Transportation Electrification Framework

Energy Division Staff Proposal

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Executive Summary

California has ambitious climate, air quality, and economic development goals that will require broad electrification of passenger vehicles and fleets. California legislation, primarily Senate Bill 350 (DeLeon, 2015), requires that California's investor owned utilities (IOUs) support the widespread adoption of transportation electrification (TE) under the oversight of the California Public Utilities Commission (CPUC).

The CPUC launched the Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification (DRIVE OIR) in December 2018 to better coordinate the IOU TE programs and directed the Energy Division to create a framework for IOU roles and priorities. In response, the Energy Division staff proposes this draft Transportation Electrification Framework (TEF) to offer a new, holistic strategy for addressing how the IOUs will support the State's clean transportation and climate goals.

The TEF harnesses lessons learned from past CPUC proceedings, initial comments from participants in the development of the DRIVE OIR, research and regulatory efforts underway at other State agencies, and resources from other organizations. The TEF proposes guidance on a wide range of issues based on what we know now and identifies processes to use upcoming research, program results, and lessons learned to further define IOU roles and responsibilities.

All staff recommendations included in this draft TEF are intended to support the development of a final TEF that will be adopted by the CPUC. Given the number and complexity of issues included in this draft, Energy Division and decisionmakers will prioritize issues to finalize first, and there may be multiple decisions adopting the final TEF guidance.

Please see the accompanying ruling in Rulemaking (R.) 18-12-006 for information about how and when to respond to this staff proposal with public comment. Energy Division staff looks forward to receiving and responding to productive feedback and input from parties on the recommendations contained in this document and to holding workshops to flesh out preliminary recommendations that still require stakeholder input.

Transportation Electrification Framework (TEF) Strategy and Timeframe

The TEF establishes a new process for California's IOUs to develop 10-year strategic investment plans to support TE infrastructure. The IOUs' holistic TE plans (TEP) will focus IOU programs on investments with the highest value for meeting State TE goals while also supporting other State regulatory priorities. The timeline proposed in the TEF aligns with ongoing State efforts to identify the extent of infrastructure necessary to achieve the state's TE goals and the California Air Resources Board's (CARB) zero-emission vehicle regulations across a broad range of vehicle types and market sectors.

The TEF requires the IOUs to develop these holistic TEPs to identify priority market segments and their discrete roles in transforming the State's transportation sector. This planning process should build on existing progress and inform ongoing efforts at other State agencies and other IOU resource planning processes. This more holistic planning process will ensure the TE portfolios leverage existing modeling and forecasting results and inform future data collection, analysis, and planning strategies. TEPs should focus on the IOUs' core competencies, such as safely and reliably

delivering electricity, and provide 10-year plans with strategies to optimally integrate TE load onto the grid. The TEPs should also provide clear, long-term signals about the level of IOU investment in different sectors to encourage the development of third-party business models.

The IOUs should file their initial TEPs no later than one year after the CPUC adopts a final TEF. Subsequently, IOUs could file any proposed limited-scale TE pilot programs through a streamlined advice letter process and full TE programs by application on a regular schedule every two years. Energy Division staff intends to fully update the TEF every five years. Staff recommends the IOUs be required to update their TEPs every two years either in conjunction with new program applications, or as a standalone TEP update if an IOU chooses not to file any new application(s).

Near-Term Transportation Electrification Investment Priorities

The public process to finalize the TEF and review and adopt the IOUs' TEPs may take up to two years. During that time, near-term IOU investment may be warranted to address several already clear barriers to widespread TE. The TEF proposes guidelines for appropriate near-term IOU program applications that would represent "no regrets" approaches to addressing specific, defined TE barriers.

Any near-term IOU TE investment proposals must be aligned with one of the following State priorities: improving resiliency by utilizing the ability and availability of electric vehicles (EV) to provide and receive energy services during a grid outage and identifying methods to charge EVs during a grid outage; strategies to improve charging options for customers without access to home charging; supporting the electrification of medium and heavy-duty vehicles; and deploying lower-cost TE infrastructure in new building construction.

Scorecards for Reporting and Evaluation

The TEF Scorecard proposes targets and metrics to track IOU progress toward meeting State TE, climate, air quality, and equity goals. The Scorecard within the final TEF that the CPUC will adopt will include specific targets and metrics for the IOUs to track and work towards achieving for their individual programs as well as for their portfolio-wide strategies. In their TEPs, the IOUs will utilize this adopted Scorecard to identify the specific targets that they aim to achieve with their TE strategies, and the metrics that they will report to demonstrate progress towards State and IOU-specific goals. The Scorecard included in this staff proposal will be revised through a public comment process prior to the adoption of the final TEF.

Ongoing evaluation of existing TE programs and these Scorecards will ensure the IOU TE investments are moving the State toward its emission reduction and EV adoption goals and will inform updates to the TEF and TEPs. The TEF proposes that IOUs include a budget for evaluation in their TEPs and recommends Energy Division staff release an Evaluation Plan setting forth a schedule and budget allocations for needed evaluations and studies.

Providing Clearer Transportation Electrification Program Guidance

The TEF also intends to provide clearer guidance to the IOUs about their role in deploying TE infrastructure and strategies to support the development of third-party TE business opportunities. Many of the recommendations proposed in this draft TEF strive to reduce the time and resources needed to resolve controversial issues that have previously been addressed on a case-by-case basis in

each program application, such as IOU ownership of charging stations, cost recovery mechanisms, equity, and safety.

IOU Role in Transportation Electrification Infrastructure

IOUs have and will continue to play a critical role in TE infrastructure deployment, whether through strategically-designed ratepayer-funded programs or the IOUs' core business of delivering electricity. Through multiple proceedings, the CPUC and parties have worked to ensure IOU investments do not hinder the development of competitive marketplaces for TE infrastructure. Relitigating issues such as IOU ownership of TE infrastructure has provided insufficient guidance for third-party investments and long-term strategic planning. Further, CPUC and stakeholders, including the IOUs, have lacked sufficient data and market analysis upon which to base decisions on infrastructure planning and the potential for unfair competition. Given the need for rapid scale-up of TE infrastructure, the TEF proposes a strategy to determine the role IOUs should play in the near term in different market segments and how their roles should evolve over time.

Equity

The core issues which widespread transportation electrification (TE) seeks to address—air quality and climate change—affect all Californians. Some communities across the state experience unfair treatment and disproportionate impacts from environmental hazards, economic burdens, or both. The TEF identifies equity-related barriers and goals, and strategies to help ensure IOU programs provide historically underserved communities access to the benefits of clean transportation options.

Safety

Safety is a priority for the CPUC across all IOU operations. TE programs have historically been required to comply with safety requirements established and adopted through individual proceedings. The TEF requires IOUs to review whether any new TE-related safety requirements are necessary for consumer and installer safety, and to consider whether any incremental workforce training is needed to support the scale of TE infrastructure installation expected in their TEPs.

Technology and Standards

Energy Division staff recognizes that TE technology is rapidly evolving, and that new standards are being developed and deployed to improve open access across EV charging networks and compatibility of TE infrastructure across service territories and varying IOU investment programs.

The TEF includes requirements for future IOU TE programs to meet the EV charging infrastructure standards and timelines adopted by other State agencies related to EV charging infrastructure. The TEF also recommends the IOUs align their vendor criteria across similar programs, and to only support networked charging stations when investing in public or private, but shared, Electric Vehicle Supply Equipment (EVSE). It also identifies existing national standards for cybersecurity and suggests the IOUs engage with federal efforts to adopt standards to ensure their TE infrastructure is protected from the risk of cyberattacks.

The TEF builds on existing IOU and CPUC efforts to improve the interconnection process through the Rule 21 proceeding and proposes strategies to ensure these interconnection processes also streamline the deployment of new EVSE and accommodate increasing TE load. The TEF proposes requirements for IOUs to make their existing application queues more transparent and identify

strategies to ensure the individual customers do not bear the full cost of distribution and service line upgrades necessary to support EV adoption by multiple customers.

Transportation Electrification and Customer Rates

Electric rates offered to EV drivers and host customers offering charging must adhere to cost-causation principles and ensure customers are making economically efficient decisions about their energy usage. Importantly, rates should ensure EV charging supports the growth of clean electric generation and provides additional grid benefits. The CPUC also has a legislative mandate to ensure electricity as a transportation fuel is cleaner and available at a lower cost than fossil fuels.

As part of the CPUC's ongoing effort to ensure new vehicle load is integrated to the electrical system efficiently, the TEF proposes a roadmap for IOUs to offer optional dynamic rates for all customers, and transition commercial EV customers to default dynamic rates over time. EV rates could be use case specific in the near-term but should evolve over time to be available across technologies and reflect more dynamic conditions associated with the California grid as more renewable energy and electric load is added.

Partnerships

The TEF proposes strategies for the IOUs to collaborate with other entities when developing their TEPs so their proposed investment programs meet the needs of their service territories, leverage other non-IOU TE infrastructure development efforts, and address local air quality needs. It identifies opportunities for public-private partnerships and coordination with other State agencies, regional air districts, metropolitan planning organizations, and community choice aggregators.

Additional Policy Guidance

The TEF provides guidance on other policy issues identified in the DRIVE Scoping Ruling. This includes coordination across IOUs on vehicle-grid integration; marketing, education, and outreach; their participation in the Low-Carbon Fuel Standard; and emerging trends such as transportation network companies (TNCs), micromobility, and autonomous electric vehicles. These issues may be emerging today but should be considered in TEPs given their potential to substantially impact transportation sector.

Conclusion

California's ambitious climate, air quality, and TE adoption goals require a robust but targeted response from the IOUs. The TEF leverages research and expertise from a range of agencies, stakeholders, and experts to provide direction for IOUs to file comprehensive 10-year plans, streamline the CPUC's consideration and adoption of future TE investment programs, and align the CPUC's TE efforts with other State, regional, and local TE programs.

1. Introduction

The Transportation Electrification Framework (TEF) creates a new transportation electrification (TE) planning process to prioritize California investor owned electric utilities' (IOUs) programs and investments in support of the State's ambitious and critical TE goals.

Since 2016, the CPUC has authorized the IOUs to spend more than one billion dollars in ratepayer funds on TE infrastructure to enable and provide charging for electric vehicles (EVs).[1] The CPUC has further directed the IOUs to adopt processes to ensure that incremental vehicle load does not cause adverse grid impacts. Over the course of 2018 and 2019, the IOUs filed applications with the CPUC requesting nearly another one billion dollars for additional infrastructure programs.

Each IOU application proposing a TE program has been evaluated on a case-by-case basis without a consistent analytical framework to prioritize TE market segments[2] or a clear strategy to identify the appropriate IOU role(s) within each segment. While the CPUC has approved innovative and beneficial TE programs, the market, ratepayers, and regulators would all benefit from creating comprehensive CPUC guidance for what IOU applications should contain, and when and how they should be submitted. This is especially true given the complexity of the nascent TE marketplace and the stringency of California's policy goals. The CPUC must consider a wide range of utility functions that are necessary to further TE goals and reduce greenhouse gas (GHG) emissions and air pollution in a way that preserves or enhances a wide range of utility functions. This includes providing safe and reliable electricity service, addressing equity, utilizing renewable energy and others.

The TEF intends to build on progress achieved through the IOUs' programs thus far and also:

- Provide a clear vision and effective guidance to ensure that IOUs conduct holistic planning to focus their TE programs on opportunities with the highest value for meeting state TE goals, while also supporting other state regulatory priorities.
- Establish a structured process to reduce the time and resources needed to resolve controversial issues that were previously addressed on a case-by-case basis.

The CPUC launched this shift in IOU TE planning through the Rulemaking for the Development of Rates and Infrastructure for Vehicle Electrification (DRIVE).[3] The DRIVE Rulemaking (R.18-12-006) and the proceeding's May 2, 2019 Scoping Memo direct CPUC Energy Division staff to develop a TEF to guide comprehensive strategies that inform future IOU investments and accelerate widespread TE.[4] This TEF provides a clear process for the IOUs to develop strategic 10-year TE Plans (TEPs) with a regular cycle to submit applications for TE program proposals. The TEF also provides guidance for the development of the IOUs' TEPs, as well as the applications and

[1] The California Public Utilities Commission (CPUC) has authority over the IOUs' TE programs. Specifically, the CPUC directs the IOUs to address specific policy needs and then approves and oversees the TE programs and costs the IOUs are authorized to recover from ratepayers.

[2] A TE segment is a part of the transportation sector such as transit bus charging or, MUD passenger vehicle charging.

[3] The DRIVE OIR is available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M252/K025/252025566.PDF (Accessed on December 9, 2019)

advice letters filed consistent with the TEPs, to efficiently and effectively advance TE in support of California's ambitious climate and clean transportation goals.

1.1 California's Transportation Electrification Goals and Infrastructure Needs

Statewide Climate, Air Quality, and Energy Goals

The California Global Warming Solutions Act (AB 32, Nunez & Pavley, 2006), requires all State agencies to implement measures that collectively reduce GHG emissions to 80 percent below 1990 levels by 2050.[5] The transportation sector will play a critical role in meeting this target, because it is the single largest source of the State's total GHG emissions.[6] The Clean Energy and Pollution Reduction Act (SB 350, De Leon, 2015) found that electrification of the transportation sector could reduce GHG emissions by 70 percent and ozone-forming air pollutants by 85 percent.[7]

In response, California has adopted ambitious TE goals that will require a similarly ambitious scale-up of TE charging infrastructure:

- Governor Brown issued Executive Order (E.O.) B-16-12 in 2012 establishing a goal of 1.5 million zero emission vehicles (ZEV) on the State's roads by 2025.[8]

- The Legislature codified E.O. B-16-12 through SB 1275 (DeLeon, 2014) "to, among other things, place in service at least 1,000,000 zero-emission and near-zero-emission vehicles by January 1, 2023, and to increase access for disadvantaged, low-income, and moderate-income communities and consumers to zero-emission and near-zero-emission vehicles."[9]

[5] AB 32 added Division 25.5 commencing with Health and Safety Code Chapter 488 §38500.

[6] In 2016, the California Air Resources Board found that GHG emissions from the transportation sector represented more than 39 percent of the state's total, when tailpipe emissions from on-road vehicles and direct emissions from other off-road mobile sources are measured. That 39 percent calculation did not include emissions from petroleum refineries and oil production. When emissions from fuel processing is included, the transportation sector represents more than 41 percent of the state's GHG emissions in 2016. See CARB's 2000-2018 GHG Emissions Trends report from 2018, available at https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_trends_00-16.pdf (Accessed on December 9, 2019.).

[7] SB 350 cites the State Alternative Fuels Plan. The analysis and more background is available at https://ww3.arb.ca.gov/fuels/ab1007/ab1007.htm (Accessed on December 5, 2019). Emission benefits will continue to increase as more renewable electricity is deployed.

[8] A note on terminology: The CPUC's initial Alternative-Fueled Vehicle rulemaking was launched prior to the state's prioritization of transportation electrification and included consideration of other fuels including natural and renewable natural gas. Since 2009, however, legislation and Executive Orders have established a priority on plug-in electric and hydrogen fuel cell vehicles that are not sources of emissions when in operation, also known as ZEVs. Currently, ZEVs consist almost entirely of plug-in electric vehicles (EV) including battery electric vehicles and plug-in hybrid electric vehicles. PHEVs have both an electric drive train and a conventional, gasoline-fueled drive train. The battery can be recharged by plugging into an external outlet as well as by the on-board gasoline-fueled engine. Deployments of hydrogen fuels cell vehicles, another type of ZEV, have been limited.

[9] See the Legislative Council Digest at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1275. Last accessed January 13, 2020.

- Governor Brown issued E.O. B-48-18 in 2018, increasing the ZEV target to five million ZEVs on the road by 2030 and requiring installation of 250,000 public charging stations, including 10,000 direct current fast charging (DCFC) stations in operation by 2025.[10]

Transportation Electrification Infrastructure Needs

The need for new electric infrastructure to support these goals is clear. EV adoption today is limited in large part by insufficient charging infrastructure, even though the total cost of ownership of an EV is often lower than that of internal combustion vehicles, largely due to lower fueling and operating costs.[11] The California Energy Commission (CEC) has found that currently installed and funded charging stations will only meet about two-thirds of the public charging stations necessary to meet the Governor's 2018 goals. In addition, meeting California's goals will require dramatic scale-up of non-public charging at multi-unit dwellings (MUDs) and workplaces to support the nearly tenfold increase in EVs that are necessary to meet 2030 State goals.[12],[13] However, a number of barriers limit TE infrastructure deployment, as noted later in Chapters 4 and 6.

