured operating windows and enforcement, fleet usage can unintentionally crowd out public charging, reducing the effectiveness of investments intended to support equitable EV access across jurisdictions.

### *ADA Considerations in EV Charging Site Design*

ADA accessibility requirements play a central role in EV charging site design, and AHJs consistently emphasized that integrating these standards early is essential for successful project planning. Because many existing parking lots, especially older surface lots and structures, were not built to current accessibility specifications, ADA-compliant EV charging often requires adjustments to site layout, grading, circulation, and hardware selection. In some cases, achieving compliant slopes or path-of-travel connections requires regrading or reconstructing small portions of a lot, as seen in older commercial and MFH sites across Californian AHJs. Similarly, one AHJ has found through its planning for equitable EV charging that accessibility needs can significantly shape project budgets, reinforcing the value of accounting for ADA considerations at the outset. In dense urban environments, block-by-block variation in sidewalk width, curb-ramp access, and clear-path requirements can influence which locations are feasible for EVSE installation. These design constraints ensure equitable access but also highlight the need for careful upfront evaluation to identify viable, cost-effective sites.

In addition, ADA-compliant stalls and access aisles can affect parking layouts, requiring AHJs and site owners to thoughtfully balance accessibility, EV readiness, and operational needs. State policies such as AB 970, AB 1100, and relevant Vehicle Code and Civil Code provisions provide tools to help jurisdictions manage these trade-offs. For example, allowing EV spaces to count toward minimum parking requirements and affirming tenants' rights to install charging in certain contexts. Even with these flexibilities, EVSE installations may reduce the number of standard parking spaces, particularly in constrained areas or older lots, which underscores the importance of proactive parking management and community engagement. Cities have adapted by allowing modest parking adjustments during plan review, while also weighing equity and access concerns in neighborhoods where parking scarcity is already acute. AHJs also raised questions about long-term compliance, such as how CALGreen requirements apply if chargers are later removed, illustrating a broader need for clearer guidance on maintaining compliance across the life cycle of EV infrastructure as codes evolve.

### *Competition for the PROW Space*

Competition for the street-furnishing zone is one of the highest-impact siting barriers for curbside EVSE across all AHJ interviews. As the same curb segment must accommodate mobility, safety, utility, and public realm priorities, EVSE proposals must navigate curb trade-offs, multi-agency review layers, future design conflicts, strict ADA geometry, and neighborhood pushback over the loss of parking or loading. As a result, curbside charging, although essential for parking-constrained residents, remains the most difficult EV charging context for AHJs statewide. Competition in the PROW increases the difficulty of site screening as vendors must weigh alternative uses of the curbside (e.g., bike lanes, public transit lanes, micromobility docking stations, commercial loading zones, and passenger pick-up and drop-off areas) and utility and safety infrastructure. Existing Utility and safety infrastructure further limits curbside siting as the furnishing zone also hosts critical infrastructure that cannot be moved or overlapped with EVSE (e.g., fire hydrants, power cabinets and utility vaults, traffic signal equipment). Lastly, upcoming capital projects, such as new or expanded bike lanes, transit priority lanes, Utility trenching, roadway resurfacing, and complete streets redesigns, pose siting competition in the PROW.

For instance, a Bay Area city has seen that vendors often propose sites without knowing about upcoming capital projects (e.g., bike lane upgrades, transit improvements, road redesigns). City staff explained they often need to redirect vendors because the city holds non-public internal information about "upcoming bike or bus lane planning" that makes locations unsuitable. This creates friction, slows permitting, and results in repeated design cycles. To combat this issue, they are building a site-selection mapping tool so vendors can pre-filter for feasible locations and is running a tech-agnostic pilot (learn by doing) to clarify standards and siting rules, both lower early study cycles. This is especially helpful for parking-constrained areas where curb space is tight and trade-offs are acute. A positive example of planning around these constraints is in Washington D.C., which publishes a GIS map of screened out PROW corridors, due to their future use for transit or micromobility.[32]

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[32] DC Gov: Curbside Regulations, Priorities, and Infrastructure GIS Map

### 6.2.5. Other Key AHJ Insights

Across AHJs, expanding public EV charging for parking-constrained customers increasingly requires navigating not only upfront capital constraints but also longer-term questions about operational sustainability and risk. Interviews indicate that these challenges shape how jurisdictions design, fund, and phase public charging investments, often emphasizing caution, flexibility, and partnerships over rapid scale. As a result, many AHJs approach public charging as an iterative, learning-oriented effort, with deployment strategies influenced by concerns about long-term cost exposure, institutional capacity, and the need to balance reliability, access, and equity objectives over time.

#### *Managing Ongoing Maintenance and Security for Public EV Charging*

Upfront installation costs are a major barrier for AHJs, but many report that ongoing O&M obligations, particularly theft, vandalism, and out-of-warranty repairs, pose an even greater long-term financial risk, especially for smaller jurisdictions with limited budgets. One AHJ captured the concern succinctly: "What happens when our chargers are out of warranty and are tied to grant funding?", For example, several chargers are now out of warranty, and without the funds or staff to repair them, they simply remain offline; the chargers also do not generate enough revenue to support maintenance, making proactive repairs infeasible. Fresno COG suggested that a PG&E-AHJ partnership focused on security and O&M could help keep chargers available after hours by reducing theft and vandalism. In some locations, repeated vandalism and copper theft have led to fencing off chargers at night, limiting access for parking-constrained residents. AHJs emphasized that coordinated efforts across Public Works, police, and vendors, such as installing durable hardware, improved lighting, surveillance, and clear operations plans, would better protect equipment while preserving safe nighttime access, avoiding the need for restrictive fencing policies that diminish charger availability.

#### *Prioritizing Access Over Profitability*

Tying into O&M cost management, many AHJs claimed that their main priority is to provide charging access to their residents rather than profitability to the locality. AHJs consistently emphasized that PCC-focused EV charging initiatives prioritize access and affordability rather than profitability and when partnerships arise, they ideally prefer no cost to the jurisdiction (e.g., CaaS, land lease, PPP), and favor pilot or phased approaches that allow cities to "learn by doing" before scaling to full programs. Across interviews, jurisdictions noted that equity-focused pricing, operational simplicity, and ensuring that chargers are placed where residents without off-street parking can reliably use them are of the utmost priority. This approach reflects a broader recognition that the success of PCC charging hinges on removing barriers to access for their residents rather than generating municipal revenues. AHJs emphasized that this can successfully be reached through iterative, pilot-based deployment, which helps AHJs test siting, community acceptance, and operational models with minimal risk.

#### *Innovative Business Models Needed to Expand Equitable PCC Charging*

AHJs repeated the need for programs and business model innovations that address parking-constrained residents in ways different from what they have experienced (e.g., traditional utility make-ready programs, status quo EV charging grants and rebates). Some AHJs suggested starting with policies that integrate equity criteria into funding and permitting processes to ensure that DACs receive priority access to EV infrastructure. Future strategies should include utility partnerships to overcome grid capacity limitations and accelerate site readiness.