TE must also play an essential role in meeting the State's other energy goals. Each of the IOUs has implemented EV-specific customer rates designed to help encourage EV battery charging at times when grid capacity is the greatest. Some EV-specific rates support the integration of increasing generation from renewable resources into the electric system by encouraging charging at times when renewable resources are abundant. IOUs are also participating in critical efforts to develop more advanced technical and policy solutions to increase vehicle-grid integration (VGI) across all customer classes.[14]

These important efforts are also essential to meet long term goals such as the California procurement planning goal of 100 percent carbon-free electricity by 2045 (SB 100, DeLeon, 2018). Electric load from TE is likely to grow nearly tenfold between now and 2030 and will play an

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[10] DCFC is defined as a charging station that rapidly charges a car battery by connecting it directly to a higher power, direct current source (see D.18-05-040 at 6).

[11] Scott Hardman, et. al., "A Review of Consumer Preferences of and Interactions with Electric Vehicle Charging Infrastructure," Transportation Research Part D, pp 508-523. Other potential barriers to EV adoption include upfront vehicle cost and range anxiety (which is also related in part to infrastructure availability for public charging).

[12] "2019-2020 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program", CEC, 2019. Available at https://ww2.energy.ca.gov/altfuels/2018-ALT-01/documents/. (Accessed on January 15, 2020)

[13] There were 655,088 electric vehicles on the road in the state as of October 7, 2019 according to Veloz, which will need to increase nearly ten-fold to meet California's goal of five million ZEVs on the road by 2030. https://www.veloz.org/sales-dashboard/ (Accessed on December 5, 2019)

[14] As defined in the draft VGI Glossary of Terms developed by the 2017 Vehicle-Grid Integration Communication Protocol Working Group, VGI is "a very broad term that encompasses the many ways in which a vehicle can provide benefits or services to the grid, to society, the EV driver, or parking lot site host by optimizing plug-in electric vehicle (PEV) interaction with the electrical grid. VGI includes both active management of electricity (e.g., bi-directional management, such as vehicle-to-grid [also known as V2G] or unidirectional management such as managed charging [also known as V1G]) and/or active management of charging levels by ramping up or down charging. VGI also includes passive solutions such as customer response to existing rates, design of improved utility rates (e.g. time-of-use (TOU) charges, demand charges and customer fees), design of the grid to accommodate EVs while reducing grid impacts to the degree possible, and education or incentives to encourage charging technology or charging level (e.g. rebates for lower level charging, modifying current allowance policy). See the full glossary for more detail. Available at https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455744 (Accessed on January 31, 2020)

increasingly critical role in meeting California's energy policy goals by providing a flexible resource to absorb increasing levels of clean, renewable energy.

1.2 Legislative Authority for Investor Owned Utilities' Transportation Electrification Programs

SB 350 (DeLeon, 2015) established the primary policy framework for the CPUC's oversight of implementation of California's TE policy goals via IOU activities.[15] SB 350 defines TE, establishes TE as a critical component of the State's GHG and air pollution reduction strategies, and directs the CPUC to require IOU investment in TE programs in consultation with the CEC and the California Air Resources Board (CARB). For instance, SB 350 established Pub. Util. Code §740.12(b) which directs the CPUC to:

"…approve, or modify and approve, programs and investments in transportation electrification, including those that deploy charging infrastructure, via a reasonable cost recovery mechanism if they are consistent with this section, do not unfairly compete with non-utility enterprises as required under Section 740.3, include performance accountability measures, and are in the interests of ratepayers as defined in Section 740.8." Also, "[P]rograms proposed by electrical corporations shall seek to minimize overall costs and maximize overall benefits."

The Public Utilities Code (Pub. Util. Code), Section 237.5 defines "transportation electrification" to mean the use of electricity from external sources, including the grid, to reduce air pollution and GHGs for mobile sources that are all or part of vehicles, vessels, trains, boats, or other equipment; as well as programs and infrastructure investments to enable and encourage this electrification. The authors of SB 350 state that their intent in directing IOUs to invest in TE is informed by the following:

1. Widespread TE is needed to achieve the goals of the Charge Ahead California Initiative (which includes EV deployment goals and increased access for disadvantaged, low-income, and moderate-income communities and consumers.[16,17]
2. Widespread TE requires electrical corporations to increase access to the use of electricity as a transportation fuel.
3. Deploying EV charging infrastructure should facilitate increased sales of EVs by making charging easily accessible and should provide the opportunity to access electricity in public and private locations.
4. Widespread TE should stimulate innovation and competition, enable consumer options in charging equipment and services, attract private capital investments, and create high-quality jobs for Californians, where technologically feasible.

[15] SB 350 was codified in Pub. Util. Code §740.12 and § 237.5."

[16] The Charge Ahead California Initiative revised Health and Safety Code Division 26, Part 5, Chapter 8.5 (commencing with Section § 44258) and sets goals including at least one million zero-emission and near-zero-emission vehicles on the road by January 1, 2023, and increasing access for disadvantaged, low-income, and moderate-income communities and consumers to zero-emission and near-zero-emission vehicles. The California Air Resources Board administers the initiative.

[17] Widespread TE includes meeting 2030 ZEV deployment goals and achieving light-, medium- and heavy-duty sector longer term electrification levels to achieve an 80 percent reduction in greenhouse gases below 1990 levels by 2050.

Deploying EVs should assist in grid management, integrating generation from eligible renewable energy resources, and reducing fuel costs for vehicle drivers who charge in a manner consistent with electrical grid conditions.

In addition to SB 350, several other California bills have established legislative TE priorities. These additional bills and are listed in Appendix A and are also referenced within the TEF where they provide direction regarding specific topics.

1.3 Current Investor Owned Utility Programs and Applications

IOU TE programs must play a critical role in supporting these goals by filling TE infrastructure gaps and supporting other energy policy goals. The CPUC approved and authorized the IOUs' first charging infrastructure pilot programs for light-duty vehicles in 2016.[18] After SB 350 was codified into law, the CPUC set forth guidance for the IOUs' initial applications to implement the new statutory TE requirements.[19] In 2018, the CPUC adopted decisions authorizing SB 350 pilots and programs for the three large IOUs, which largely address medium and heavy-duty (MD/HD) TE sectors. Including previous decisions, the CPUC has authorized $986 million of ratepayer funding for the large IOUs and a combined $10.8 million in funding for Bear Valley Electric Service (BVES), Liberty Utilities, and PacifiCorp.[20] These programs are summarized in Appendix B.

The CPUC has also authorized BVES, Liberty Utilities, PG&E, and SCE to implement rates designed to reduce the cost of using electricity as a transportation fuel for commercial customers, and all of the IOUs other than PacifiCorp offer EV-specific time-of-use (TOU) rates for residential customers. Details about the current EV rates available in California are included in Appendix G.

The IOUs have filed the following infrastructure program applications, which are currently pending as of January 2020:

- SCE filed Application (A.)18-06-015 requesting approval for Charge Ready 2 to install and own light-duty TE infrastructure; to provide rebates for TE infrastructure in new construction; and to provide marketing, education, and outreach (ME&O).
- SDG&E filed A.19-07-006 requesting approval of a rate for high-powered EV charging stations intended to reduce demand charges for commercial customers deploying charging ports.
- SDG&E filed A.19-10-012 for CPUC approval to extend and modify the Power Your Drive pilot program to install EV charging infrastructure at MUDs and workplace locations.

Other open proceedings related to TE are included within the stocktake that Energy Division previously compiled.[21] The DRIVE Rulemaking also scopes in additional TE-related issues that are

[18] Decisions (D) D.16-01-023, D.16-01-045, D.16-12-065 authorized SCE, SDG&E, and PG&E to each deploy infrastructure programs that install or support the installation of Level 2 electric vehicle supply equipment at workplaces and multi-unit dwellings.

[19] The Assigned Commissioner's Ruling providing guidance on the initial SB 350 applications is available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M167/K099/167099725.PDF.

[20] Details of the IOUs authorized programs under SB 350 can be viewed at www.cpuc.ca.gov/sb350te (Accessed on January 13, 2020), and in D.18-01-024, D.18-05-040, D.18-09-034, D.19-08-026, and D.19-09-006, D. 18-09-034, D. D 18-09-034 and D. 18-09-034

[21] "Energy Division stocktake on related CPUC Proceedings" is available at: https://www.cpuc.ca.gov/zev/ (Accessed on December 5, 2019)

discussed but not fully addressed in this TEF, including rates, cost recovery mechanisms, submetering, and VGI.

Despite the significant efforts already underway, the ongoing barriers to widespread TE require a broad response, including robust utility strategies and programs to support TE infrastructure. The Energy Division staff proposal that follows highlights guidance for IOU solutions to address these barriers and unlock demand that will accelerate progress towards the States' goals of widespread TE adoption.

2. Transportation Electrification Framework Overview

This section provides an overview of the scope of this Energy Division staff proposal and includes a schedule for TEF updates that will resolve some issues that are not able to be fully evaluated and addressed in this initial staff guidance.

Question for Stakeholders
1. Identify any additional topics that should be addressed in the Transportation Electrification Framework (TEF), and why the TEF is the appropriate venue to address these topic(s). 2. Recommend whether a full California Public Utilities Commission vote is necessary to approve each TEF update, or whether Energy Division staff guidance is appropriate for each five-year update going forward.

2.1 Scope of the Transportation Electrification Framework

The DRIVE Scoping Memo directed Energy Division staff to establish a common comprehensive framework for review of proposed investments by the IOUs to stimulate transportation electrification (TE), aligned with the goals of Senate Bill (SB) 350. Although the CPUC has previously directed the IOUs to submit more holistic plans for their initial SB 350 TE portfolios,[22] none of the applications filed to date have contained TE infrastructure deployment planning strategies or projections for how to include incremental TE load into IOUs' distribution and transmission systems.[23] Given the growth in TE investment in recent years, it is now critical for each IOU to develop and propose its own long-term plan of investment strategies. This TEF includes specific guidance for how the IOUs should develop this plan and what it should include.

[22] In September 2016, the Assigned Commissioner's Ruling said the intent of its guidance was to "provide the utilities flexibility to maximize benefits and consider innovative program designs, while establishing a market signal toward widespread TE," and directed the IOUs to include within their initial SB 350 TE program applications a narrative that would "describe, tabulate, and/or graphically demonstrate how their TE portfolio, on the whole, meets the requirements of §740.12." See the 2016 ACR at 18 and A1. Accessed at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M167/K099/167099725.PDF. (Accessed Jan 13, 2020).

[23] The 2016 ACR directed the utilities to consider their "proportional share of [the] statewide goals," and "Their Integrated Resource Plans developed pursuant to §454.51; Emissions Reduction Trajectories compliance with the volume of emissions reductions within the timeframes set by the 2030 Scoping Plan and Mobile Source Strategy developed by the California Air Resources Board; [and] Demand forecasts to determine deferred or necessary infrastructure upgrades." 2016 ACR at A1.

The DRIVE Scoping Memo[24] directs staff to consider defining targets for the following topics within the TEF:

- IOU investments based on priority market segments.
- The appropriate IOU role in TE.
- Leveraging third-party investment.
- Alignment with other CCA and state agency programs.
- The role of emerging technology within IOU TE portfolios.

The Scoping Memo also directs Energy Division staff to consider:

- Outlining a streamlined program application and review process.
- Defining data gathering and tracking to measure IOU program success.
- Defining the role of the IOUs in conducting Marketing, Education, and Outreach (ME&O).
- Outlining rate design principles.

In the process of drafting recommendations to address these important issues, it became clear that Energy Division staff is still awaiting data and program evaluation results that are critical to proposing long-term IOU TE investment targets. For example, the IOUs' SB 350 pilots and programs are still being implemented, and evaluations are not yet complete. In addition, the CEC is developing its Infrastructure Deployment Strategy, an extensive modeling exercise to determine statewide TE infrastructure needs,[25] and CARB is updating a Mobile Source Strategy to define TE goals to 2050 and drafting multiple other TE-related regulations. Thus, in some areas additional planning is needed to define TE investment targets.

Accordingly, the TEF addresses the following topics:

- The development of a new, holistic, long-term planning process for IOU TE programs including a data-driven process to identify TE infrastructure gaps and prioritize IOU investments and roles.
- A Scorecard to track IOU progress toward meeting State goals, which includes both portfolio-wide and program-specific targets and reporting metrics.
- An initial effort to focus near-term IOU activities on "no regrets" investments specific TE infrastructure needs and statewide priorities, including resiliency; reaching customers without access to home charging; medium and heavy-duty vehicles; and support low-cost charging infrastructure at new construction where appropriate.
- Acceleration of TE deployment in disadvantaged communities and other historically underserved markets.
- Continued prioritization of safety for TE installers and TE program participants.
- Proposed technology and product standards requirements for IOU TE programs.
- Standards for processing applications for utility service to support TE infrastructure.
- Continued development of TE-specific rates, including a timeline for offering dynamic rate options to all customers.

[24] The DRIVE OIR Scoping Ruling can be accessed at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M285/K712/285712622.PDF. (Accessed Jan 13, 20202.)
[25] As directed by Assembly Bill (AB) 2127 (Ting, 2018)

- Partnerships that IOUs should leverage to ensure IOU TE infrastructure planning and programs support local, regional, and statewide TE infrastructure programs and priorities.
- Additional policy guidance on overarching issues such as vehicle-grid integration (VGI), ME&O for TE programs, and IOUs' Low Carbon Fuel Standard (LCFS) credit revenue.
- Emerging transportation trends and their role in IOU TE planning and future program design.

The TEF provides a framework for IOUs to plan TE investments and activities through 2030 including emerging trends and includes more detailed guidance for action the IOUs should take through 2025.

2.2 Policies Outside the Scope of the Transportation Electrification Framework's Policy Guidance

While the TEF encompasses a far-reaching range of policy issues, some issues related to ZEVs are beyond the legislative direction on IOU TE spending, such as infrastructure to build new hydrogen fueling stations.[26] The DRIVE OIR also identifies some priorities without requiring that Energy Division staff addresses them in the TEF and they may instead be addressed in other ways within the DRIVE OIR or another CPUC proceeding, such the TE-related applications that are already under CPUC review.[27]

2.3 Transportation Electrification Framework Updates

As the markets and business models associated with TE infrastructure deployment are largely nascent industries, Energy Division staff recommends regular updates to the approved TEF that will address topics such as:

- Lessons learned from a maturing TE market
- More complete results of IOU TE programs
- Changes in TE standards, technology, cost, and broader TE market developments
- Unforeseen issues that might arise as programs are implemented
- New State regulatory and legislative priorities

Energy Division staff anticipates that within five years of the issuance of this draft TEF, a TEF update will be needed to address these key issues to effectively and cost-efficiently implement the State's goals. Staff proposes to provide regular five-year TEF updates, starting in February 2025, to ensure the document aligns with rapidly changing TE technologies, ongoing market evolution, and incorporates lessons learned from IOU-funded pilots and programs.

Future updates may contain more specific metrics or targets, as discussed further in Section 3.2 (Targets, Metrics, and Reporting), add or remove investment priorities as necessary, and propose new criteria against which TE program applications may be weighed. Each TEF update will undergo

[26] Pub. Util. Code Section § 237.5, as created by SB 350, defines transportation electrification as "the use of electricity from external sources of electrical power, including the electrical grid." Since hydrogen fuel cells generate electricity onboard the vehicle, they do not fall under the TE definition adopted in SB 350. However, the potential design of rates for electricity used to generate hydrogen as a transportation fuel falls within the CPUC's broad authority to regulate electric rates.

[27] Details about the open CPUC TE-related proceedings other than the DRIVE OIR are available in Appendix B.

a public process to ensure all parties can provide feedback and guidance on any new or shifting priorities. The TEF updates will provide staff guidance to future IOU plans and program applications but would not require full CPUC adoption. IOUs' long-term Transportation Electrification Plans (TEP), their TEP updates, and their biennial program applications, will require full CPUC adoption, as described in Section 3 (Strategic Transportation Electrification Plans).

That said, as the TE market matures, the need for IOU ratepayer funded programs and activities should become clearer and also more tightly focused on supporting third-party business opportunities. The need for regular TEF updates may become less frequent as the TE market matures, so Energy Division staff may determine in the future that less frequent revisions will be necessary.

Recommendation

Energy Division Staff recommends that the California Public Utilities Commission:

- Authorize Energy Division staff to update the Transportation Electrification Framework (TEF) no later than five years after the issuance of this draft TEF and to provide a schedule for the next update in each TEF issuance.

3. Strategic Transportation Electrification Plans

3.1 Transportation Electrification Plans' Goals and Process

Summary

To ensure future TE programs maximize ratepayer benefits, Energy Division staff recommends the CPUC direct each IOU to develop a holistic, strategic 10-year TE plan (TEP), based on specific criteria described below. This TEF proposes firm requirements for the IOUs to complete more holistic TE portfolio planning that can serve as a roadmap for ratepayer supported TE investment programs moving forward.

In response to the directives adopted in the final TEF, each IOU's TEP should identify its planning processes for and proposed role in transforming the State's transportation sector through ratepayer investment and strategies to create competitive markets. Each IOU's planning process should incorporate ongoing efforts at other state agencies and within other resource planning processes that the IOU is conducting itself to ensure the TE portfolios leverage existing modeling and forecasting results and inform future data collection, analysis, and planning strategies. These holistic plans should consider their core competencies, such as reliably delivering electricity to customers, with creative programs designed to ensure incremental TE load is optimally integrated into their transmission and distribution systems. The TE strategies that an IOU puts forward in its TEP based on this planning should also provide clear, long-term market signals that encourage the development of third-party business opportunities.

The IOUs should file their initial TEPs no later than one year after the CPUC adopts the final TEF. Subsequently, IOUs could file any proposed TE pilot-scale programs through a streamlined advice letter process, and full TE programs by application on a regular schedule every two years. This

section also proposes a schedule for updating the TEF every five years, starting in 2025, and TEPs every four years, starting in 2026.

Questions for Stakeholders
1. Should the same requirements be adopted for the Transportation Electrification Plans (TEPs) of large and small investor-owned utilities (IOU)? If not, please provide proposed differences in detail. 2. What additional guidance is needed to inform how existing planning processes for IOUs and regulatory development efforts at other State agencies should be leveraged to develop TEPs? 3. What additional resources could be used if the outputs of the planning efforts described in the Transportation Electrification Framework are not available or useful for TEP development? 4. What resources should the IOUs draw from to develop budgets for their TEPs? 5. Should TEP budgets be established as a cap on an IOU's investments or a forecast of the programmatic costs? 6. Please identify any market, regulatory, or operational considerations that would justify defining a pilot program differently than it was previously defined in the 2016 Assigned Commissioner's Ruling, namely as one-to-two years in duration and with a budget less than $4 million. 7. Should an application template for TE program proposals be adopted in addition to the template for pilot projects filed by advice letter? If yes, identify the process for developing this template.

Background

Historically, the CPUC has evaluated the IOUs' TE program proposals on a case-by-case basis using a broadly defined balancing test[28] as well as guidance provided in SB 350 and other legislative or gubernatorial directives. Each case-by-case evaluation has incorporated stakeholder feedback to identify program designs that ensure the IOUs' TE programs are effective and do not unfairly compete or adversely affect the development of a competitive TE marketplace.

The process to date has not resulted in the IOUs proffering any comprehensive long-term TE planning strategies to propose the most effective use of ratepayer dollars to promote TE, nor has it provided long-term market signals or clear opportunities for third-party business opportunities that could be supported by IOU TE investments.

This section describes a proposed framework that requires the IOUs to develop robust strategic investment portfolios that support widespread deployment of TE infrastructure and utilize ratepayer funds effectively.

[28]The balancing test, applied in D.11-07-029 and reaffirmed in D.14-12-079, weighs the benefits of utility ownership of the EV charging infrastructure against the competitive limitation that may result from that ownership in order to determine if a particular circumstance merits IOU ownership of EVSE. D.14-12-079 titled "Phase 1 Decision Establishing Policy to Expand the Utilities' Role in Development of Electric Vehicle Infrastructure," lifted the blanket prohibition on IOU ownership of EVSE from D.11-07-029 and paved the way for a case-by-case assessment of IOU ownership.

3.1.1 Transportation Electrification Plans

Energy Division staff recommends that the CPUC order the IOUs to file holistic, strategic 10-year TEPs within 12 months of adoption of this TEF[29] to transition the TE planning approach:

- From: ad-hoc IOU applications that address disparate market segments and balancing tests that are insufficiently equipped to accurately assess market maturity

- To: a holistic IOU strategy that selects targets for TE investment based on priority market segments and accounts for State policy goals, TE market and technology evolution, infrastructure needs, other funding mechanisms for TE infrastructure, and other regulatory, market and operational factors.

The TEPs will be 10-year plans that include projected infrastructure needs in the IOU service territories, and include the IOU's investment strategies and specific targets based on priority market segments, estimated budgets to support expected IOU TE programs, and descriptions of programs the IOUs may propose to achieve the stated targets. These strategic plans will ensure IOU programs, and ratepayer-funded investments, are effective in achieving the State's TE goals and the associated GHG reductions for the electric sector.

The TEP process represents a significant evolution in strategic planning that will ensure that IOU programs align with the investment programs and regulatory efforts of other California agencies, as well as with the IOUs' overall responsibility for infrastructure and resource planning. The TEPs should address all topics discussed in the TEF, including equity, safety, and identifying strategies to address regional and local issues within each IOU's service territory. Appendix C includes a detailed checklist of what each TEP should include, and below we discuss how the IOUs should develop their TEPs and details about key elements they should contain.

3.1.2 Coordination with State Agencies

Energy Division staff appreciates the essential contributions of other State agencies during TEF development and will continue to collaborate during the finalization and implementation of the TEF. Interagency coordination is critical because ongoing regulatory efforts at other agencies will define the State's infrastructure needs to meet its TE goals, including:

1) Many state, regional, and local agencies have incentives and other programs to encourage TE, such as the CEC's CALeVIP,[30] which provides rebates for qualifying EV supply equipment (EVSE) through specific regional programs.[31] Results of and lessons learned from IOUs' pilots and programs can also help inform and shape innovative State and regional/local programs to increase TE infrastructure.
2) Energy Division staff seeks to align the TEF and future IOU program planning with ongoing planning and research by other State agencies regarding TE infrastructure

[29] Energy Division staff envisions this initial deadline to apply to the three large IOUs- PG&E, SCE, and SDG&E. The small and/or multi-jurisdictional IOUs may have delayed timing if the CPUC finds it is reasonable to authorize more time to develop their strategic TEP.

[30] Details about the CALeVIP program are available at https://calevip.org/ (Accessed on December 9, 2019)

[31] A stocktake of all existing TE-related state, local, and CCA programs was compiled by SCE in compliance with the May 2019 DRIVE OIR Scoping Ruling. (Southern California Edison, 2019) This document is available as part of the docket for R.18-12-006 at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M319/K457/319457683.PDF, (Accessed on December 9, 2019)

deployment strategies, persistent infrastructure gaps, and market maturity across various TE industry segments.[32]

a. California Energy Commission (CEC)
    i. CEC Electric Vehicle Infrastructure Needs Assessment: The CEC is leading a TE infrastructure needs assessment called the Infrastructure Deployment Strategy (IDS) in collaboration with CARB and the CPUC as required under AB 2127 (Ting, 2018).[33] The CEC is evaluating existing TE infrastructure and identifying areas where charging availability gaps remain for light-, medium, and heavy-duty as well as off-road vehicles. The CEC is seeking input from the IOUs, other utilities, and other stakeholders.[34] The CEC will then identify the remaining infrastructure needed to meet the State's goals for GHG reduction, air quality, and TE. Energy Division staff recommends using the IDS to guide the type, magnitude, and distribution of IOU investments once the CEC's analysis is available, and request feedback on additional resources that could be useful to inform the IDS analysis.
    ii. The CEC also evaluates technology and market maturity, including prioritizing sectors for investment and providing implementation guidance and specific technological criteria for its own incentive programs. For example, CEC is developing future technology standards for its CALeVIP program starting in 2021,[35] and has launched a new rulemaking to evaluate load management standards.[36]
b. California Air Resources Board (CARB)
    i. CARB Mobile Source Strategy (MSS): CARB's MSS demonstrates how the State can simultaneously meet air quality standards, achieve GHG emission reduction targets, decrease health risk from transportation emissions, and reduce petroleum consumption. SB 44 (Skinner, 2019) requires CARB to update its MSS by January 1, 2021.[37] CARB's regulatory documents and the research supporting them identify a pathway for electrifying the transportation sector, including medium- and heavy-duty vehicles. The MSS also outlines TE needs to support regional air quality improvements. Some regional air quality plans similarly identify TE priorities for meeting regional

[32] "2018 ZEV Action Plan: Priorities Update", Governor Edmund G. Brown Jr., 2018 is available at http://www.business.ca.gov/Portals/0/ZEV/2018-ZEV-Action-Plan-Priorities-Update.pdf.(Accessed on January 13, 2020) It was most recently updated in September 2018, defines key roles of state agencies by establishing goals and priority actions for every agency in the state with a role in TE.
[33] AB 2127 was codified as Chapter 365, Statutes of 2018, and created Public Resources Code §25229.
[34] The CEC is also seeking input and feedback from compliance entities such as transit agencies and fleet operators, automobile manufacturers, electric vehicle service providers, advocacy groups, and academia. See CEC Docket 19-IEPR-04 available at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-IEPR-04. (Accessed on January 13, 2020)
[35] See CEC Docket 17-EVI-01 https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-EVI-01 (Accessed on January 13, 2020)
[36] See CEC Docket 19-OIR-01 https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-OIR-01 (Accessed on January 13, 2020)
[37] "2016 Mobile Source Strategy", California Air Resources Board, May 2016. Available at https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf, Accessed on December 9, 2019

air quality goals.[38] The IOUs' TE program planning should reflect these plans and priorities.[39] Energy Division staff recommends using the MSS to help guide the scope of IOU TE investments, especially specific segments within the medium- and heavy-duty sectors.

ii. CARB is drafting and implementing numerous regulations to reduce emissions from the transportation sector including, but not limited to: Advanced Clean Cars,[40] Advanced Clean Trucks,[41] Innovative Clean Transit,[42] and Clean Miles Standard.[43] The IOUs should participate and collaborate with CARB staff in their regulatory development and implementation, and leverage resources developed through the regulatory process to inform their TEPs.

Figure 1 depicts Energy Division staff's vision of the interrelated agency processes the outputs that IOUs should ensure contribute to their 10-year TE infrastructure plans. The IOUs should coordinate with key State agencies to define the role of IOUs in transforming the transportation sector and to align investments with upcoming regulatory deadlines.[44] The IOUs should actively participate in CARB and CEC planning and research efforts to provide their expertise to support the development of these vital regulatory timeframes. These planning and research efforts will also inform future TEF updates, which may contain more specificity regarding IOU infrastructure targets once this research is completed.

Figure1: Regulatory Alignment Critical for Meeting State Goals

[38] For example, in its 2017 Bay Area Clean Air Plan, the Bay Area Air Quality Management District found that by 2050, 90 percent of the motor vehicle fleet needs to be zero-emissions, with heavy-duty vehicles powered by electricity or renewable liquid fuels. https://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en (Accessed on January 13, 2020)

[39] Local agency plans typically focus on TE activities needed to achieve air quality needs rather than specific TE implementation strategies. AQMDs focused on TE activities typically focus on grants and incentives and rely on CARB to adopt regulations. "South Coast Air Quality Management Plan", South Coast Air Quality Management District, 2016. Available at http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp (Accessed on December 9, 2019)

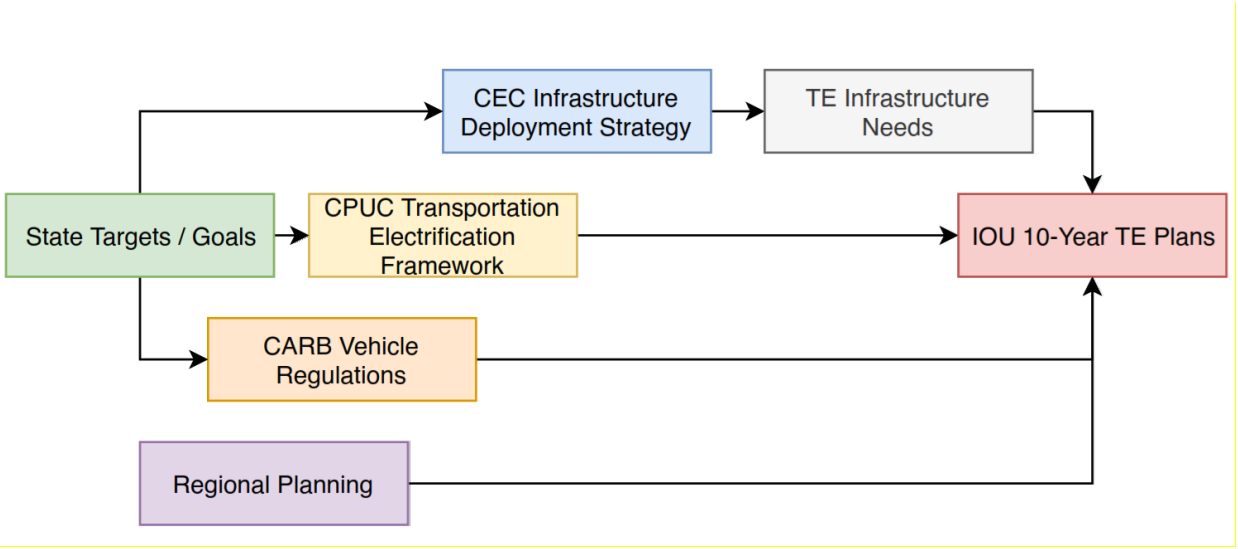
[40] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program (Accessed on January 30, 2020)

[41] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks (Accessed on January 30, 2020)

[42] https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit (Accessed on January 30, 2020)

[43] https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard (Accessed on January 30, 2020)

[44] See Section 4.1 below for more detailed recommendations on this collaboration.



3.1.3 Coordination with Third Parties

The IOUs should, to the maximum extent possible, design programs that encourage the development of sustainable third-party business models. Specifically, their infrastructure programs should largely target sectors within the TE markets that need more public-sector support and identify strategies to provide smaller subsidies to sectors that have more mature third-party business opportunities. This concept is discussed further in Section 4 (Investor-Owned Utility Roles to Accelerate TE Infrastructure Deployment).

Similarly, the IOUs should ensure their TEPs support the goals of local government planning organizations and are not redundant to TE programs already being offered by regional air districts or community choice aggregators (CCAs). SCE compiled a stocktake of programs that are offered by CCAs and air districts that has already been incorporated into the DRIVE OIR procedural record,[45] and further discussion of these potential partnerships is included in Section 10 (Partnerships).

The IOUs should ensure they consider the investments and programs private businesses and local/regional agencies are already providing, to determine whether any additional ratepayer funding is necessary to support those efforts, and to help identify clear areas where IOU programs are no longer necessary.

3.1.4 Coordination with Other Investor-Owned Utility Planning Processes

In developing infrastructure budgets and proposed deployment targets in the TEPs, IOUs should leverage and coordinate with their other resource planning processes including the Distribution Resource Planning (DRP) and Integrated Resources Planning (IRP) processes, as detailed further below. IOUs should also provide information about potential hiring, training, and the internal infrastructure needed to ensure a rapid, streamlined TE deployment process.