Additionally, AHJs emphasized the necessity for programs that make PPPs more attractive and streamlined. Notably, one AHJ noted that PPPs with EV charging vendors have proven effective for installations at county-owned sites, such as park-and-ride lots. However, as mentioned earlier, these PPPs can increase soft costs due to challenges with multistakeholder coordination. Yet at the same time, expanding these partnerships helps to spread the allocation of hard costs and risks to incubate the PCC market and provide access to the untapped market. AHJs emphasized the need for vendors to offer discounted charging rates for low-income residents, modeled after PG&E's reduced-rate programs, and to handle the verification and administration of those discounts. The AHJ highlighted that legal simplification is key for PPPs, as lengthy licensing agreement reviews by county counsel currently slow down PPP projects. Integrated planning between utilities, AHJs, and vendors during site selection would help avoid grid-related setbacks and accelerate deployment.

# 7. PG&E's Demonstration Project Scoring Criteria

This section presents the EPIC 4.03 demonstration project scoring criteria, focusing on down-selecting technology solutions most likely to help PG&E scale PCC EV charging needs and meet their 2030 TNS EV goals. To present the scoring criteria framework, guiding principles, pre-screening methodology, and scoring metrics and weighting.

## 7.1. Scoring Criteria Framework

PG&E's EPIC 4.03 technology down-selection process applies a two-stage evaluation framework, prescreening followed by a 100-point weighted scoring assessment to identify the most viable technology solutions for scaling EV charging solutions for PCCs. Solutions first undergo yes, yes*, or no (i.e., radio button style) prescreening to confirm minimum feasibility requirements for EPIC 4.03 and beyond. These pre-screenings include standards and regulatory compliance, revenue-sharing flexibility, cost-sharing flexibility, and user experience readiness. Technology solutions that pass are then evaluated across five weighted scoring pillars comprised of scoring metrics, adding up to a total of 100 to compare across technology solution groups (e.g., smart outlets, PROW, community hubs).

### 7.1.1. Guiding Principles

As EPIC 4.03 transitions into the demonstrations, the Guiding Principles recommended in Phase 1 support PG&E in determining which projects to pursue in Phase 2. To preface the down-selection process, the research team introduces the guiding principles specific to PG&E's EPIC 4.03, given benchmarked research, pilots, and programs, as well as Phase 1 market research.

#### *Minimize Changes to Existing Routine for PCCs*

First and foremost, PG&E should prioritize charging solutions that fit seamlessly into where PCCs already live and park today, minimizing disruption to existing daily routines. This means electrifying the exact parking locations PCCs currently rely on. For medium-PCCs, PG&E should continue to install EV charging for their unassigned off-street parking spot (i.e., extending and continuously improving program offerings such as PG&E's MSDI). For high-PCCs, PG&E should install curbside charging and charging hubs in their neighborhoods.

#### *Partner with Existing Efforts Where Possible*

For EPIC 4.03 funds, PG&E can jump-start Phase 2 by leveraging existing efforts to serve PCCs in PG&E's service territory and focusing funds on assisting these efforts and capturing shared lessons learned. For curbside, look to partner with the Curbside EV Charging Pilot local to the Bay Area with their three vendors serving three different grid-connection models (i.e., EV-sub metered building powered, pole-mounted streetlight circuit powered, and new dedicated EV service in the PROW). In tandem, PG&E should review EV Power Ready (Rule 29) applications that site developers have submitted for community hubs projects (e.g., IONNA Rechargery and EVgo.)

#### *Leverage Existing Power Supplies Where Available*

In step with partnering with existing efforts where possible, PG&E will ideally not initiate new EV Power Ready interconnections unless needed. Not only have PG&E customers reported that EV Power Ready energization timelines are a major barrier for these projects, but the current timelines can also extend well beyond the average 182-calendar-day regulatory requirement, posing a timeline risk to the delivery of the EPIC 4.03 Report in Phase 3. For curbside charging, PG&E can ask two main questions: (1) Are there viable sites where power can be pulled from existing building service , and (2) Can power be provided by existing streetlight circuits in the service territory ? For community hubs, PG&E should use the GRIP map to identify congested areas to avoid for potential sites and confirm site selection with distribution engineering.

### *Vandalism Mitigation Must Be a Priority*

Vandalism mitigation must be a priority for EPIC 4.03 demonstration sites. Beyond down-selection recommendations from the research team, PG&E should only use technology solutions that aim to limit vandalism by design (e.g., CatStrap's EV cable shield, ChargePoint's cut-resistant cables, retractable cables, bring-your-own cable). In addition to vandalism mitigation features, PG&E can focus on additional vandalism mitigation methods (e.g., siting in high-traffic areas, site access control, lighting, cameras, and on site security).

## 7.1.2. Pre-Screening

Table 11 shows the pre-screening criteria for ensuring that only feasible and compliant technologies advance to down-selection. Solutions must clear "Yes/No*/No" gates for standards and regulatory compliance (e.g., CTEP[33] and D.18-01-024 Large IOU Safety Checklist[34]), revenue-sharing flexibility, cost-sharing flexibility, and user-experience readiness (e.g., product capability supportiveness towards the Task 2.2 market segments), with "no" outcomes flagging technology solutions that will likely not be deployed for EPIC 4.03. This step helps streamline the identified technology solutions and sets a realistic baseline for the 100-point comparative assessment that follows.

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33 CDFA - DMS - CTEP Certificates of Conformance Database Search

34 D.18-01-024 Large IOU Safety Checklist

**Table 11. Scoring Pre-Screening**

| Pre-Screener | Pre-Screen Metric | Pre Screen Flag* | Description | Measurement |
|---|---|---|---|---|
| **Standards and Regulatory Compliance** | Whether the technology solution complies or is in the process of coming into compliance with all relevant safety, performance, and regulatory standards to operate in PG&E's Service Territory. Includes D.18-01-024 Large IOU Safety Checklist and California Type Evaluation Program (CTEP). Technology solutions that do not comply are legal liabilities for PG&E. | Yes/No*/No | If No, prescreens the solution out. No compliance/moving towards compliance with CDFA (N) Engaging with CDFA for compliance exemption/pending CTEP approval (N*), CTEP approval granted (Y) | Y- Meets CTEP and D.18-01-024 Large IOU Safety Checklist (if going through Rule 29)<br>N* - (Continues down selection but highlighted) - Meets D.18-01-024 Large IOU Safety Checklist but is in the process of meeting CTEP compliance.<br>N - Does not meet CTEP and D.18-01-024 Large IOU Safety Checklist |
| **Revenue-Sharing Flexibility** | Concession modeling - revenue sharing with the site host over time for the use of their site/land. Is the vendor willing to share revenue, such that the site host reduces their upfront costs. | Yes/No*/No | If No or No*, prescreen flags solution. | Y- Flexible to revenue sharing<br>N* - In their roadmap or willing to consider<br>N - Not willing to revenue share |
| **Cost-Sharing Flexibility** | Is the vendor able to share cost responsibility with the Utility | Yes/No*/No | If No or No*, prescreen flags solution. | Y- Flexible to cost sharing with the Utility on BTM and TTM<br>N* - Flexible to cost share with the Utility on BTM<br>N - Not willing to cost share |
| **User Experience Readiness** | Product capabilities to support user group creation and segmentation for charging access that can vary by times of day, user group-specific pricing, and the ability to accept multiple payment options | Yes/No*/No | If No or No*, prescreen flags solution. | Y- Product meets one or more of the capabilities<br>N* - Product roadmap could meet the capabilities within the timeline of the demonstration<br>N - Product cannot meet any of the capabilities |

## 7.1.3. Scoring Metrics and Weighting

Figure 26 illustrates the full scoring metrics and relative weighting the research team uses to score the identified technology solutions and down select for Phase 2 of EPIC 4.03.