The TEP should also describe the impact of other IOU programs, such as the point-of-purchase vehicle rebate that will be funded by their LCFS revenue, on their TE load projections, and

[45] SCE's stocktake that is part of the DRIVE OIR record is available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M319/K457/319457683.PDF (Accessed on January 31, 2020)

strategies to align TE infrastructure upgrades with other investments to support building electrification and new building efforts.

Distributed Resources Planning

The IOUs' efforts to improve modeling and transparency of distribution system hosting capacity under the DRP proceeding (R.14-08-013) could be leveraged to support infrastructure deployment in regions where the incremental load would not trigger any distribution system upgrades, and where load management could defer otherwise necessary upgrades.[46]

Similarly, IOUs could use the existing Integrated Capacity Analysis (ICA) maps to evaluate locations where new TE load could be added without triggering any major distribution upgrades. That said the ICA maps and modeling efforts should be more clearly accessible on the IOUs interconnection application sites, or another publicly accessible venue, and regularly updated to ensure all TE market players can make investments at those more shovel-ready locations.[47] If preferred, the utilities could collaborate and use a similar methodology for utilizing their ICA maps to identify those locations with existing capacity that have potential to support incremental TE-related load.[48] The IOUs should ensure a strategy to provide the information about existing capacity that could support additional TE load is included in their TEPs, either within their existing ICA maps or through a separate mapping effort that is specific to load-only EV siting capacity.

While infrastructure gaps are being identified and evaluated through the CEC's IDS analysis, the IOUs should design and implement programs that install charging infrastructure at locations where the grid has excess capacity or where costly distribution upgrades could be deferred by incorporating load management solutions such as on-site renewable generation and storage facilities to offset some of the new incremental TE load.

The results from IOUs' initial TE programs and the DRP analysis described above should be leveraged to better define the magnitude of infrastructure investments necessary on the utility-side of customers' meters to help estimate the full the cost of meeting state TE targets and ZEV regulations. These results could be incorporated into future ICA maps or a separate TE-specific grid analysis to identify sites where TE infrastructure could be deployed without triggering immediate infrastructure upgrades and locations where projected TE load will require costly new distribution and/or transmission system upgrades over the next 10 years. For example, transit agency depots will

[46]Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769.(R.14-08-013) is available at https://apps.cpuc.ca.gov/apex/f?p=401:56:0::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R1408013 (Accessed on January 13, 2020)

[47] The final ICA report was filed on January 8, 2018 and is available at https://drpwg.org/wp-content/uploads/2018/01/ICA-WG-LTR-Report-Final.pdf (accessed on January 15, 2020).

[48] During the DRP proceeding, the utilities had different views on the best practices for developing a methodology for using the ICA maps for interconnection purposes. The final working group report recommended using a "streamlined method" that applies a common set of equations and algorithms to evaluate power system criteria at each node on the distribution system. See, for example, "Pacific Gas and Electric Company Appendix to Integration Capacity Analysis Working Group Final Report" Available at https://drpwg.org/wp-content/uploads/2016/07/ICA-WG-Final-Report.pdf. (Accessed on January 13, 2020)

be converting to electric buses over time could trigger the need for new substations.[49] Going forward, the IOUs' grid capacity analysis should account for CARB's new and pending ZEV regulations and help inform the CEC's IDS regarding existing infrastructure gaps.[50] The IOUs' TEPs should describe how their ICA maps, results from TE programs, and the CEC's IDS are used to inform the IOUs' near- and long-term program planning, and how the analysis of shovel-ready locations can best be broadcast to other investors willing or required to pay for TE infrastructure, including entities that need to comply with CARB regulations.

Integrated Resources Planning

One significant reason for requiring the TEPs is to encourage the IOUs to collaborate across their planning and strategy teams to fully evaluate the potential impact of increasing TE load on their distribution systems, and how to most effectively integrate it to the grid while serving the interests of ratepayers.[51] For example, the IRP process[52] is already evaluating resource needs through 2030, but it has not historically included detailed planning for new TE load at the magnitude needed to meet State goals.[53] Similarly, the transportation energy demand reference case adopted through the CEC's IEPR has not historically projected the level of EV adoption needed to meet state goals. The Draft 2019 IEPR, for example, forecasts that 4.6 million light-duty EVs will be on the road by 2030. Only the "aggressive" scenario shows the state meeting the 5 million ZEV adoption goal established in Executive Order B-48-18.[54]

The 2019-2020 IRP update will evaluate some more aggressive EV adoption scenarios to evaluate the impact to the system of high and rapid EV adoption to achieve a deeper decarbonization of the state's transportation sector.[55] IOUs should consider the more aggressive EV adoption models presented by the most recent CEC IEPR and the IRP update and determine the impact on their

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[49] The Innovative Clean Transit (ICT) regulations adopted by CARB took effect in October 2019 and require 100 percent of new buses to be zero-emission by January 2029, regardless of transit agency size. More details about the ICT requirements are available at https://ww2.arb.ca.gov/rulemaking/2018/innovative-clean-transit-2018. (Accessed on December 26, 2019).

[50] The CEC's infrastructure needs assessment will be updated biannually after it is initially released in December 2020 as directed in AB 2127.

[51] The "interests" of ratepayers is defined in SB 350 and Public Utilities Code §740.8.

[52] The CPUC has directed Load-serving entities (LSE) to develop integrated resources plans (IRPs) to incorporate this planning goal and to reduce GHG emissions to 42 million metric tons by 2030 for the electric sector. The IRP and Long-Term Procurement Plan (LTPP) is an "umbrella" planning proceeding to consider all of the CPUC's electric procurement policies and programs and ensure California has a safe, reliable, and cost-effective electricity supply. The proceeding is also the CPUC's primary venue for implementation of the SB 350 requirements related to IRP. It will implement a process for IRP that will ensure that LSEs meet targets that allow the electricity sector to contribute to California's economy-wide greenhouse gas emissions reductions goals.

[53] The 2019-2020 IRP Cycle is the first to consider the CEC's Deep Decarbonization scenarios for forecasting future EV load.

[54] The CEC's 2019 Draft IEPR update also includes preliminary metrics for electrified medium- and heavy-duty vehicles, based on CARB's vehicle incentive programs. The reference case does not project that those sectors will attain the level of electrification needed to meet CARB's regulatory timeframe. For example, it projects that only 25,000 EVs will be in the medium- and heavy-duty fleet sectors by 2030. The Draft IEPR is available at https://efiling.energy.ca.gov/getdocument.aspx?tn=230539 (Accessed on January 13, 2020)

[55] "Inputs and Assumptions: 2019-2020 Integrated Resource Planning", California Public Utilities Commission, November 2019 incorporates three scenarios based on a 2018 CEC Deep Decarbonization Report, including a 'High Electrification' scenario. More details about the 2019-2020 IRP's assumptions and inputs is available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/Inputs%20%20Assumptions%202019-2020%20CPUC%20IRP_20191106.pdf, (Accessed on November 29, 2019)

systems associated with supporting that level of incremental TE load. These more aggressive scenarios may impact whether utilities need to propose new load management programs to mitigate the impacts of growing TE load, propose new investment programs to support distribution system upgrades, and/or procure additional generation resources to meet growing TE-related load.

3.1.5 CPUC Process

IOUs must file and serve TEPs in the DRIVE OIR,[56] or any successor proceedings, and will undergo a public review and CPUC approval process. Once the CPUC adopts an IOU's TEP, the IOU would be authorized to file new program applications and pilot program advice letters. Energy Division staff recommends the CPUC adopt a schedule for initial program applications to conform with an IOU's adopted TEP. Subsequent program applications could be filed in the first quarter of every other year as part of each IOUs' TEP update. Pilot programs can be filed by advice letter, as described below, in the fourth quarter of each year.

While each IOU's TEP should span a full decade, the IOU should file updated plans every four years. Each TEP update should describe the current status of implementing the initial 10-year plans, results of ongoing programs, any changes that may be proposed in the current update, and how those proposed changes will affect the IOU's TEP costs and implementation timeline. As with the initial TEPs, each update should include specific budget estimates and program details for years 1-5 but may provide higher-level budget estimates and program designs for years 5-10.

3.1.6 Transportation Electrification Plan Structure

Each IOU should include a detailed investment plan of their proposed TE strategies and specific targets based on priority market segments for the next five years, including a preview of program(s) and pilot(s) each IOU intends to file after their TEPs are approved by the CPUC. For each TE strategy, the IOU should identify the barrier the strategy would help overcome, the specific market segment involved (if applicable), the target (See Section 3.2) the IOU is aiming to achieve, and an explanation of and justification for the IOU's proposed role. The IOU should include a total five-year TE budget for the entire plan, identifying the budget for each TE strategy. Given the uncertainty surrounding the evolution of TE infrastructure and EV markets and the CEC's ongoing development of a full TE infrastructure needs assessment, the final five years of the TEPs can provide more general details regarding the utility's plans and anticipated infrastructure budgets.

Each IOUs' TEP must fully address the issues defined in the TEP Completeness Checklist (Appendix C) and should fully explain any other issues it believes are crucial to its TE-specific planning processes and alignment with other IOU planning processes.

3.1.7 Expedited Advice Letter Process to Address Key Barriers

To effectively address key barriers to widespread TE, Energy Division staff recommends the CPUC allow a streamlined process for evaluating TE "pilot programs" that are up to two years in length and less than $4 million per project. There should be a $50 million cap for each large IOU's pilot programs and $10 million for each small IOU, over a five-year period. While larger TE programs would still be filed by application, IOUs could propose pilot-scale programs that address identified barriers to widespread TE via an advice letter. Energy Division staff recommends the IOUs' pilot program proposals initially focus on the proposed priorities identified in Chapter 5 (Pre-TEP

[56] R.18-12-006

Program Priorities).[57] Pilot-scale programs should have short implementation timeframes and be evaluated quickly after full implementation is complete to help inform new program designs and TEP updates.

In instances where pilot-level priorities could be addressed across all IOU service territories in the same time period, IOU programs should vary in structure to test different strategies.[58] This approach should prevent the IOUs from implementing identical pilots. Alternatively, each IOU could choose different barriers and investment priorities to test solutions in each of their pilot program filings.

The CPUC has previously attempted to streamline pilot proposal review and offer smaller-scale programs an expedited review process.[59] The 2016 ACR provided guidance for pilot-scale programs, stating they should be one to two years in duration and should cost less than $4 million per project, and be "non-controversial". Despite improved efficiencies, it took nearly a full year to review and approve targeted, small-scale proposals in the initial round of SB 350 applications.[60] Many of the projects proposed as "priority review" in A.17-01-020 et al., were deemed controversial by parties, so a clearer definition of the priorities and investment types that are fit for the TEF-related pilot process is necessary.

This TEF includes a proposed template (see Appendix D) that IOUs should use for a Tier 2 Advice Letter submitted to the service list of the DRIVE OIR and/or any subsequent TE proceeding to request approval of pilot programs. This will expedite the advice letter review process, and Energy Division staff can reject any proposal that does not fully align with the template.

Each pilot program should be consistent with the IOU's TE strategies identified in their TEP to support the State's TE goals. Pilot results and evaluations will inform Energy Division staff's regular TEF updates and identify potential changes to the IOUs' TEPs.

In proposing new TE pilots, the IOUs should leverage the results of past CPUC, CEC and/or CARB-funded programs, as well as completed programs by other entities within and beyond California. Energy Division staff encourages the utilities to incorporate the lessons learned from these past experiences, including those documented within the CPUC's EV Survey, updated most recently in 2018.[61]

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[57] The DRIVE OIR on page 23 directs Energy Division staff to, within its proposed TEF, identify "priority sectors for investment." Given the outstanding evaluation of existing IOU TE programs and ongoing efforts by the CEC to identify the state's infrastructure gaps, staff limited its definition of priorities to near-term investments identified as clearly described in Section 5.

[58] For example, the CPUC authorized different ownership models across the IOUs' initial light-duty vehicle infrastructure investment programs approved in 2016, to better identify the costs and benefits associated with IOU ownership of various portions of the EV infrastructure investments.

[59] SB 350 "priority review process" for smaller-scale pilot programs that met criteria established in the 2016 ACR The September 2016 ACR, for example, created a streamlined process for the IOUs to propose "priority review projects," with a combined budget of no more than $20 million per utility, and $4 million per project, that were smaller-scale and non-controversial. The CPUC reviewed those priority review programs on an expedited schedule and issued D.18-01-024 just over one year after the applications were filed.

[60] The three largest IOUs' initial SB 350 applications were filed on January 20, 2017, as directed in the 2016 ACR. D.18-01-024 authorized 15 priority review programs on January 11, 2018.

[61] Information about the EV infrastructure and VGI pilot survey, including links to download the most recent results, is available at https://www.cpuc.ca.gov/zev/ under the 'Resources' heading. (Accessed on January 13, 2020)

3.2 Application Process and Procedures

After the TEPs are reviewed and approved by the CPUC, utilities can serve large-scale TE program applications on the DRIVE OIR within the first quarter of each odd-numbered year to request approval of TE programs that follow their authorized 10-year plan. The schedule proposed in this draft TEF presumes that CPUC adoption of the initial TEF would occur by Q4 2020, the IOUs' would file TEPs 2021, and the IOUs TEPs would be adopted by the CPUC in 2022. If that schedule holds, the first round of full IOU TE program applications could be filed in Q1 2023.

If a utility does not submit a filing within the first quarter of the scheduled year, it should wait until the following odd-numbered year to request authorization for larger-scale programs.

Energy Division staff recommends the CPUC direct the IOUs to file their initial TEPs no later than one year after this TEF is adopted by the CPUC. As an example of how the schedule could move forward, if the CPUC adopts the TEF by the end of 2020, and the IOUs' initial TEPs are proposed in 2021 and adopted by the end of 2022, full program applications could then be filed in Q1 2023. If the IOUs do not choose to file program applications in Q1 2023, they should wait until Q1 2025 to file new program applications.

Energy Division staff recommends the CPUC's decision approving the IOUs' 10-year TEPs include a clear schedule directing the IOUs to file new full-scale program proposals based on the biennial process described above. The biennial program applications should be filed in alignment with and integrated with the IOUs' TEP updates as described below.

Beyond the regular biennial application process, the assigned Commissioner and/or the assigned Administrative Law Judge (ALJ)s may also issue ruling(s) calling for new program proposals to be filed if deemed necessary. Interim rulings calling for new TE applications would include more details the rationale for the additional application and the types of programs that should be prioritized.[62]

3.3 Transportation Electrification Plan Timing and Updates

The IOUs should provide regular TEP updates every four years that identify any changes to ZEV adoption forecasts and revisions to TE infrastructure needs and associated IOU investment targets. The TEP updates should be based on lessons learned from prior programs, major policy changes, and shifts in the TE market. Each TEP update should incorporate any new full program applications that have been approved since the prior TEP was adopted, and describe any new

[62] The IOUs would be directed to submit filings pursuant to Public Utilities Code § 740.12(b), which directs the CPUC to, in consultation with CARB and the CEC, "direct electrical corporations to file applications for programs and investments to accelerate widespread transportation electrification to reduce dependence on petroleum, meet air quality standards, achieve the goals set forth in the Charge Ahead California Initiative (Health and Safety Code, Division 26, Part 5, Chapter 8.5), and reduce emissions of greenhouse gases to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050."

strategies to address infrastructure and/or investment needs that differ from those identified in the IOUs' initial TEP or the modifications proposed in prior TEP updates.

The IOUs should plan to incorporate the CEC's biennial IDS updates, account for any changes in CARB regulatory timelines, and identify any new partnerships they are developing with third-parties and/or local government agencies in each TEP update and any biennial program applications they file.

After the CPUC adopts the IOUs' initial TEPs, the TEPs should be updated every four years, through a public stakeholder process within this proceeding or its successor. For example, if the initial TEPs are approved in 2022, the first full TEP update filings would occur in Q1 2026. The updates should be informed by the IOUs' participation in the CARB and CEC regulatory efforts and other CPUC proceedings described above and include any modifications that were proposed and approved through prior TEP updates and associated program applications, when necessary. Any updated TEPs would go through a full CPUC public process and would not take effect until adopted by the CPUC.