**Figure 28. Scoring Metrics and Weighting (100 Points Available)**

| Scoring Pillar | Scoring Metric | Metric Points* |
|---|---|---|
| Charger Procurement and Ongoing Costs (28 Points) | Charging Equipment Procurement Costs | 4 |
| | Installation Costs for BTM | 8 |
| | Installation Costs to Utility for TTM | 8 |
| | Expected Annual Operation and Maintenance Costs | 8 |
| | **Subtotal** | **28** |
| Ease of Installation (12 Points) | Planning Difficulty and Electrical Upgrades Needed | 6 |
| | Networking and Connectivity Difficulty | 6 |
| | **Subtotal** | **12** |
| Safety (16 Points) | Public Safety | 10 |
| | Safety for Utility Equipment | 6 |
| | **Subtotal** | **16** |

| Scoring Pillar | Scoring Metric | Metric Points* |
|---|---|---|
| Scalability (12 Points) | Established Market Presence | 4 |
| | Production Ramp Ability | 8 |
| | **Subtotal** | **12** |
| Meets the Needs of each Market Segment (32 Points) | Form factor and Power Level Fit for Typical User Dwell Time | 6 |
| | Technology Solution Features and Capabilities | 10 |
| | User Experience on Payment Options | 8 |
| | Vandalism Mitigation | 8 |
| | **Subtotal** | **32** |
| | **Total** | **100** |

### *Charger Procurement and Ongoing Costs*

Table 12 drills down on the Charger Procurement and Ongoing Costs scoring pillar, with the scoring metric, scoring description, and metric points that add up to a subtotal of 28 for the pillar. Charger procurement and ongoing costs determine whether a charging technology can be deployed affordably at scale. Hardware prices set the baseline, with lower-cost units enabling more chargers per budget. Installation costs, both BTM and TTM, often account for the largest expenses due to trenching, wiring, civil work, and potential grid upgrades. Annual networking, software, and maintenance needs add recurring costs that ensure chargers remain reliable. These cost components matter because they directly shape which technologies PG&E can scale efficiently in demonstrations and beyond.

**Table 12. Charger Procurement and Ongoing Costs Scoring Pillar**

| Scoring Pillar | Scoring Metric | Scoring Description | Metric Points |
|---|---|---|---|
| **Charger Procurement and Ongoing Costs** | Charging Equipment Procurement Costs | The upfront cost to procure a single charger unit, excluding installation costs, ancillary network management, and other associated software costs. For instance, cheaper unit costs allow for broader development within a fixed budget, enabling more chargers to be installed. | 4 |
| | Installation Costs for BTM | The cost of installing the charger infrastructure from the utility meter to the charger. Includes trenching, conduit, wiring, labor, and any site-specific modifications required to complete the installation. High installation costs can offset savings from lower hardware prices, making this a critical component of the total cost to deploy. ***Assessment will be informed by subject matter experts to ensure alignment with utility-side cost data.*** | 8 |
| | Installation Costs to Utility for TTM | The cost of installing the charger infrastructure from the distribution grid to the meter. includes any required grid upgrades, transformer work, and utility-side infrastructure enhancements. Utility-side costs can significantly impact project feasibility and scalability, requiring extensive grid upgrades or complex utility integration, which may introduce delays and higher long-term expenses. ***Assessment will be informed by utility subject matter experts to ensure alignment with utility-side cost data.*** | 8 |
| | Expected Annual Operation and Maintenance Costs | The cost of ongoing networking and maintenance to achieve charger uptime with full functionality. Includes preventive maintenance, repairs, replacement parts, labor, and any service agreements required to ensure uptime and reliability. Additionally, includes the cost of software and services required to manage the technology solution. Includes expenses for charger connectivity, monitoring platforms, load management tools, and any subscription or licensing fees associated with these systems. | 8 |

## *Ease of Installation*

Table 13 details the ease of installation scoring pillar, with the scoring metric, scoring description, and metric points that add up to a subtotal of 12 for the pillar. Ease of installation reflects how difficult it is to plan, permit, and physically deploy a technology solution. Physical planning and electrical upgrades can require trenching, civil work, utility service upgrades, permitting, and coordination across multiple stakeholders, all of which add complexity and project risk. Networking and connectivity needs can also introduce challenges if solutions require extensive setup, extra hardware, or complex commissioning processes. This matters because simpler, lower-effort installations reduce deployment timelines, costs, and risk across PG&E’s demonstration portfolio.

**Table 13. Ease of Installation Scoring Pillar**

| Scoring Pillar | Scoring Metric | Scoring Description | Metric Points |
|---|---|---|---|
| Ease of Installation | Physical Planning and Electrical Upgrades | The complexity and level of effort of installation planning steps for BTM, TTM, and EVSE (e.g., trenching, civil work, alterations, or service upgrades) to the site for deploying the technology solution from spec-sheets and generalization, attempting to avoid site-specific engineering challenges (research team judgment around the typical installation). Includes permitting requirements, land use and zoning considerations, the number of stakeholders involved, etc. Technologies that require fewer permits, simpler zoning compliance, and minimal stakeholder coordination, as well as trenching and civil work needed at the site, can reduce project risk. | 6 |
| | Networking and Connectivity Difficulty | The complexity and level of effort the technology solution takes to be networked for commissioning, monitoring, and controlling. Includes connectivity options and the complexity of setup and configuration for site hosts. Technology solutions that require complex networking setups or additional hardware can increase installation time and costs, whereas simpler connectivity options improve scalability and reduce operational risk. | 6 |

### *Safety*

Table 14 lists the Safety scoring pillar, with the scoring metric, scoring description, and metric points that add up to a subtotal of 16 for the pillar. Safety evaluates whether technology solutions protect both users and utility infrastructure. Public safety depends on meeting electrical standards and preventing hazards such as shock, fire, overheating, or equipment misuse. Features like emergency shutoffs, clear signage, and secure enclosures further ensure safe charging experiences. Safety for utility equipment focuses on avoiding transformer overloads, voltage issues, or other grid risks that could damage assets or require mitigation. Strong safety performance is essential because unsafe technologies increase PG&E's operational risk.