Recommendations

Energy Division Staff recommends that the California Public Utilities Commission (CPUC) should direct the investor-owned utilities (IOU) to:

1. File and serve 10-year strategic Transportation Electrification Plans (TEP) in the Rulemaking to continue the Development of Rates and Infrastructure for Vehicle Electrification (DRIVE OIR) within one year of the final adoption of the Transportation Electrification Framework (TEF).
2. Engage in ongoing State energy forecasting efforts and resource planning proceedings and use the most recent transportation electrification (TE) adoption projections from the California Air Resources Board's regulatory timelines, the California Energy Commission's infrastructure needs assessment, and the IOUs' Integrated Capacity Analysis (ICA) maps to develop the infrastructure targets and proposed budgets in the TEPs.
    a. Use the existing ICA maps to evaluate locations where new TE load could be added without triggering any major distribution upgrades.
    b. Design and implement TE programs that install charging infrastructure at locations where the grid has excess capacity or where costly distribution upgrades could be deferred by incorporating load management solutions.
3. Include all information identified in the TEP Completeness Checklist (Appendix C) in their TEPs.
4. Submit pilot proposals via advice letter using the pilot template proposed as Appendix D and serve the advice letter on the DRIVE OIR service list.
5. Submit large-scale program proposals the first quarter of every odd numbered year and serve the application(s) on the DRIVE OIR service list.
6. Provide full TEP updates every four years, starting in 2026.
7. Align TEP updates with any new issues and/or program priorities identified through the five-year Energy Division staff TEF update process.

Energy Division Staff Recommends that the CPUC:

1. Approve an advice letter process for an expedited review of pilot programs so long as IOUs use the advice letter template proposed in Appendix D.

2. Establish a cap of up to $50 million, over five-years for each large IOUs and $10 million for each small IOU, for pilot programs that are up to two years in length.

3.4 Targets, Metrics, and Reporting

Summary

The State's TE programs and regulations are working towards achieving the State goals discussed above—reduction in GHG emissions, improvements in air quality and public health, reduced dependence on petroleum, widespread TE, EV adoption, deployment of EV charging infrastructure, and equity. Through the planning process described within Chapters 3 and 4, the IOUs will propose within their TEPs future TE investment strategies to help overcome market barriers to achieve State goals. This section provides guidance intended to help the IOUs plan these TE investments in alignment with the overarching State goals and targets, and metrics to track whether the IOUs' programs and investments are supporting those goals and targets.

Energy Division staff has developed a Scorecard to identify metrics and types of targets for the IOUs' TE programs and their TEP investment plans. These targets and metrics will measure and demonstrate publicly the progress of the IOUs' TE investments in reaching our State goals. It is important to note that this proposed Scorecard framework is only a first step in the development. The CPUC should adopt a version of the Scorecard along with the final TEF, which will apply to the IOUs' TEPs and future IOU programs. Public input prior to TEF adoption will be a critical component to ensuring the Scorecard includes the appropriate types of metrics and targets, and input from CEC and CARB efforts will also inform the final Scorecard.

Questions for Stakeholders
1. How could the financial metrics proposed in the draft Scorecard be expanded and leveraged to help develop cost-effectiveness metrics? 2. Should the final Transportation Electrification Framework include firm targets and metrics the IOUs' Transportation Electrification Plans must address? Can those targets and metrics be addressed through the workshop and comment/response process described below? 3. What methodologies for calculating greenhouse gas emission and air pollutant reductions could be applied to IOU TE programs to better track their effectiveness? Should a new emissions reduction measuring methodology be developed specifically for transportation electrification infrastructure programs? 4. What additional cost data, if any, should the CPUC direct the IOUs to report as metrics? 5. Is there sufficient data, or a path to collect the correct data, to evaluate whether IOU TE programs or planned TE portfolios could cause downward pressure on customers' volumetric energy rates?

Discussion

3.4.1 Scorecard Targets

The proposed Scorecard identifies a variety of targets—both program-specific targets and portfolio-wide benchmarks. These are designed to measure and track the IOUs' progress toward supporting State goals, and to ensure the IOUs are accountable for their approved TE spending. In their

program applications and advice letters the IOUs should identify at least one program-specific target applicable to each proposed investment—each pilot, program, and rate. Some of the proposed targets are portfolio-wide, and would be applicable to the IOUs broadly, independently of their program and pilot filings.

The Scorecard targets are intended to be achievable and within the IOUs' core competencies. For example, the final Scorecard will include a target for the total amount of charging infrastructure resulting from IOU programs to support TE, and potentially the number of EV drivers persuaded to charge off-peak by an EV electric rate. Other program-specific targets will measure grid resiliency, backup power supplies, or investments in Environmental and Social Justice (ESJ) communities.[63] Such targets should track the IOU programs' success toward addressing barriers and achieving widespread TE.

The Scorecard proposes targets within various categories—infrastructure, equity, load management/VGI, and process improvement – which Energy Division staff have identified as important measures of progress toward meeting state goals. For example, a proposed Scorecard target is the *number of transit agencies electrified*. The Scorecard categorizes this as an *infrastructure target* and describes how staff recommends the CPUC implement the target.

Table 1: Proposed Scorecard Target Categories

Scorecard Target	Category of Target	Program vs. Portfolio	Description
Number of transit agencies electrified	Infrastructure Target	Program-Specific	Final Scorecard would set target number of transit agencies an IOU infrastructure program would need to electrify, based on the number of non-electrified transit agencies in the IOU territory

The full list of proposed Scorecard targets is articulated in Appendix E.

3.4.2 Scorecard Reporting Metrics

To complement the Scorecard targets, staff has developed proposed Scorecard reporting metrics. While the Scorecard targets establish achievable and desirable outcomes from TE programs and investments, the metrics are data collection requirements that staff finds will illuminate progress towards State and IOU-specific goals, in addition to providing valuable data to policymakers, industry, ratepayers, and research institutions. These proposed metrics aim to define data collection necessary to ensure the IOUs' investments are effective in meeting the Scorecard targets and broader State goals. Energy Division staff envisions that over time, some metrics may transition to become targets.

[63] See Chapter 6 for a detailed discussion of ESJ communities and equity in IOU TE planning.

Like the targets, some of the metrics would be program-specific and some would be portfolio-wide. However, the list does not comprehensively include the data collection requirements for each individual TE program and pilot. The CPUC may continue to require IOUs to use the Data Collection Template, which the CPUC adopted in several recent decisions, and is designed to track and report project and program-specific metrics and costs.[64]

One example of a proposed Scorecard metric is *location of all EV chargers deployed in the IOU service territory*. The Scorecard would categorize this as an *infrastructure metric* and includes a description of the metric, as shown below.

Table 2: Proposed Scorecard Metric Categories

Scorecard Metric	Category of Metric	Program vs. Portfolio	Description/Notes
Location of all EV chargers deployed in service territory, by zip code	Infrastructure Metric	Portfolio-Wide	The goal is to ensure the utilities are aware of EV load growth so they can plan for future investments and/or identify necessary upgrades

The proposed metrics categories are infrastructure, equity, financial, environmental, load management/VGI, and vehicle adoption. Energy Division staff may develop additional metrics to evaluate the impact of IOU TE spending on customer rates and whether incremental TE load is currently or may over time create downward pressure on customers' volumetric energy rates.

A full summary of the recommended Scorecard reporting metrics is listed in Appendix E.

The Scoping Memo for the DRIVE Rulemaking mentions cost-effectiveness metrics. However, given the nascence of the market, Energy Division staff does not recommend developing cost-effective targets for TE at this time. That said, the financial metrics category is critical to track infrastructure costs across an IOU's portfolio of investments and reporting could support future consideration of cost-effectiveness metrics.

3.4.3 Scorecard Development

Energy Division staff is proposing categories of targets that do not yet have numbers assigned to them for each IOU. Through a collaborative, stakeholder process, parties, the IOUs, and Energy Division staff will review initial results from the SB 350 priority review project evaluations,[65] forecasted data from the CEC's Infrastructure Deployment Strategy, and CARB's regulatory

[64] Data Collection Template adopted for the TE programs authorized in Decisions D.18-01-024, D.18-05-040, D.18-09-034, and D.19-08-026, and is adopted with modifications for D.19-09-006 and D.19-11-017. https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457045 (Accessed on January 15, 2020)

[65] CPUC Executive Director Alice Stebbins authorized an extension of time for the three large IOUs to file their evaluation results from the priority review projects authorized in D.18-01-024 on January 10, 2019. An interim evaluation report is due on January 11, 2020, and the final evaluation is due on January 11, 2021.

development and implementation timelines to finalize the proposed Scorecards for CPUC review and adoption in the final TEF.

Specifically, Energy Division staff is recommending a stakeholder workshop or workshops to discuss and receive input on the specific numbers assigned to the Scorecard targets, and potentially to discuss how to apply the data from the CEC's Infrastructure Deployment Strategy to the Scorecard once that data is finalized.

The workshop(s) will aim to further develop and refine the Scorecard to:

1. Gather feedback from stakeholders about whether the categories of targets and metrics are sufficiently comprehensive to track progress towards addressing State goals.
2. Determine whether the Scorecard should incorporate additional targets and metrics.
3. Determine for which targets the CPUC has enough data to formally adopt numbers within the final TEF, and which targets will require a placeholder until other data is available.
4. Determine whether the Scorecard should be tailored to include service territory-specific targets and metrics.
5. Discuss the Scorecard implementation and reporting processes

Following stakeholder input, the CPUC should adopt the Scorecard with the final TEF, prior to the IOUs filing their TEPs. This should include a process for incorporating CEC and CARB data into the Scorecard as it becomes available.

For program-specific targets and metrics, the IOUs should identify all of the approved targets they plan to meet and strategies to track and report on the targets and metrics within their individual pilot, program, and rate design filings.

Conversely, certain portfolio-wide targets and metrics should apply to all IOUs, independent of what investments they propose within their TEPs. These will be an integral part of each IOU's TEP. For example, the target for reducing the number of days for EVSE connection is not tied to a specific program, but rather a CPUC goal to improve this process on a statewide basis.

3.4.4 Scorecard Reporting and TEP Evaluation

The CPUC should require the IOUs to regularly publicly release their Scorecards so policymakers, ratepayers, industry, and academics can utilize and review the data demonstrating progress towards meeting state and IOU-specific TE goals. In addition, the CPUC should require IOUs to hire an independent consultant to evaluate the IOUs' programs and overall TE portfolio on a regular basis.

Energy Division staff recommends that the IOUs propose an evaluation budget as part of the budget they include in their TEPs. This should cover the cost of an independent third party to evaluate their progress towards meeting State goals and the targets they set in their 10-year plans. It could also pay for other evaluations and studies that would be beneficial to staff for updating the TEF, to IOUs for updating their TEPs, and to generally assist IOUs in promoting widespread TE.[66]

[66] See, for example, program evaluation studies done for other customer-facing programs that IOUs administer under the California Solar Initiative at https://www.cpuc.ca.gov/General.aspx?id=7623 (Accessed on January 13, 2020)

The CPUC should authorize Energy Division staff, by letter from the Energy Division Executive Director, to issue an Evaluation Plan after the first round of TE programs is adopted pursuant to the TEPs. The Evaluation Plan should include detail about evaluations and studies that are necessary, budget allocation to those evaluations, and the associated schedules. It should also address timing for IOUs to release their Scorecards publicly and coordination with other data collection efforts to streamline and align the requirements. Energy Division staff should coordinate with IOUs when developing the plan.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should:

1. Adopt the Scorecard following stakeholder input, and prior to the IOUs filing their Transportation Electrification Plans (TEP).
    a. The Scorecard may account for differences by IOU territory.
    b. The Scorecard should include portfolio-wide targets and metrics, which apply to all IOUs to measure progress towards achieving statewide policy goals.
    c. The Scorecard should include program-specific targets and metrics, with at least one applying to each pilot, program, and rate.
    d. The Scorecard may include some placeholders for data that is not yet available, along with a plan for how to integrate that data into the Scorecard.
2. Authorize Energy Division staff to issue an Evaluation Plan by letter from the Division Director after the first round of transportation electrification programs are adopted.

Energy Division staff recommends that the CPUC direct the IOUs to:

1. Identify at least one program-specific Scorecard target as a benchmark for each program application and pilot program advice letter to measure each investment's success.
2. Track and report progress on all relevant portfolio-wide and program-specific Scorecard targets and metrics.
3. Propose an evaluation budget as part of their TEPs.
4. Allow the IOUs to propose updates to the Scorecard as part of the regular TEP updates.

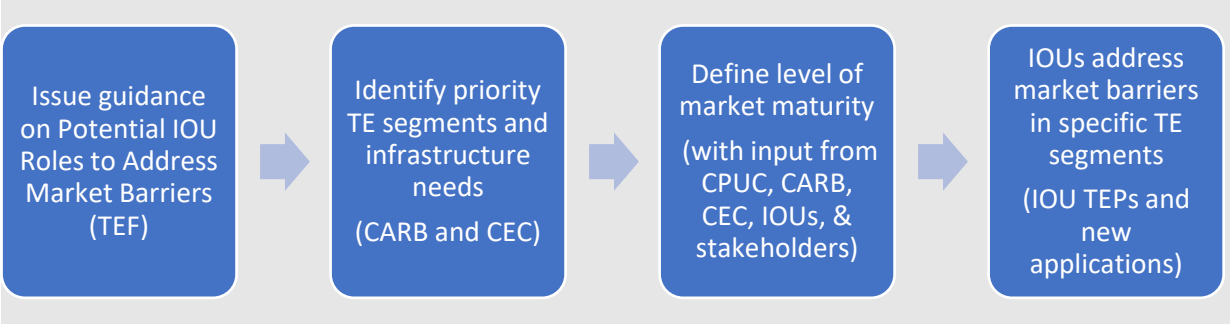
4. Investor Owned Utility Roles to Accelerate Transportation Electrification Infrastructure Deployment

Summary

Energy Division staff believes the IOUs will continue to play a critical role in TE infrastructure deployment through strategically designed ratepayer-funded programs and the IOUs' core business of delivering electricity. In prior TE proceedings, the CPUC and parties have endeavored to ensure IOU programs address priority needs and do not unfairly compete or adversely affect the development of a competitive marketplace for TE. These proceedings have involved repeated litigation over how much and which parts of the TE infrastructure supply chain should be owned by the IOUs. These ongoing controversies have absorbed the CPUC's and parties' time without providing sufficient guidance for future IOU and/or third-party investments and long-term strategic planning. Further, CPUC and parties engaged in the IOU TE proceedings continue to lack data and market analysis upon which to base decisions on infrastructure planning and the existence of "unfair competition." Given the need for rapid scale-up of TE infrastructure, this approach must evolve.

New resources and regulations are being developed by other state agencies that will help the IOUs prioritize and quantify needed TE infrastructure investments and activities. This chapter explains the process for building on these resources and identifies pathways to determine the IOUs' roles to accelerate TE infrastructure deployment by addressing key market barriers as shown below in Figure 2. The intent is to target IOU investments on technologies in the early deployment phase to support those new technologies' commercialization, with IOU funding decreasing as markets mature. This transition will allow non-utility companies to scale up private equity to meet market needs and transition the market away from reliance on ratepayer funding.

Figure 2: Process for determining IOU roles to accelerate TE infrastructure



1. **The TEF Identifies Market Barriers to widespread TE:** The TEF identifies key market barriers to widespread TE in Table 3 based on categories used by an AB 32 advisory committee.[67]
2. **State Agencies Prioritize TE Segments:** CEC modeling and the IDS will identify statewide priority TE segments and determine infrastructure needs associated with meeting the emissions reduction targets set in the CARB MSS – i.e. **What**, **How Much, When,** and **Where.**
3. **Assess Market Maturity in Priority TE Segments:** A Market Maturity Assessment will determine the current level of market maturity for TE segments. IOUs will use the Assessment in step four as an input to determine **How** IOUs should invest in overcoming market barriers.
4. **Develop IOU Programs to Overcome Market Barriers:** IOU TEPs and new program applications filed under the TEPs will build on steps one through three, explain how IOUs will support and/or install infrastructure, and explain **What**, **How Much**, **When, Where,** and **How**.