**Table 14. Safety Scoring Pillar**

| Scoring Pillar | Scoring Metric | Scoring Description | Metric Points |
|---|---|---|---|
| Safety | Public Safety | The technology solution's ability to ensure user and public safety during operation and maintenance. Includes compliance with electrical safety standards, protection against hazards such as shock, fire, and overheating, and the presence of safety features like emergency shutoff, clear signage, and secure enclosures. | 10 |
| | Safety for Utility Equipment | The technology solution's impact on utility-owned equipment and infrastructure, ensuring no damage to existing assets. Includes grid safety standards, such as risks of overloading transformers and voltage fluctuations, as well as the additional protective measures needed. ***Assessment will be informed by utility subject matter experts to ensure alignment with grid safety standards.*** | 6 |

## *Scalability*

Table 15 outlines the Scalability scoring pillar, with the scoring metric, scoring description, and metric points that add up to a subtotal of 12 for the pillar. Scalability measures how reliably a vendor can support large-scale deployment of their technology. Established market presence, including years in operation, deployment history, financial stability, and customer base, reduces the risk of vendor failure or stranded assets. Production ramp-up ability evaluates how quickly suppliers can manufacture, deliver, and scale production to meet utility demand. High scalability matters because PG&E needs partners who can deliver consistent volume as EV charging expands across the service territory.

**Table 15. Scalability Scoring Pillar**

| Scoring Pillar | Scoring Metric | Scoring Description | Metric Points |
|---|---|---|---|
| Scalability | Established Market Presence | How established the technology vendor is in the market. Includes years in operation, number of deployments, financial stability, and customer base. For instance, a startup has a higher risk of defaulting, leading to increased stranded asset risk. | 4 |
| | Production Ramp Ability | The technology vendor's ability to rapidly scale production and deliver units. Considering: How many units can be produced in a typical year? How quickly can the technology solution unit be produced, procured, and ready to be sent to the site? Inability to deliver utility-requested demand and long procurement timelines can be a bottleneck for scaling the charging solution | 8 |

## *Meets the Needs of Each Market Segment*

Table 16 establishes the Meets the Needs of Each Market Segment scoring pillar, with the scoring metric, scoring description, and metric points that add up to a subtotal of 32 for the pillar. This pillar assesses whether a technology solution aligns and provides a positive user experience for the PCC end user. Form factor and power levels must match typical user dwell times to ensure throughput and appropriate charging speed. Features such as reservations, idle fees, SOC-based charging management, and load management improve both user experience and operational efficiency. Payment options such as apps, RFID, card readers, Plug & Charge, or phone-based initiation must be flexible enough to serve diverse users and maximize accessibility. Vandalism mitigation is also critical, as protecting cables and hardware helps maintain uptime, making this pillar essential for selecting technologies that work reliably across all PCC communities.

**Table 16. Meets the Needs of Each Market Segment Scoring Pillar**

| Scoring Pillar | Scoring Metric | Scoring Description | Metric Points |
|---|---|---|---|
| Meets the Needs of Each Market Segment | Form Factor and Power Level Fit for Typical User Dwell Time | How well does the technology solution's power output (kW rating) and mounting type/form factor align with the typical dwell time of users in the Task 2.2 market segmentation? Considers whether the technology solution is aligned from a throughput standpoint (i.e., handle processing volume). | 6 |
| | Technology Solution Features and Capabilities | The consumer-facing functionality enhancements for user experience and optimizing charger throughput. Considering whether the technology solution has queuing/reservation capabilities? Whether the technology solutions allow site hosts to set idle fees? Additionally, the technology solution's ability to manage electrical load across multiple units. Considering whether the technology solution has load management capabilities at all? Are these capabilities automatic or require user input? Can the technology solution enact demand response capabilities? | 10 |
| | Availability of Payment Options | The technology solution's compatibility with different types of payment maximizes user experience for a given PCC customer segment. Includes mobile apps, card reader, RFID, Plug & Charge, and toll-free call for the base model. Considers the redundancy of payment options increases accessibility to different users and multiple options to initiate a charge. | 8 |
| | Vandalism Mitigation | The technology solution's ability to withstand or deter vandalism and tampering of equipment. Includes cable protection capabilities (e.g., authorized access (typical fencing/parking garage deployments), retractable cables) to ensure that charger uptime is not impacted. | 8 |

# 8. Technology Deployment Models for Demonstration Projects

This section summarizes the primary technology solution models that can expand at or near-home charging access for PCCs. The discussion is intentionally technology and vendor-agnostic and focuses on the capabilities, site conditions, and implementation requirements that determine whether a solution can be deployed predictably, scaled across jurisdictions, and maintained reliably over time.

Across PCC segments, the central question is not whether charging technology exists, but whether a given approach can be deployed repeatably under real-world constraints, permitting and design iteration, ADA/accessibility integration, interconnection/energization timelines, PROW governance, and ongoing O&M. This section therefore emphasizes "what must be true" for each model to scale in practice, including the soft-cost and coordination requirements that often determine outcomes as much as hardware.

> No single charging approach fits all PCC conditions. Smart outlets are often the most scalable pathway for MFH-dominated medium-PCC segments when paired with feasible electrical design and clear operating rules; PROW charging can provide essential near-home access for high-PCC residents but depends on standardized permitting pathways, ADA-compliant siting, and durable O&M models; and community hubs can serve as reliable 24/7 anchors where on-site charging is limited but may be constrained by higher capital needs and energization timelines. Across all three models, predictable processes, clear roles, and realistic operations planning are foundational to scale.

The three models described below align with the report's segmentation framework:

- **Smart outlets** are typically best suited to the medium-constrained PCC segment, where some on-site parking exists, but electrical capacity, proximity to power, and coordination barriers still exist.
- **PROW charging** (streetlight and curbside) can provide near-home access for medium- and high-constrained PCCs, especially where residents rely on on-street parking and private home charging is infeasible.
- **Community charging hubs** can serve medium- and high-constrained PCCs as reliable 24/7 anchors where on site charging is limited but typically require higher capital investment and may be driven by energization timelines and site security/O&M requirements.

## 8.1.1. What Demonstration Projects Should Evaluate (Across All Models)

To ensure lessons learned are transferable and scalable, demonstrations should prioritize standardized measurement across models, including the following:

### Project Outcomes

- **Equity and affordability outcomes:** Whether usage and benefits reach intended low-income and disadvantaged communities, and whether pricing structures preserve affordability relative to home charging.
- **O&M results:** Uptime, vandalism/theft exposure, repair logistics, and who is responsible over time) because sustained availability, particularly overnight, is essential for PCCs.

### High-Level Soft Costs

- **Time and effort by project phase:** Track the steps from screening, design, permitting, construction, commissioning, energization to isolate where delays occur and what mitigations reduce rework.
- **Utility energization critical path:** Especially where new or upgraded electrical service is required and how schedule uncertainty affects funding windows and construction sequencing.
- **Process predictability and repeatability:** Clarity of permitting pathway, completeness of submittals, number of review cycles, cross-department coordination. For more information about soft costs to evaluate read Soft Costs PG&E Will Explore and Address.

## 8.2. Smart Outlets

Smart outlets are an approach to add EV charging without installing full charging stations. These outlets are network-connected sockets that enable controlled, metered L1 and/or L2 charging without installing conventional EV charging stations at every parking space. Smart outlets are generally best suited to **medium-constrained** parking settings, most commonly MFH and condo properties with shared or unassigned parking, where charging access is possible but constrained by proximity to power, electrical capacity, and coordination barriers, but would also be applicable to assigned parking scenarios.

### 8.2.1. Smart Outlets Advantages and Risks

#### *Advantages of Smart Outlets*

In MFH settings, smart outlets can expand access by leveraging simpler electrical work in some configurations, while still supporting user authorization, billing, and basic monitoring. When paired with appropriate electrical design and load management, smart outlets can **offer a lower-cost pathway to electrify more spaces**, particularly where conventional EVSE would trigger extensive panel upgrades or costly trenching. The approach can **reduce design and permitting challenges** by narrowing the scope of equipment installed at each space, while still enabling managed charging and user-level access controls.

#### *Key Constraints and Risks to Consider*

Smart outlets still face several recurring constraints that can limit scalability if not addressed early:

- **Make-ready needs at scale:** Even when individual installations are simpler, expanding beyond a small number of electrified spaces may still require on site make-ready work, especially where building electrical infrastructure is constrained.
- **Regulatory/permitting ambiguity:** Some jurisdictions treat smart outlets as EVSE; others treat them as receptacles or building outlets with software controls, creating inconsistent permitting expectations and potential rework.
- **Interoperability and user experience:** BYOC approaches can reduce cable vandalism risk, but introduce questions about interoperability, certification expectations, and resident usability.
- **Operations and property rules:** Because medium-PCC sites often involve shared parking, successful deployments typically require clear property policies (stall access, enforcement, and maintenance responsibilities) to ensure charging access is reliable and equitable.

### 8.2.2. Demonstrations for Testing Smart Outlets

To produce transferable lessons, demonstrations should evaluate the following:

- **Electrical feasibility and load management performance:** Whether the approach meaningfully expands the number of usable charging spaces without triggering disproportionate upgrades.
- **Permitting pathway clarity:** What submittal elements and inspection expectations reduce resubmittals and accelerate approval.
- **Resident and site-host operations**: How user authorization, billing, stall management, and O&M responsibilities function in real MFH conditions.

## 8.3. Public Right-of-Way (PROW) Charging

PROW charging (streetlight and curbside) adds EV charging on public streets where people already park. It helps residents who do not have driveways or parking at their building charge near their homes. PROW charging is essential for **high-constrained** PCCs, residents who rely on on-street parking. For **medium-constrained** PCCs in dense neighborhoods, it can complement MFH approaches when on site retrofits are slow or infeasible.

This report uses PROW EV charging solutions as an umbrella term that includes both streetlight charging and curbside charging, while acknowledging that each has distinct design, power, ownership, and permitting implications.

### 8.3.1. Streetlight Charging Advantages and Risks

#### *Advantages of Streetlight Charging*

Streetlight charging is defined here as pole-mounted EV charging that taps into existing streetlight electrical service. Where circuit voltage, ownership, and metering/tariff conditions are aligned, it can reduce civil work and avoid some trenching and new service requirements. However, feasibility is highly dependent on circuit characteristics, ownership fragmentation, metering constraints, ADA siting requirements, and maintenance and security needs.

#### *Key Constraints and Risks to Consider*

- **Electrical service limitations:** Voltage/amperage and circuit configuration may not support L2 charging without upgrades.
- **Ownership and standards alignment:** Utility-owned vs. municipality-owned lighting assets can imply different standards and approval pathways.
- **Metering and billing approach:** Reliable, compliant metering is foundational for scalable pricing, monitoring, and program evaluation.
- **ADA and streetscape constraints:** Sidewalk clearance, curb ramps, and accessible routes can be determinative.
- **O&M, vandalism, and uptime expectations:** PCC value depends on consistent overnight access.

## 8.3.2. Curbside Charging Advantages and Risks

### *Advantages of Curbside Charging*

Curbside charging (pedestal or streetscape installations in the furnishing zone) generally involves pedestal-style EVSE installed in the PROW. Curbside charging supports equitable near-home access for residents without off-street parking while allowing jurisdictions to add capacity incrementally in dense neighborhoods where building retrofits are impractical. It enables public agencies to address high-constraint charging needs using the public realm, despite higher coordination and permitting requirements. However, it can carry higher soft costs due to dual permitting and encroachment requirements, ADA integration, multi-agency coordination, and (frequently) the need for new or dedicated make-ready infrastructure in the PROW.

### *Key Constraints and Risks to Consider*

- **Dual permitting and coordination burden:** Public Works encroachment plus building/planning review, and often across multiple departments.
- **Competition for curb space:** The furnishing zone must accommodate mobility, safety, utilities, and public realm priorities; this can drive iteration cycles and site churn.
- **Enforcement and access management:** Non-EV's parking in dedicated charging stalls and long dwell times can reduce functional access if not addressed through operations and curb management.
- **Security and vandalism exposure:** Design and operating plans must be realistic about theft/vandalism risks and repair logistics.

## 8.3.3. Delivery and Partnership Models (PROW)

Because the PROW is governed by public authorities, scalable deployments often depend on public-private partnership (PPP) and concession-style frameworks that clarify roles for siting, permitting, installation, operations, pricing, data-sharing, and performance expectations (e.g., uptime). These frameworks can reduce ad hoc negotiations and help standardize deployments across multiple sites.

## 8.3.4. Demonstrations and Testing PROW Charging

To generate scalable playbooks, demonstrations should evaluate the following areas:

- **Repeatable siting and screening processes:** Criteria and mapping that reduce infeasible proposals and redesign churn.
- **End-to-end permitting pathways:** This includes whether bundling requirements early reduces resubmittals and delays.
- **Interconnection/energization sensitivity:** How strongly timelines depend on new service work versus leveraging existing power supplies.
- **Operations and curb management:** Enforcement, pricing, utilization patterns, and reliability outcomes in PCC neighborhoods.

## 8.4. Community Charging Hubs

Community charging hubs are neighborhood anchors for Reliable 24/7 access. They constitute neighborhood-scale clusters of L2 and/or DC fast chargers located near everyday amenities and designed to provide reliable, near-home access for PCCs in areas where on site charging is limited. Compared with dispersed curbside or pole-mounted approaches, hubs can concentrate throughput and simplify operations, but often require higher upfront capital, added security measures, and, at many sites, upstream grid or dedicated service upgrades that place energization timelines on the critical path.

### 8.4.1. Where Community Charging Hubs Are Most Effective

Hubs can be especially valuable where PCC density is high, and on site retrofits are slow, infeasible, or unlikely to reach scale in the near term. The sites can provide 24/7 access and adequate safety and security conditions. Ideally, sites for charging hubs can be paired with daily destinations (e.g., retail stores, grocery stores, and libraries), improving user experience and utilization potential.