This process will ensure that IOUs develop a comprehensive strategy and establish the level of ratepayer-funded electric distribution infrastructure needed to remove barriers to longer term, larger scale, and private investment of TE. It will also provide a framework for identifying when IOU ownership of TE electrical infrastructure and EVSE on the customer-side of the meter may be appropriate before markets have matured.

[67] "Advanced Technology to Meet California's Climate Goals: Opportunities, Barriers & Policy Solutions", Economic and Technology Advancement Advisory Committee Report, Figure 1-5, Final December 2009, accessed on November 29, 2019. It is available at https://ww3.arb.ca.gov/cc/etaac/meetings/etaacadvancedtechnologyfinalreport12-14-09.pdf

This process will also identify when transitions in ratepayer funded TE investments are needed as markets and technology mature. Over time, the IOUs' role in deploying infrastructure should focus on supporting the market through typical utility functions of maintaining and operating the electric T&D system and providing appropriate rate structures; as well as targeted support activities to address long-term market barriers and enable a flourishing TE infrastructure market.

Through proactive leadership via these roles, the IOUs can increase opportunity and confidence for both the public and the investor community to promote widespread TE.

Questions for Stakeholders
1. Do you agree that the investor-owned utilities' (IOU) Transportation Electrification Plans (TEP) should evaluate opportunities to address each of the barriers identified in Table 3? a. If not, what barriers should be excluded, or are missing, and why? b. Do you agree with the types of IOU roles that are appropriate to address each market barrier during the market and technology development lifecycle? 2. Will the California Energy Commission's Infrastructure Deployment Strategy analysis and Assembly Bill AB 2127 (Ting, 2018) implementation process, the California Air Resources Board's Mobile Source Strategy, and the IOUs' existing planning processes provide a complete foundation for defining IOU infrastructure roles to be included in TEPs (What, When, How, How Much and Where)? a. If not, what are the gaps and how should they be filled? 3. Market Maturity Assessment a. Will the proposed metrics for determining the level of market competition provide the appropriate information to evaluate market maturity across various TE industries and business models? b. What resources can be used to provide data for these market maturity metrics, and what is the best way to collect this data? c. Should the Market Maturity Assessment be developed by a third-party consultant or workshopped and finalized by Energy Division staff for CPUC consideration in the final Transportation Electrification Framework?

Background

The CPUC is responsible for applying statutory direction to the IOUs' TE programs, including what IOU roles are appropriate to support widespread TE adoption while also meeting economic development goals including fostering a competitive TE market.

Some key principles regarding specific IOU roles include:

- Overcome market barriers to widespread TE growth.[68]

[68] The TEF focuses primarily on infrastructure necessary to serve electric vehicles' fueling needs, which is the IOUs' primary role in supporting the state's ZEV adoption goals. Energy Division staff notes the importance of programs to reduce vehicle costs, including rebates via Low Carbon Fuel Standard credits, but believe the IOUs' primary role is in providing the necessary infrastructure to serve those vehicles' fueling needs.

- "[S]timulate innovation and competition, enable consumer options in charging equipment and services, attract private capital investments … where technologically feasible" as directed by statute.[69]
- Ensure IOU investments are in the "interests" of ratepayers as defined in statute.[70]
- Finance electric system infrastructure in a manner that minimizes ratepayer costs, maximizes ratepayer benefits, and supports the development of a competitive market.[71]

To date, the CPUC has conducted its evaluation of TE proposals on a case-by-case basis, using both the balancing test adopted in D.11-07-079 and legislative directives from SB 350 as general guidance. Key issues, like IOU infrastructure ownership, must be re-litigated with each new proposal. This chapter of the TEF provides guidance to create a comprehensive and focused IOU investment strategy that will apply to all IOU applications.[72]

One key issue has been IOU ownership of different aspects of TE infrastructure. On one hand, the CPUC seeks to prevent utilities from exerting monopoly power in emerging TE-related markets and discouraging market development. At the same time, utilities' programs provide important funding streams needed to help support and grow pre-commercial TE business models and improve market confidence. The IOUs have tested different TE infrastructure ownership models, including incentives for customer owned equipment as well as IOU ownership of the EVSE and other infrastructure on the customer side of the meter, often referred to as "make-readies," as shown below in Figure 3.

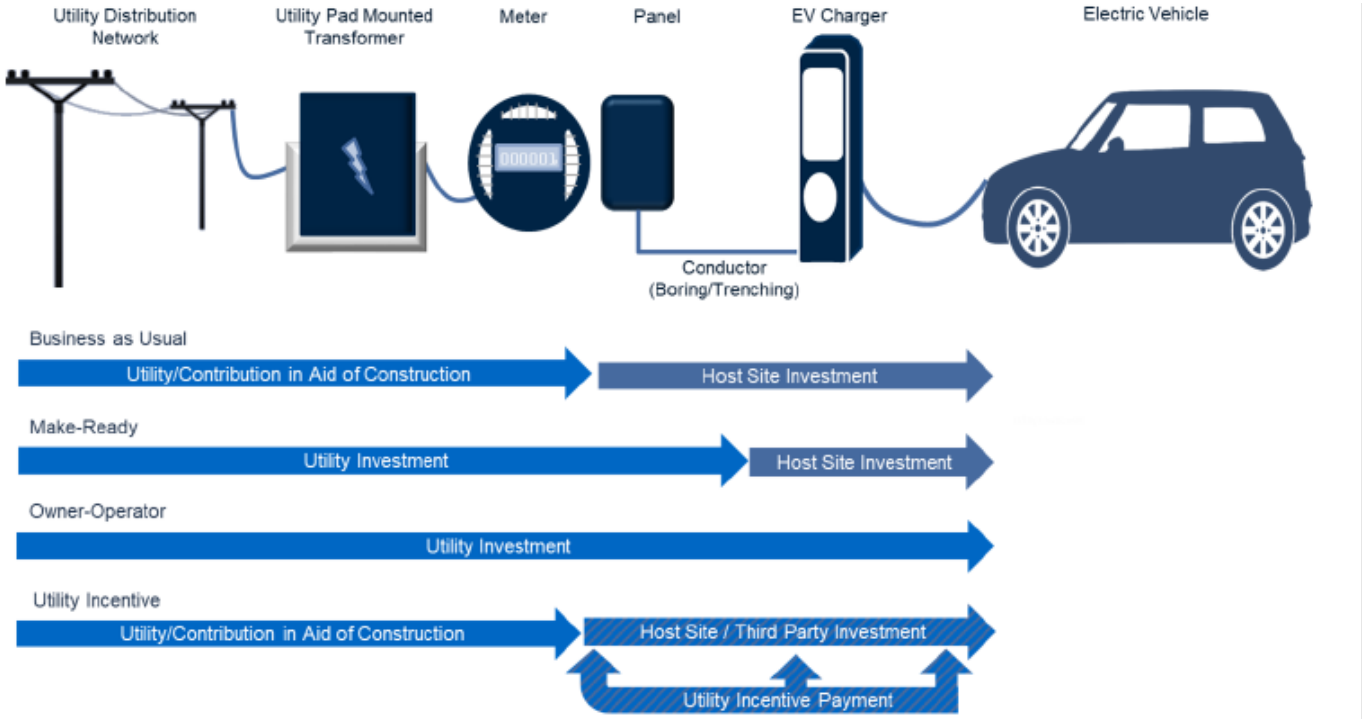
[69] Public Utilities Code §740.12 (a)(1)(F)

[70] Public Utilities Code §740.8 defines the "interests" of ratepayers, short- or long-term, as direct benefits that are specific to ratepayers, consistent with the following: (a) Safer, more reliable, or less costly gas or electrical service, consistent with Section 451, including electrical service that is safer, more reliable, or less costly due to either improved use of the electric system or improved integration of renewable energy generation; (b) Any one of the following: (1) improvement in energy efficiency of travel; (2) reduction of health and environmental impacts from air pollution; (3) reduction of greenhouse gas emissions related to electricity and natural gas production and use; (4) increased use of alternative fuels; and (5) creating high-quality jobs or other economic benefits, including in disadvantaged communities identifies pursuant to §39711 of the [California] Health and Safety Code.

[71] For example: consideration of different financing and cost recovery models; requirements to mitigate anti-competitive behavior by market participants; requirements to leverage private investments; developing programs that support new construction building codes and provide incentives to meet the reach goals adopted in local government PEV readiness plans.

[72] For more background, see the DRIVE proceeding http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M252/K025/252025566.PDF (Accessed on January 13, 2020)

Figure 3: Models of Utility Investment in EV Charging Infrastructure[73]



The TEF establishes a comprehensive long-term framework to determine the extent of IOU investment, in terms of types of programs and appropriate ownership model(s), necessary to develop and support the development of a fully commercialized TE infrastructure market. The TEF establishes a new four step process based on assessment of market barriers and market maturity to identify TE infrastructure needs and the role of utilities to address these needs.

Step One: The TEF Identifies TE Market Barriers

A number of studies have found that clean energy technologies, including TE technologies, often stall in the "Valley of Death" after the pilot or demonstration stage and before reaching commercial maturity.[74] A number of barriers that contribute to the "Valley of Death" for TE deployment include higher up-front costs for infrastructure, lack of infrastructure, need to develop technical standards, and other categories of barriers that prevent the development of a commercial market that provides business opportunities for third-party investors. Column one of Table 3 below lists

[73] "Utility Infrastructure in Electric Vehicle Charging Infrastructure: Key Regulatory Considerations," Paul Allen and Grace Van Horn (M.J. Bradley & Associates), Matthew Goetz, James Bradbury, Katherine Zyla (Georgetown Climate Center), 2017. This is available at https://www.mjbradley.com/reports/utility-investment-electric-vehicle-charging-infrastructure-key-regulatory-considerations. (Accessed on November 22, 2019). In this Figure, "Business as Usual" depicts the typical IOU ownership model up to the utility meter, which leaves the customer(s) responsible for paying for any infrastructure or equipment on their property.

[74] See for instance "Accelerating Clean Energy Commercialization: A Strategic Partnership Approach", Richard Adams et. al., April 2016. Available at https://www.nrel.gov/docs/fy16osti/65374.pdf, last accessed January 30, 2020. In 2009, the Economic and Technology Advancement Advisory Committee (ETAAC)established by AB 32, California Global Warming Solutions Act identified a number of barriers that hinder the commercialization and deployment of TE and other technologies needed to achieve the State's AB32 goals

categories of these barriers (the other columns will be used in step four to identify potential IOU roles to address these barriers as explained below.)

These barriers are particularly acute for many types of TE technology that are still facing hurdles to commercial maturity. Strategic IOU TE program investments are necessary to supplement efforts by other State agencies and organizations and successfully move technologies through the early deployment stage to full deployment and then transition as needed to supporting commercial TE markets.

Step Two: Prioritize TE Market Segments

As described in Section 3.1 above, the IOUs' TEPs should identify priority TE market segments and identify infrastructure deployment goals based on their DRPs, IRPs, and ongoing research from the CEC and CARB. Research from other State agencies may also lead to revisions to the categories of barriers identified above in step one. CEC's IDS[75] will provide an assessment of the infrastructure gaps that currently hinder TE adoption. The IDS assessment is intended to be California's most comprehensive effort to date to define specific TE infrastructure needs. This critical analysis will provide a foundation for the IOUs and other funding entities to develop a more strategic approach to fill existing infrastructure gaps. As noted earlier, the CEC has already identified specific gaps in public charging infrastructure needed to meet 2025 EV deployment goals and the IDS will provide a broader assessment of TE infrastructure needs through 2030, including specific quantities of TE needed to fill gaps.

In addition, CARB's updated MSS is due January 1, 2021 and will identify priority TE segments. The MSS has in the past contained some information regarding the level of market maturity and may also identify specific needs (TE infrastructure, standards, cost-effectiveness data, etc.).[76]

The IOUs should support these processes by providing data and input to CARB and CEC based on IOU programs to date, TE deployments and projections, cost data, and/or other IOU resources that can support these efforts. IOU TEPs should identify target priority segments and infrastructure gaps and propose budgets and programs that could address those key segments and gaps using the application format described in Section 3.1 and further detailed in Appendix C (TEP Completeness Checklist).

Step Three: Market Maturity Assessment

The Market Maturity Assessment will provide a key input into the process of deciding specific IOU investments, including whether IOUs should be allowed to own and/or operate TE infrastructure, and other roles within the segments they identify as needing public support during the TEP implementation window through the development of this tool. The assessment will fill information gaps about the varying market development status of individual TE segments.

For example, the electrification of medium- and heavy-duty segments is typically less commercially available than light-duty vehicle charging infrastructure technologies and the status may vary between segments. In addition, markets serving potential EV drivers in DACs may be different than in non-DAC areas.

[75] The IDS and its role in informing the IOUs' TEPs is described in more detail in Section 3.1.
[76] The MSS will be updated every five years required by SB44 (Skinner, 2019)

The Market Maturity Assessment will define market maturity levels based on factors such as deployment levels, cost of TE compared to non-electric transportation options, and progress addressing a variety of potential market barriers.

Whether IOUs should own and operate TE infrastructure in any given segment is a critical question given the need to foster competitive markets and statutory requirements that the CPUC prevent unfair IOU competition. Through the Market Maturity Assessment process, the following questions, and potentially others, will help identify whether a full third-party supply chain can provide, install, operate, and maintain TE infrastructure on the customer side of the meter on a commercial scale in response to market demand and/or policy signals:

- How well do existing supply chains serve demand? Is the existing supply chain adequate to serve current and near-term vehicle deployments?
- Are a variety of companies or organizations serving the market and providing opportunities for customer choice between vendors?
- Are products and services widely available, or are they limited to specific geographic areas or market segments?
- Is information readily available to consumers about services and products available from the supply chain?
- Are infrastructure costs standardized and transparent, or are there unknown costs and barriers that may prevent or discourage third party deployment of infrastructure?
- Have regulatory and administrative barriers been addressed so that permitting and installation of TE infrastructure is timely?

This type of assessment may require data that is not currently collected by the Energy Division. Thus, Energy Division staff requests stakeholder feedback on appropriate data sources and data collection methods. Staff also requests feedback on whether this assessment should be an effort led by a third-party consultant or workshopped and finalized by Energy Division staff for CPUC consideration in the final TEF.

Key data sources for this assessment include, but are not limited, to the following:

- The IDS assessment of infrastructure installations and services available in the market.
- The MMS, which in some cases describes the level of market maturity for TE segments and may also provide data to answer some of the specific questions in the Market Maturity Assessment.
- Lessons learned from existing IOU programs.
- A stakeholder workshop and stakeholder comments.

Step Four: TEPs Address Market Barriers with Strategic Investments

Step four will integrate all of the previous steps and apply the matrix in Table 3 to identify the IOU strategies necessary to address priority market barriers based on the results of the Market Maturity Assessment, including any specific strategies necessary to address equity, as discussed within Chapter 6, "Equity." This matrix lists potential market barriers and potential roles for IOUs based on the level of market maturity. The matrix will help IOUs target investments to move TE segments in the early deployment phase to full deployment and then reduce funding and transition to a market support role for technologies that are commercially successful.