### 8.4.2. Community Charging Hubs Advantages and Risks

Hubs can improve reliability and user confidence by offering consistent availability, clear wayfinding, and simplified O&M compared with many dispersed curbside sites. At the same time, hubs can be difficult to scale because they may require substantial planning and civil work; trigger significant utility-side upgrades or new service needs, which can dominate schedules; and require robust security and maintenance planning to sustain uptime and safe access, particularly overnight.

### 8.4.3. Demonstrations for Testing Community Charging Hubs

Demonstration projects for community charging hubs should evaluate these critical factors:

- **Site selection and feasibility workflow:** How early screening and utility feasibility checks reduce late-stage redesigns.
- **Energization timeline sensitivity:** Identifying which project elements most often delay commissioning and how mitigation strategies affect schedule risk.
- **Operational model realism:** Security, uptime, repair logistics, and the sustainability of O&M funding/roles.
- **Affordability and equity outcomes:** Whether pricing and access patterns support PCCs who otherwise rely on higher-cost public fast charging. Consider if additional financial support (e.g., prepaid cards, funds added to account) is needed to support low-income PCCs utilizing the community charging hubs.

# 9. Soft Costs PG&E Will Explore and Address

A significant portion of EPIC 4.03 Phase 2 focuses on measuring the specific soft cost drivers that materially affect whether PCC-focused charging solutions can be deployed at scale in PG&E's service territory. Phase 2 will help PG&E answer the question: What needs to be true for [PG&E] to unlock EV adoption/charging amongst Parking-Constrained Customers in the service territory? Phase 1 identified a wide range of soft costs originating from utility, AHJ, and site host processes, but many were described at a high level, and many have not been validated under real PG&E project conditions. In Phase 2, PG&E will oversee, via building and/or partnering with AHJs, live demonstration projects, allowing Cadmus to observe soft costs as they occur across design, permitting, construction, and commissioning. This approach enables direct measurement of time, staff effort, and coordination complexity rather than relying solely on stakeholder perception. The research team will ultimately document the lessons learned from Phase 2 in the Phase 3 EPIC 4.03 report.

Phase 2 analysis aims to analyze soft costs beyond generic explanations, such as long permitting timelines, to uncover the root causes of delays and costs. Prior studies frequently cite unclear guidance or lengthy reviews as the primary drivers of project delays, yet PG&E's experience shows these labels often obscure more actionable issues. These include misaligned review sequencing, unclear decision ownership, technology-specific uncertainty, repeated design iterations, and internal risk management practices. Phase 2 will disaggregate these dynamics to determine which underlying factors are most responsible for added time and administrative burden across different technology solutions.

For each down-selected technology solution, Cadmus will assess not only the magnitude of key soft costs but also the effectiveness of tested mitigation strategies under real-world conditions. This evidence will help confirm or disprove Phase 1 hypotheses about which solutions are most viable and scalable within PG&E's service territory. The resulting lessons learned will support future program design, internal process improvements, and broader Clean Transportation investment decisions. Below are the highest-priority soft costs to measure in phase 2, originating from the Utility and AHJ. See Table 17 and Table 18 while a comprehensive list of soft costs is to be measured.

## 9.1. Utility High Priority Soft Costs to Measure in Phase 2

Table 17 presents the highest-priority utility-driven soft costs that Phase 2 of EPIC 4.03 will measure through live demonstration projects. These soft costs were prioritized based on their observed ability to materially influence PG&E project timelines, administrative burden, and scalability across PCC-focused charging solutions. The table focuses on discrete utility processes, such as program onboarding, inter-agency coordination, contracting, energization, and technology review that repeatedly introduce challenges across projects. Each soft cost category reflects issues that PG&E and stakeholders identified in Phase 1 as both widespread and consequential but insufficiently understood under real-world PCC-specific deployment conditions.

For each soft cost category, the table pairs a clear measurement objective with a targeted mitigation strategy to enable test-and-learn validation in Phase 2. The Proposed Way to Measure column specifies how Cadmus and PG&E will quantify soft costs using observable metrics such as staff time, number of handoffs, number of meetings, sequencing dependencies, and elapsed days between project milestones.

This approach allows Phase 2 to move beyond anecdotal feedback and capture where time and effort are actually expended across utility processes. The Mitigation Measures column then identifies practical interventions, such as standardized toolkits, clear roles and responsibilities for staff, contract templates, and internal performance targets, that can be directly tested during demonstrations to assess their effectiveness in reducing administrative costs or timeline risks.

**Table 17. Utility High Priority Soft Costs to Measure in Phase 2**

| Soft Costs for Utility to Track in Phase 2 | Proposed Way to Measure in Phase 2 | Mitigation Measures | Use Case |
|---|---|---|---|
| **Utility incentive programs carry administrative costs associated with educating and supporting AHJs, installers, and site hosts. These costs can be partially offset through the provision of Technical Assistance resources such as TEAS.** | A major challenge for many participants, particularly MFH site hosts, is simply not knowing where to begin.<br>The objective is to measure the amount of time and administrative cost utility staff spend explaining program requirements, including how dynamic pricing structures may operate if DAC/low-income rates are introduced through a fuel card mechanism. It also requires documenting the number of meetings needed to secure all necessary approvals from initial application through the final accepted contract. | **Standardized "Getting Started" PCC Program Toolkits for AHJs, Installers, and MFH Site Hosts**<br>• Create a single, universally applicable onboarding packages for each of the stakeholder groups. For example, includes the step-by-step process map for EV Power Ready, pre-approved equipment lists, example site plans and wiring diagrams, one-pager on "How dynamic pricing works" explainer. | Smart outlet, PROW, Community Hub |
| **Multistakeholder and inter-agency coordination costs: Utility administrative costs associated with coordination with non-utility AHJ departments.** | Large AHJS cited interagency bottlenecks as one of the largest timeline drivers to projects.<br>The objective is to measure the number of departments involved, staff members involved in coordination, meetings required, and whether the review sequencing is parallel or requires waiting on one agency approval/procedural stage-gating. | **Clearly Defined Roles and Responsibilities with Single Point of Contact for PCC EV Projects (Utility Champion)**<br>• Assign one utility staff member or project coordinator responsible for managing all communication with all AHJ internal departments, triaging questions from departments such as Fire, Planning, Building, Transportation, and Public Works, to the correct internal team, and tracking status and ensuring timely responses. This will aim to reduce confusing multi-department email chains and inconsistent guidance to non-utility staff. | Smart Outlet, PROW, Community Hub |