Table 3: Examples of Potential IOU TE Roles to Address Market Barriers Based on Market Status[77]

	Early Deployment (Serving Early Adopters)	Full Deployment (Serving Mass Market)
Infrastructure Barriers	· Utilities address requests for electrical service for charging ("energization") on a case-by-case basis and focus on individual customer needs as well on process improvements. · Some building types such as MUDs are typically difficult to retrofit with TE infrastructure · Utilities address up-front capital costs for TE infrastructure as noted below.	· Utilities focus on maintaining transparent and streamlined processes to respond to requests for energization and identify any additional needed enhancements. · Utilities address up-front capital costs for TE infrastructure on a more limited basis as noted below.
Up-Front Capital Costs	· Utility uses ratepayer funds to contribute to efforts to lower upfront infrastructure installation costs through targeted programs and rebates · Utility programs should align with other State funding partners to fully leverage available resources and meet any significant gaps including in DACs and tribal communities · Utility ownership and/or operation of TE infrastructure on the customer side of the meter may be desirable in some cases to accelerate customer adoption, and to package solutions to a variety of market barriers in a single program · Utilities transition to subsidies and programs that stimulate market solutions as market matures	· Utilities continue to provide funding for infrastructure programs to address any remaining barriers for DACs, tribes, or other underserved communities that may lack access to capital as noted in an SB 350 barriers study[78] · Utility ownership and/or operation of TE infrastructure could displace otherwise competitive market actors · Utilities support should transition to supporting market solutions, except where justified for specific exceptions

[77] Sources: Energy Division staff and "Advanced Technology to Meet California's Climate Goals: Opportunities, Barriers & Policy Solutions," Economic and Technology Advancement Advisory Committee Report, Figure 1-5, Final December 2009

[78] "SB350 Barriers Report." CARB. Available at https://ww2.energy.ca.gov/sb350/barriers_report/ last accessed Jan 16 2020

Existing Infrastructure "Lock-in"	· Utilities support voluntary or mandatory EV infrastructure requirements and offer incentives for "beyond code" EVSE installations in new construction	· Utilities support mandatory building code revisions as needed and provide incentives where needed for "beyond code" EVSE installations in new construction
Industry Structure	· Utilities work to coordinate different types of market actors such as automakers and EVSPs to provide services such as VGI.	· Utilities implement coordination procedures and refine as needed
Market Demand	· Utilities stimulate demand through programs that demonstrate consistent, ongoing procurement of TE infrastructure · Utilities provide appropriate electric rates, and support third-party market growth through streamlined utility operations	· Utilities support market through rates, utility operations, and targeted programs and action items to address remaining barriers
Information Barriers	· Standardized IOU data collection, reporting, and program evaluation can increase visibility of market costs · Utilities provide information to customers and program participants to encourage accelerated TE adoption	· Utilities continue to collect and report program data along with best practices and lessons learned · Utilities provide information to target groups, e.g. DACs and other underserved customers as needed
Uncertain or Unfavorable Processes	· Utilities standardize service processes by streamlining application timelines, providing distribution capacity maps, determining load from TE uses, etc. · Utilities review demand charges, including for fleet customers. · Utilities support the development of permitting tools and resources for local officials to help streamline EVSE installation	· Refine utility processes/rules as needed · Update and maintain resources for local officials and third-party market participants
Uncertain or Unfavorable Standards	· Utilities can identify technical or other standards needed to support VGI or other technology deployment; support building codes as noted above	· Refine technical standards and gap-filling as needed; support building codes as noted above

Need to Complete Additional Regulations	· Utilities should consistently coordinate with CARB and other agencies to provide research, cost, and/or other data to support the development of new TE-related regulations, which will provide the market with certainty about regulatory targets.	· Coordinate with CARB, other agencies, and regulated entities to support implementation as needed.

IOUs should reflect the final results of this process in TEPs as follows:

- Explain the amount of TE infrastructure needed in each TE segment; estimate the amount that State agencies intend to provide or will be provided by the private market; and how much requires IOU support.
- Explain in TEPs and applications each market barrier that IOU programs address, including any barriers that are specific to underserved communities, and how IOUs are coordinating on issues that affect more than one IOU
- Identify market barriers that are already addressed by IOU programs outside of TEPs; or are sufficiently addressed by other agencies or organization(s) to avoid duplication.
- Identify any remaining gaps, including gaps that must be addressed by other organizations.
- Document the need for any proposed utility ownership of TE infrastructure on the customer side of the meter based on the Market Maturity Assessment and describe transition points when IOU ownership of additional infrastructure on the customer side of the meter would no longer be necessary.[79]

Appendix F contains examples of information specific to MD/HD sectors that should be used when applying this process to those sectors. In addition, when relevant for any priority TE strategies that IOUs propose in their TEPs, the IOUs should leverage lessons learned from their current programs, and from any approved pre-TEP programs, and carefully coordinate with other sources of incentive funding.

Addressing some market barriers will require a statewide response and contributions from every IOU. In these cases, for example if proposing strategies to help achieve CARB's Advanced Clean Trucks regulation once adopted, IOUs should work together to determine the IOU share of infrastructure needed to meet statewide targets and their individual contributions to prevent duplication and meet regulatory goals. IOUs should also coordinate on other statewide needs, such as determining any common technology development needs including interoperability or other standards needed for IOU funded TE equipment.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

[79] Applications should also provide, where possible, a customer option for a rebate or other incentive instead of IOU ownership.

1. Actively engage their subject matter experts in ongoing State agency transportation electrification (TE)-related planning and modeling efforts, including but not limited to the California Air Resources Board's Mobile Source Strategy update and the California Energy Commission's Infrastructure Deployment Strategy analysis. Summarize TE infrastructure gaps based on state planning processes and other resources.
2. Provide information and participate in the development of a Market Maturity Assessment.
3. Explain in their Transportation Electrification Plans (TEP) each market barrier that each IOU program is intended to address and how the program(s) will address the barrier.
4. Explain in TEPs any market barrier(s) that IOU TE programs are not suited to address.

Energy Division staff also recommends holding a workshop on the proposed market barriers and market maturity assessment, and the necessary steps for finalizing the guidance for IOU roles described in this Chapter.

5. Near-Term Investor Owned Utility Transportation Electrification Investment Priorities

Summary

This chapter provides guidance to the IOUs on issues Energy Division staff consider relevant for any pre-TEP program applications that an IOU files between the release of the draft TEF and the CPUC's final approval of their TEPs.

This chapter describes near-term priorities for IOU investments in TE infrastructure, based on the current state of the market, state regulatory deadlines, and other TE barriers that could be addressed through 'no-regrets' investments.

While this section does not intend to encourage interim applications for new TE programs ahead of the CPUC's adoption of their TEPs, the IOUs are encouraged to consider whether it is prudent to adopt strategies to address only these near-term priorities in interim program applications or, once the TEF is fully adopted by the CPUC, through pilot program advice letter filings as described in Section 3.1. These identified priorities should address clear and present barriers to TE adoption, and include:

- Enhancing EVs and resiliency—charging at evacuation/emergency response centers, and leveraging EVs for grid resiliency
- Customer types—residents without access to home EV charging
- Market segments—medium- and heavy-duty EV infrastructure, and new building construction

Questions for Stakeholders
1. Should the investor-owned utilities' pre-Transportation Electrification Plan (TEP) program proposals be limited to these identified priority areas? Why or why not?

2. If not, identify any other program priorities that should be considered appropriate for pre-TEP programs and provide detailed information about why the investment would be "no regrets".
3. Is $20 million per IOU an appropriate budgetary cap for pre-TEP programs? Why or why not?

5.1 Near Term Transportation Electrification Priorities

It may be two years before the IOUs' TEPs receive final CPUC approval after a full public process. However, given the nascent state of TE, there may be barriers and issues that may be appropriate for near-term IOU investment. This section of the TEF proposes guidelines for the types of programs that may be appropriate pre-TEP program applications. All applications filed before the IOUs' TEPs are adopted by the CPUC should represent "no regrets" approaches to addressing already-defined TE barriers and policy priorities.

Energy Division staff is not calling for the IOUs to submit interim applications prior to TEP adoption. Instead, the investment priorities described in this section identify program types that may serve as a bridge between the IOUs' current TE programs and their holistic TEPs. Any programs the IOUs propose and/or receive authorization to implement prior to their TEPs being adopted should inform and be incorporated into the IOUs' longer-term TE planning.

Any program proposal filed prior to CPUC approval of an IOU's TEP should meet the following criteria and be completed within two years:

- Address one or more of the following pre-defined barriers to widespread TE:
    - Resiliency:
        - Install EV charging at evacuation/emergency response centers; and/or
        - Pilot technologies and programs that use EVs as backup power resources to enhance resiliency in communities that may face power shut-offs due to weather, wildfire risk or other emergencies
    - Customers without access to home charging:
        - Addressing cost of fueling disparity through non-infrastructure approaches; and/or
        - Charging options for customers that lack access to home EV charging.
    - Medium and heavy-duty EV adoption:
        - Support regulatory mandates to electrify transit under CARB's Innovative Clean Transit regulation,[80] and/or
        - Implement strategies to electrify high-emitting medium- and heavy-duty fleets.
    - New building construction:
        - Support lower-cost EVSE installation in new buildings
- Minimize long-term commitments that may be inconsistent with the IOU TEPs:

[80] CARB has multiple regulatory efforts underway to reduce emissions from the transportation sector each of which have near-term requirements for cleaner vehicles to be deployed, including the Innovative Clean Transit, Advanced Clean Cars, and Advanced Clean Trucks programs. Investments that support vehicle electrification under these existing regulatory efforts could be considered as applications filed before TEPs are filed and approved if the IOUs clearly describe how their infrastructure program(s) clearly advance the goals of these regulations. More details of CARB's regulations are available at https://ww2.arb.ca.gov/our-work/programs (Accessed on January 13, 2020)

    - Avoid irrevocable hardware commitments or market interventions that the CPUC has not already authorized in a prior TE-related decision.
    - Include criteria for hardware and software that can be supported and implemented by multiple entities.
- Address equity:
    - Any applications filed prior to IOU TEP adoption should address the recommendations described in Chapter 6, "Equity," as they relate to the specific topic area.

Energy Division staff also proposes implementing a time limit and budget consistent with the CPUC's 2016 ACR, which proposed a $20 million total budget for each large IOU over a one- to two-year term for "priority review projects."

The IOUs should provide clear justification for ratepayer investment in any applications filed prior to the adoption of their TEPs. For instance, the IOUs should not propose new investment programs where the market shows signs of private sector engagement, such as single-family home residential charging stations and workplace L1 or L2 charging deployment. [81] Those sectors should be addressed as part of the IOUs' TEP strategies and be coordinated with partner funding resources, including government grants and private investment.

The rest of this chapter discusses the near-term priorities in more detail.

5.2 Electric Vehicles and System Resiliency

Summary

As California is now dealing with climate related and other natural disasters, we must address the potential challenges to provide reliable, widely accessible fueling opportunities for customers that drive EVs. Reliable EV fueling options are essential in the event of a blackout caused by a natural disaster or other disruption to the distribution system. Conversely, EVs simultaneously present an opportunity to improve grid resiliency and serve as backup power during a de-energization event. Priority TE strategies that IOUs should address in the near-term include improved customer communication, the use of EVs as back-up power resources, and the availability of public charging within natural disaster-prone areas and at evacuation/emergency response centers.

Background

California is experiencing the impact of climate change, notably through longer, drier summers that have resulted in catastrophic wildfires. The decade of 2001-2010 saw temperatures 2°F higher than historic averages.[82] This could go up to 2.5°F - 2.7°F by 2039 if drastic measures are not taken to limit global GHG emissions.[83] Severe droughts are becoming more likely to occur.[84] In addition to severe droughts, insect infestations are more prevalent, which combined have caused massive tree

[81] Energy Division staff is not pre-judging the outcome of pending IOU applications that may address the market sectors listed here.
[82] https://nca2014.globalchange.gov/report/regions/southwest (Accessed on January 13, 2020)
[83] https://www.energy.ca.gov/sites/default/files/2019-08/20180827_Summary_Brochure.pdf (Accessed on January 13, 2020)
[84] https://www.epa.gov/sites/production/files/2016-08/documents/climate_indicators_2016.pdf (Accessed on January 13, 2020)

deaths in California's forest. These factors have created ideal conditions for wildfires to occur within California.

There are signals suggesting that California's wildfire season is now a nearly year-round event.[85] The CPUC has classified roughly 25 million acres of land as either *very high* or *extreme* fire threats. Additionally, 25 percent of the state's population (11 million people) live in areas that the CPUC deemed to be at least *very high* fire threats.

Questions for Stakeholders
1. Should the investor-owned utilities (IOU) prioritize projects that will test and validate resiliency strategies that utilize electric vehicles (EV) as grid resources and ensure EV drivers have adequate access to charging options during power outages? a. If yes, how should the IOUs design their pilot(s)? What sector(s) should the pilot(s) target? What use cases should the IOUs prioritize in their pilot(s)? 2. Which local agencies and community organizations should the IOUs work with to identify resiliency challenges as more vehicles are electrified across their service territories?

Discussion

Wildfires and other climate impacts present priority opportunities for EVs to provide grid benefits to areas impacted by these events. It is necessary to define how EVs can play a role in ensuring climate resiliency in the face of climate related impacts.[86]

As a result of recent wildfires, the IOUs have implemented processes to de-energize targeted regions as a last-resort measure to prevent grid-initiated fires. These de-energization events, or Public Safety Power Shutoffs (PSPS), are triggered by a combination of factors that heighten the risk of a wildfire.[87] When Californians are subject to a PSPS event, or live in a wildfire impacted area, they have the difficult option to either forgo power or to generate their own electricity through a diesel generator or distributed energy resources (DER). The same goes for other unforeseen power shutoffs. That said, in some circumstances a charged EV has the potential to act as a cost-effective, low-zero emission power source for customers.[88]

[85] https://www.bloomberg.com/news/articles/2019-01-17/california-fires-burn-all-year-as-drought-left-state-a-tinderbox (Accessed on January 13, 2020)

[86] Resilience is a concept that can include activities undertaken to prepare for, withstand, and recover from disturbances. Both the range of activities and the types of disturbances that are included in discussions about resilience can vary widely depending on the context. In this staff proposal, we use resilience to mean the ability and availability of EVs to provide and receive energy services during a wider grid outage.

[87] Resolution ESRB-8 and D.19-05-042 provide guidance on for how the IOUs are to communicate PSPS events to their customers. On October 28, 2019, the CPUC issued a Press Release (http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M318/K885/318885370.PDF) Accessed on January 15, 2020, which in part, announced a new Rulemaking Proceeding to develop a protocol for how the IOUs are to use the PSPS. On November 1, 2019, the ALJ assigned to the current PSPS Rulemaking Proceeding (R.18-12-005) released a ruling to suspend the current proceeding until a new Scoping Memo is released to correspond to the critical impacts of wildfire and PSPS events. See Ruling (http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M318/K943/318943481.PDF), (Accessed on January 15, 2020)

[88] Plug-In Electric Hybrids are not zero emission since they depend on gasoline as a partial fuel source.

In particular, MD/HD vehicles (such as electric buses) could be valuable assets in an emergency because the vehicle battery storage is comparable to the capacity of the typical backup diesel generator.[89] While light-duty EVs have smaller batteries that restrict their ability to support large power needs, they can still perform some essential functions.[90]

Important to allowing EVs to provide backup power to an area is the availability of EV charging. Current ratepayer funded EVSE installations have concentrated in dense population centers, leaving rural regions and smaller urban centers without the level of access seen in the State's large population centers.[91] The lack of available EVSEs throughout a large region of the state could prevent customers and emergency responders from using an EV to provide backup power or refuel the vehicle prior to a PSPS event.

Program applications filed prior to TEP adoption can, and all IOU TEPs should, address resiliency barriers by identifying opportunities to address how EV charging is impacted by a power outage and how EVs can serve as a power source during outages. Specifically, the IOUs play an essential role in four key priority strategies for EVs and resiliency:

1. Customer Communication
2. Backup Power Resources
3. Availability of Public Charging
4. Damage to Utility TE Infrastructure

5.2.1 Customer Communication

The CPUC requires the IOUs to effectively communicate a PSPS event to their customers in a timely manner.[92] However, the PSPS notification does not contain language to encourage EV owners to fully charge their vehicle prior to the PSPS.[93] One of the biggest barriers to EV adoption is the fear of not being able to use the EV due to a depleted battery and the unavailability of charging.[94] This concern is magnified with the risk of being unable to drive an EV during a disaster event. Although the CPUC is expected to provide further guidance on how the PSPS event is communicated to customers by summer 2020, Energy Division staff recommends that the CPUC require the IOUs to immediately include language in the PSPS notifications suggesting customers fully charge their EV as soon as possible.

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[89] The standard diesel generator will consume 15 gallons of gasoline in a 24-hour period, with a conversion factor of 1 gallon of diesel equating 40.7 kWh, the generator can produce roughly 600 kWh of power. A MD/HD EV, such as a Proterra Catalyst electric bus has a battery capacity of 440 kWh – 660 kWh.

[90] A long-range Tesla Model 3 has a battery capacity of 75 kWh. This can support the power needs of a medical device for a few days, depending on the power demand.