| Soft Costs for Utility to Track in Phase 2 | Proposed Way to Measure in Phase 2 | Mitigation Measures | Use Case |
|---|---|---|---|
| **Multistakeholder and inter-agency coordination costs: Utility administrative costs associated with contracting under emerging business models such as PPPs, tolling agreements, and concession models. These arrangements require utilities to negotiate complex contract structures with private EV charging providers and, in some cases, with AHJs.** | Contract negotiations often take significant time, especially when determining appropriate cost-share or revenue-share mechanisms, land-lease structures, insurance and indemnification requirements (i.e., particularly for PROW EV charging), concession-agreement terms, and performance clauses.<br>The objective is to measure the amount of time and administrative cost required for utility contracting and legal staff to finalize and sign off on each contract. | **Develop Standardized Contract Templates**<br>• For example, inquire into PROW contracting terms from pilots and programs in our Literature Review. To create master templates for PPP agreements, tolling and performance usage-based revenue-share models, concession agreements with AHJs, standard land-lease structures, and special insurance and indemnification clauses especially relevant for the PROW. | Smart Outlet, PROW, Community Hub |
| **EV Power Ready (Rule 29) Energization Timelines (Full Process)** | EV Power Ready (Rule 29) energization timelines represent one of the largest and most universal soft cost drivers for MFH and public EV charging projects. AHJs have reported energization delays ranging from 12 to 18 months.<br>The objective is to measure the average number of days from application to energization and compare observed timelines against energization targets[35] from SB 410[36]and PG&E internal targets. | **Set and Adhere to Internal Average Target Number of Days for Each Numbered Step in the Process Flow**<br>• Beyond the grouped average number of days targeted (i.e., on the process map, the design process should take on average 55 days), break step 3, 4, and 5 into the targeted number of days internally and track why these are not successful when missed. | Smart Outlet, PROW, Community Hub |

35 CPUC R.24-01-018: Decision Establishing Target Energization Time Periods and Procedure for Customers to Report Energization Delays

36 Powering Up Californians Act SB 410

| Soft Costs for Utility to Track in Phase 2 | Proposed Way to Measure in Phase 2 | Mitigation Measures | Use Case |
|---|---|---|---|
| **Pole-Mounted PG&E Greenbook Challenges** | Pole-mounting EV charging on PG&E owned and operated streetlight circuits with the current Greenbook add additional coordination and siting costs for utilities and technology providers. For example, a pole-mounted vendor has experienced prolonged feasibility review timelines due to unclear internal rule interpretation, both within the Curbside EV Charging Pilot local to the Bay Area and across other projects in PG&E's service territory. These delays are largely driven by the need to assess how new pole-mounted EVSE technologies align with existing safety requirements and regulations, particularly within the Greenbook context.<br><br>The objective is to measure the additional time and administrative cost to evaluate new technology safety, Greenbook compliance, and internal interpretation of applicable standards. Additionally, to measure the amount of utility staff time to update the Greenbook to accommodate new pole-mounted charging. | **Leverage Utility Contacts at other Pilots and Programs for PROW**<br>• Reach out to other utility staff for how they have worked through their Greenbook (i.e. Portland for the EVCROW project and LADWP). | PROW |

By measuring these dynamics at a granular level, Phase 2 aims to isolate which elements of utility processes most consistently slow projects, and which can be streamlined without compromising safety or regulatory compliance. Lastly, the table links each high-priority soft cost to applicable PCC charging use cases to support technology-specific decision-making. While many of these soft costs cut across smart outlets, PROW charging, and community charging hubs, their magnitude and relevance vary by deployment context. Identifying where soft costs are universal versus use-case-specific will help PG&E determine which mitigation strategies should be standardized across programs, and which should remain tailored.

## 9.2. AHJ High Priority Soft Costs to Measure in Phase 2

For each AHJ soft cost, Table 18 pairs detailed measurement objectives with mitigation strategies designed to test whether coordination and policy adjustments can meaningfully reduce permitting friction. For standard AHJ permitting, Phase 2 will evaluate the effectiveness of facilitated lessons-learned discussions and working groups among AHJs, leveraging EPIC 4.03 findings to share best practices beyond baseline permit streamlining checklists. For PROW dual permitting, Phase 2 will assess whether longer and more predictable PROW access timelines, such as extended permit terms informed by pilots like Seattle's EVCROW program, can reduce administrative burden and improve developer participation. These mitigation measures are intentionally practical and policy-relevant, allowing PG&E and AHJs to assess feasibility alongside impact.

Table 18 identifies two high-priority AHJ-originated soft costs to be measured in Phase 2 and pairs each with a targeted mitigation strategy. While AHJ permitting challenges are frequently cited in prior studies, Phase 2 focuses on isolating the specific process steps, decision points, and coordination requirements that materially extend project timelines under real-world conditions across priority AHJs. As mentioned in Section 6, permitting timelines are primarily process-driven, aside from the EVCS streamlining status. For instance, two streamlined AHJs might both have the same status in the lens of California Regulatory; however, they result in drastically different average numbers of days from application submission to permit issuance.

The table highlights two AHJ soft cost categories with standard AHJ permitting processes and PROW dual-permitting processes that are not consistent between AHJs and sometimes non-existent procedurally for PROW EV charging. For conventional permitting, delays often arise from incomplete or unclear submittals, zoning interpretation challenges, variability in portal versus in-person workflows, and reviews that extend beyond a single department. For PROW charging, these challenges are compounded by the need to secure both Public Works encroachment permits and Building or Planning permits, often across unfamiliar or newly established permitting pathways. Table 18 defines how Phase 2 measures these costs by tracking total staff hours, number of departments involved, resubmittal frequency, review sequencing, and the incremental time added by specific permitting steps.

For each AHJ soft cost, Table 18 pairs detailed measurement objectives with mitigation strategies designed to test whether coordination and policy adjustments can meaningfully reduce permitting friction. For standard AHJ permitting, Phase 2 will evaluate the effectiveness of facilitated lessons-learned discussions and working groups among AHJs, leveraging EPIC 4.03 findings to share best practices beyond baseline permit streamlining checklists. For PROW dual permitting, Phase 2 will assess whether longer and more predictable PROW access timelines, such as extended permit terms informed by pilots like Seattle’s EVCROW program, can reduce administrative burden and improve developer participation. These mitigation measures are intentionally practical and policy-relevant, allowing PG&E and AHJs to assess feasibility alongside impact.

**Table 18. AHJ High Priority Soft Costs to Measure in Phase 2**

| Soft Costs for Utility to Track in Phase 2 | Proposed Way to Measure in Phase 2 | Mitigation Measures | Use Case |
|---|---|---|---|
| **AHJ Permitting Process and Timeline** | The AHJ permitting process, including navigation of zoning classifications for AHJ staff and the use of online portals versus in-person permitting, represents a significant soft cost and timeline driver for EV charging projects. Incomplete or unclear permit submittals are a major source of delays across jurisdictions.<br>The objective is to measure the total number of hours spent working through each priority AHJ process, from initial application submission through plan approval and permit issuance, to note the average number of days added for specific parts of the process. Additional metrics include the number of AHJ departments involved when review extends beyond the building or planning department, as well as whether the project triggers CEQA review or qualifies for ministerial environmental review. If resubmittals are required, further measurement should capture the total hours spent on revisions, the number of permit revisions submitted, and the specific reasons why each revision was necessary. | **Facilitate Lessons Learned Discussions between AHJs**<br>• For instance, leverage the findings from EPIC 4.03 and the relationships PG&E has with AHJs to establish a working-group around AHJ permitting processes beyond adopting the EVCS Permit Streamlining Checklist steps. | Smart outlet, PROW, Community Hub |
| **AHJ PROW Dual-Permitting Process and Timeline** | AHJ PROW dual-permitting, which typically includes both a Public Works encroachment permit and a Building or Planning permit, represents a significant soft cost and timeline driver for EV charging projects. Incomplete or unclear permit submittals are a major source of delays, particularly because public-ROW EV charging is a relatively new permitting category for many AHJs and utilities.<br>The objective is to measure the total number of hours spent navigating the dual-permitting process, including the percentage of time attributable specifically to issuance of the Public Works encroachment permit. Additional metrics include documenting the reasons for delays across either permit type, the total number of departments and staff involved, and the administrative effort required to develop and revise supporting materials such as site plans, ADA routes, trenching diagrams, electrical drawings, and load calculations. If resubmittals are required, further measurement should capture the total hours spent on revisions, the number of permit revisions submitted, and the specific reasons why each revision was necessary before final approval. | **Establish Longer PROW Access Timelines for Developers**<br>• From the Seattle Department of Transportation EVCROW Pilot: "Private companies continue to express interest in PROW charging, though none expressed interest in applying under the annually renewed public space management permit. SDOT could address this by issuing a permit with a longer agreement length, covering some installation costs, or a combination of both. This issue must be addressed for any future version of EVCROW to be successful." To mitigate look at the PROW permit term structuring depending on the AHJ and look for longer agreement lengths. | PROW |

Together, the AHJ soft costs in Table 18 provide critical context for understanding where utility process improvements alone are insufficient to accelerate PCC charging deployment. While many mitigation levers in Phase 2 sit within PG&E's control, AHJ permitting and PROW access conditions often determine whether projects move forward at all. By measuring these dynamics consistently across use cases, Phase 2 will help PG&E identify where targeted collaboration, shared learning, or policy adjustments with AHJs are necessary.

# 10. Conclusion

## 10.1. Lessons Learned

Phase 1 research presented in this report confirms that PCCs represent a large, underserved, and strategically important market segment for PG&E's TE goals, especially in the dense, urban environments in the San Francisco Bay Area. Interest in EVs is high (72% of non-EV PCCs intend to choose an EV as their next vehicle, with that only falling to 65% for survey respondents without access to off-street parking), yet practical access to affordable, near-home charging is the limiting factor. PCCs are predominantly in MFH, and LI/DACs, face the steepest access and cost burdens, rely more on costlier public DCFC, encounter fewer chargers per capita, and experience longer waits and lower reliability at public charging sites. However, DCFC remains essential for corridors, fleets, and select high-throughput use cases; however, it is not a cost-effective or equitable default for daily charging among parking-constrained households.

Across MFH retrofits and PROW deployments, soft costs, such as permitting, design, utility coordination (Rule 29 timelines), ADA compliance, and multi-stakeholder administration, routinely outweigh hardware costs and pose the primary barrier to scale. Technically, the most cost-effective solutions by segment are clear: smart outlets for medium-PCC MFH; streetlight and curbside L2 to serve medium- and high-PCC areas; and community hubs as 24/7 anchors where on-site charging isn't feasible. Equity must be a siting gate, with EPIC allocations to DACs/LI embedded in selection criteria, and outreach must be multilingual and CBO-partnered, but timed after utility feasibility to avoid community fatigue.

## 10.2. Characteristics of an Ideal Demonstration Site

Ideal Phase 2 sites prioritize PCC-dense MFH and LI/DAC blocks, ensure 24/7 access, ADA-compliant geometry, and active enforcement to keep stalls available for EV charging needs. They leverage existing power (building service or streetlight circuits) where feasible to minimize Rule 29 exposure and de-risk timelines; they align with AHJ willingness and have transparent, ministerial permitting or a clear PROW pathway. Candidate sites should be screened using a GIS overlay (PCC density, LI/DAC layers, existing public charging, and feeder-level constraints via PG&E GRIP), then validated with site-specific feasibility. Finally, sites should enable standardized designs (e.g., pole-mount details, curbside layouts) and repeatable workflows that can scale beyond the pilot.

## 10.3. Suggestions for Stakeholders

### 10.3.1. PG&E and Utilities

Treat energization as the critical path, formalize utility–AHJ roles and responsibilities set realistic SLAs for Rule 29 milestones, track and publish time-to-energize by site type, and use feeder-level screening plus early feasibility to avoid late redesigns. Budget for and measure soft-cost drivers (staff hours, resubmittals, review cycles). PG&E should continue to explore the applicability of Rule 29 to projects in the PROW and seek to establish a pathway for those projects in the PROW to participate in Rule 29.

### 10.3.2. AHJs

Standardize and streamline permitting with AB 1236/970-aligned packets, checklists, and pre-approved design details; where possible, consolidate dual PROW permits and establish fast lanes for LI/DAC sites. Coordinate inter-department reviews (Public Works, DOT, Fire, Urban Forestry) to reduce sequential bottlenecks.

### 10.3.3. CBOs and Community Partners

Lead multilingual outreach and trust-building, focusing engagement after utility feasibility is confirmed; help track and report equity KPIs such as LI/DAC session share and customer pricing relative to home-charging benchmarks.

### 10.3.4. Vendors/Private EV Charging Providers

Participate in PPP/concession-style models with template agreements, uptime and data-sharing commitments, vandalism-resistant designs, and equity-oriented pricing (including optional low-income discounts) to protect affordability during scale-up. Validate O&M realism and utilization "sweet spots" before expansion.

## 10.4. Next Step: Phase 2 Demonstration Projects

Phase 2 should down-select and deploy the most promising solutions by segment: smart outlets in medium-PCC MFH; streetlight and curbside L2 in medium- and high-PCC corridors; and community hubs near everyday amenities for reliable, 24/7 access. Launch initial sites in priority Bay Area jurisdictions to accelerate learning where PCC density and AHJ readiness are high. Each project should measure (1) installation feasibility and time-to-energize, (2) soft-cost drivers and mitigation effectiveness, (3) utilization, reliability, and equity KPIs (sessions, LI/DAC share, pricing vs. home), and (4) O&M and vandalism outcomes. Results will feed a Soft-Cost Playbook, permit templates, standard design details, and a refined business-model toolkit (PPP/concessions) to scale deployments across PG&E territory. The overarching objective is to translate latent demand into access, reduce cost and complexity, and institutionalize repeatable processes that can be expanded rapidly and equitably in subsequent program cycles.

By aligning Phase 2 demonstrations with the segment-specific solutions, streamlined utility–AHJ processes, and equity-first siting practices detailed in this report, PG&E can convert high PCC interest into practical, affordable charging access. The path to scale lies in compressing soft costs, leveraging existing power, standardizing designs and agreements, and partnering through PPP/concession models, while measuring energization timelines, utilization, reliability, and LI/DAC benefits. These demonstrations will produce the toolkits and proof points needed to scale neighborhood charging across PG&E's service territory, accelerating EV adoption while advancing California's climate and equity commitments.