[91] See map of EVSE installations for PG&E EV Charge Network, SCE Charge Ready, and SDG&E Power Your Drive

[92] See Phase 1 Decision of R. 18-12-005. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M296/K598/296598822.PDF (Accessed on January 15, 2020)

[93] See "Tesla Owners Receive Warnings to Recharge Amid PG&E Blackouts", CBS SF Bay Area, October 11, 2019", https://sanfrancisco.cbslocal.com/2019/10/11/tesla-owners-warning-recharge-pge-outages-psps/ (Accessed on January 13, 2020)

[94] Singer, Mark "*The Barriers to Acceptance of Plug-In Electric Vehicles: 2017 Update*" National renewable Energy Laboratory. 2017. https://www.nrel.gov/docs/fy18osti/70371.pdf (Accessed on January 13, 2020)

Also, in preparation for PSPS or times of natural disaster, it is essential that IOU rate structures do not penalize EV drivers for charging their vehicle during periods that are typically designed to discourage electric consumption. This would send the wrong signal to customers regarding the benefits of a fully charged EV during potential outages. High cost TOU periods could discourage customers from sufficiently charging EVs needed to evacuate a disaster impacted area. Energy Division staff recommends that the IOUs should immediately eliminate this unnecessary choice by implementing a process to reduce customer's rates for electricity consumed between the announcement and enactment of a PSPS.

5.2.2 Backup Power Resources

The concept of EVs as a backup power source has been circulating in recent years.[95] To date, most EVs and EVSEs operating in the United States have limited ability to send power from an EV to a building or the grid. While bidirectional EVSEs are available, and while pilots like that at the Los Angeles Air Force Base with SCE and the University of California San Diego microgrid through the NRG Settlement have tested vehicle-to-building (V2B) or vehicle-to-grid (V2G), most EV manufacturers do not currently warranty vehicle batteries for bidirectional power flows due to concerns with accelerated battery degradation.[96] However, globally, auto manufacturers have offered warrantees for bi-directional batteries and in some instances sponsored V2B and V2G projects.[97] The objective of the ongoing VGI Working Group[98] is to identify strategies and potential policy shifts that could encourage auto manufacturers and other stakeholders to provide opportunities for deployment of VGI functions at scale in California and beyond.

The IOUs should proactively coordinate with emergency services organizations, local communities, planning agencies, and auto manufacturers to identify the infrastructure investments, utility IT system upgrades, and other technology developments necessary to enable V2B functions to support resiliency efforts. This coordination should result in a local load prioritization plan that identifies which services require more power. The IOUs could use this prioritization plan to design pilot(s) that:

- Test strategies to enroll customers in a V2B program within vulnerable areas
- Identify issues that arise from bi-directional power flow between vehicles and homes or facilities
- Determine whether new protocols or standards are necessary to support V2B services via IOU distribution and service lines

To fully address the potential for EVs as a backup power source, it will be critical for the IOUs to consider the integration of microgrids in addressing resiliency. In response to SB 1339 (Stern, 2018), the CPUC opened a Microgrid Rulemaking to address microgrid standards, barriers to deployment,

[95] "Electric Vehicles Drive to Back Up the Grid", B. Patterson, July 14, 2015. https://www.scientificamerican.com/article/electric-vehicles-drive-to-back-up-the-grid/ (Accessed on January 13, 2020)
[96] "Evaluating California's Vehicle-Grid Integration Opportunities", Gridworks, August 2019, https://www.nrel.gov/docs/fy18osti/70371.pdf (Accessed on January 13, 2020)
[97] https://www.nissan-global.com/EN/ZEROEMISSION/APPROACH/COMPREHENSIVE/ECOSYSTEM/ (Accessed on January 13, 2020)
[98] Established in CPUC R.18-12-006 https://gridworks.org/initiatives/vehicle-grid-integrationwg/ (Accessed on January 13, 2020)

guidelines for microgrid impact studies, and rates and tariffs to support microgrids.[99] Going forward, IOU investment programs filed prior to TEP adoption and proposed as part of the TEP process should align with the policy priorities of the microgrid proceeding (R.19-09-009) by designing appropriate pilots that test the use of EVs as backup power resources.

5.2.3 Availability of Public Charging

Not all customers will have access to home charging and therefore may require public facilities to charge their EV batteries before a PSPS event or when their usual charging station(s) lacks power. Accordingly, the IOUs should develop pilot programs that deploy off-grid EV charging solutions, placed in strategic locations such as IOU Community Resource Centers.[100] The IOUs should work with community organizations and representatives when choosing where to locate this charging.

5.2.4 Damage to Utility TE Infrastructure

To mitigate ratepayer risk for their investment in public charging infrastructure, the IOUs should employ the Catastrophic Events Memorandum Account (CEMA) through which they are authorized to seek cost recovery of damaged investments in a declared emergency.[101] Through this mechanism, the IOUs can record any costs associated with damaged TE infrastructure, replacement equipment, and the required labor through their existing CEMA process.

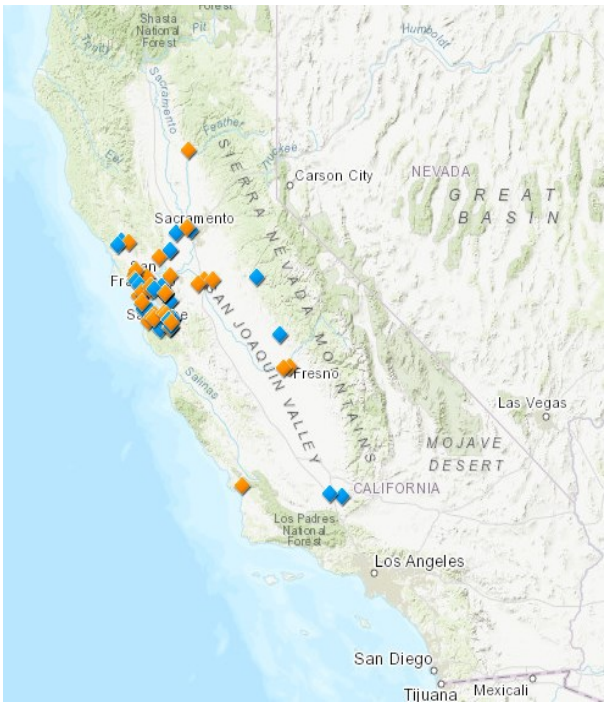
As shown in Figure 4: and Figure 5 the IOUs are installing TE infrastructure in or near identified areas at risk of wildfire damage.

[99] R.19-09-009 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M314/K274/314274617.PDF (Accessed on January 13, 2020)

[100] The Community Resource Centers provide customers the opportunity to access electricity to charge electronic devices, use the restrooms, and a number of other luxuries than are not available if the power is off such as air conditioning or heating, and could be a key location to offer EV charging opportunities. "PG&E Opens Community Resource Centers for Residents Impacted by Power Shutoffs", J. Jaroz, M. Ball, October 27, 2019 https://www.abc10.com/article/news/local/wildfire/pge-opens-community-resource-centers/103-6a19951e-7ad8-4013-9cd3-b46c83d26e84 (Accessed on January 13, 2020)

[101] See Resolution E-3238 The IOUs use CEMA to track and recover broader transmission and distribution system impacted by catastrophic events. "Cost Recovery Mechanisms for Energy Utilities", E. Lau, California Public Utilities Commission, October 26, 2016 (Accessed on January 13, 2020)

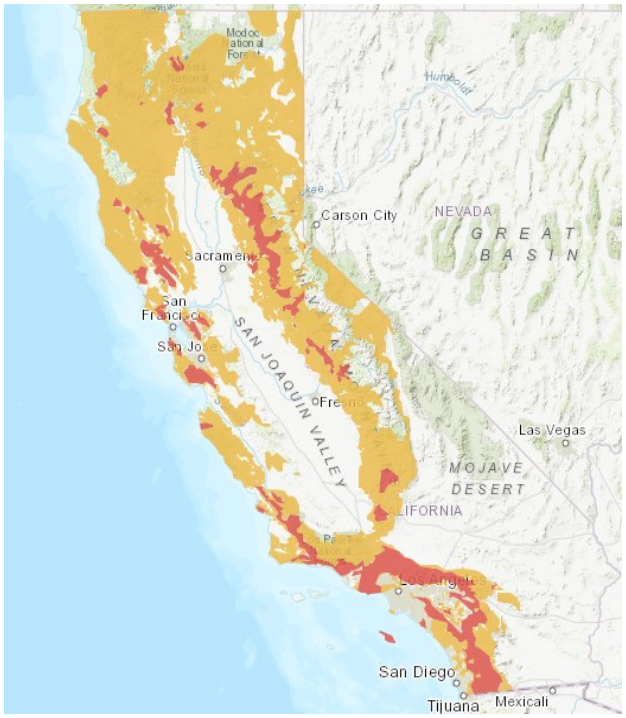
Figure 4: PG&E EVCN Installations as of Q4 2019



Orange diamonds represent sites still under construction as of September 2019, while blue diamonds indicate a site has been electrified.

Source: https://www.arcgis.com/home/webmap/viewer.html?webmap=7f4188377e7547a4b791b5becb1a8c2d&extent=-125.7923,32.3734,-111.9055,40.5997m (Accessed on January 13, 2020)

Figure 5: CPUC Wildfire Map



Areas in yellow indicate the region is Tier 2 Elevated Risk and red areas represent Tier 3 Extreme Risk regions.

Source: https://ia.cpuc.ca.gov/firemap/ (Accessed on January 13, 2020)

In areas that have or will potentially suffer significant damage from a wildfire or other natural disaster, the IOUs should partner with local resources to rebuild the area to ensure it is compatible with the expected growth in EV adoption. The IOUs should include forecasted distribution and transmission capacity upgrades necessary to support projected EV adoption in those areas, along with other needed EV infrastructure in new buildings.

5.3 Customers Without Access to Home Charging

Summary

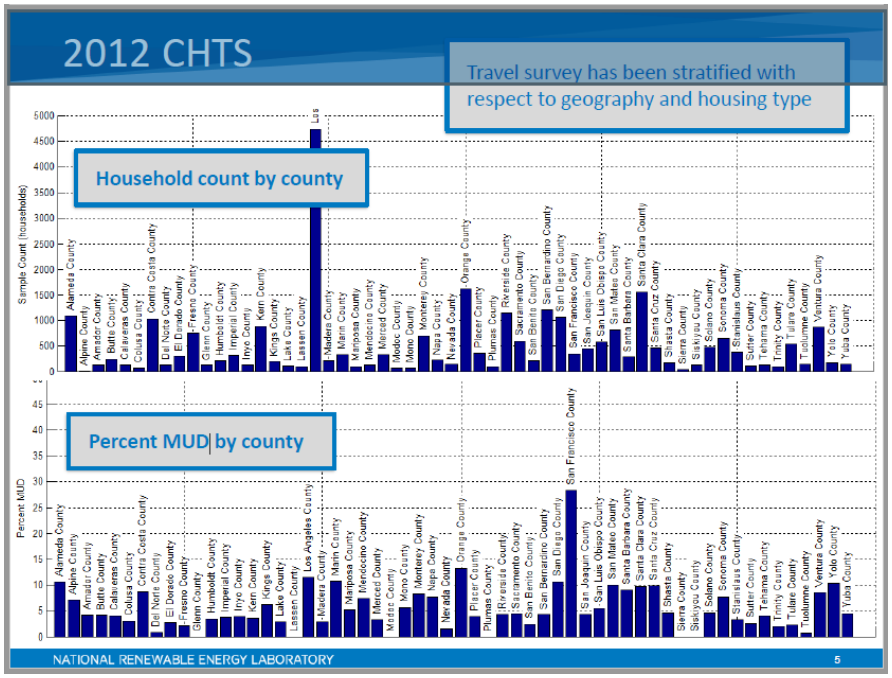
A key barrier to widespread TE is the lack of access to home charging options for Californians who live in multi-unit dwellings (MUDs) or rental properties. This customer segment has been a core target of IOU TE pilots to date—including through the light-duty EV infrastructure pilots,[102] the NRG Settlement's public DCFC, and the NRG Settlement's make-ready program. Despite the

[102] SCE's Charge Ready, PG&E's EV Charge Network, and SDG&E's Power Your Drive.

IOUs' efforts to address this barrier, homeowners in California are still more than three times as likely to own an EV compared with those who do not own a home.[103] This leaves residents of MUDs and rental properties with fewer charging options, that tend to be more expensive to fuel their EV than the options for their counterparts with EV charging access at a single-family home.

CARB's Low-Income Barriers Study cites to this issue, calling for support and incentives for charging infrastructure installation including for existing MUDs for low-income residents.[104] The CEC within its PEV Infrastructure Projects 2017-2025 also addresses the need to build out infrastructure to serve this critical segment. Figure 6 shows household count and percent of MUDs by county. For portions of California, MUD residents make up a significant portion of the population.

Figure 6: Household Count and MUD Percentage by County[105]



Given these barriers, addressing the customer segments that lack access to home charging fits within the appropriate scope of program priorities that could be addressed prior to IOU TEP adoption. However, in line with the guidance in this chapter, any near-term investment within this segment should serve as a bridge between the current IOU TE programs and the TEPs. The IOUs should consider these investments in the context of their longer-term TE plans, and ensuring they are 'no-regrets' investments. Within this section, Energy Division staff provides additional recommendations on how any pre-TEP investment within this scope should move forward.

[103] https://nhts.ornl.gov/ (Accessed January 17, 2020)

[104] https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf (Accessed January 16, 2020)

[105] California Energy Commission report, "California PEV Infrastructure Projections 2017-2025 PowerPoint Presentation" May 29, 2018.

Questions for Stakeholders
1. Given the lack of California Public Utilities Commission regulation of end-use public charging pricing, how can we ensure equity in the cost of fueling between customers with access to home charging and customers without? a. Are there solutions that do not compromise the cost causation principle of ratemaking? b. Are there solutions that do not involve infrastructure investment?

Background

Charging Infrastructure

The IOU light-duty EV infrastructure pilots[106] have aimed to address the lack of home EV charging options for Californians who live in MUDs or otherwise lack access to home charging through the installation of workplace and MUD Level 2 charging. To date, these pilot results have identified several challenges to increase access of EV charging at MUDs, including the property manager's required time or financial investment and concerns about dedicating parking spaces to EVs.

Through the NRG Settlement's installation of public DCFC stations,[107] SCE's Urban DCFC Clusters pilot,[108] and PG&E's DCFC make-ready program,[109] the CPUC is piloting alternative approaches to serving the needs of customers without access to home charging. By building plazas containing multiple DCFCs located near, but not at, MUDs we are testing whether a more gas station-like approach could serve the needs of these customers. Siting these installations can be challenging, but the CPUC has directed the IOUs and NRG to ensure that stations can serve residents of nearby MUDs and/or DACs.

Similarly, workplace charging options, like those offered through the existing light-duty EV infrastructure pilots, have worked to serve as an alternative to home charging. Data is still not available to determine whether the workplace charging infrastructure is serving customers without access to home charging, nor do we have a standardized methodology/survey to determine whether it is influencing customers to purchase EVs.

Cost of Fueling

Customers who can charge an EV at home on a residential EV rate[110] have access to favorable off-peak rates.[111] This allows them an opportunity to charge at a competitive cost. However, customers

[106] SCE's Charge Ready, SDG&E's Power Your Drive, and PG&E's EV Charge Network

[107] NRG Settlement, approved by FERC on November 5, 2012. Settlement and associated amendment documents are available at https://www.cpuc.ca.gov/General.aspx?id=5936; accessed on November 29, 2019

[108] D.18-01-024

[109] D.18-05-040

[110] https://www.cpuc.ca.gov/zev/#Rates (Accessed January 16, 2020)

[111] See Appendix G, "EV Rates Background"

without home charging typically do not have access to the same rates. Shared EV charging stations at MUDs and workplaces must enroll on a commercial rate with off-peak prices that are often not as favorable as those offered through residential EV rates.

If customers lack access to private, private but shared, or dedicated workplace charging, they may have to rely solely on public stations. As battery capacity continues to grow, and given the time required to charge EVs at lower power levels, DCFC may often better suit drivers' needs. The CPUC does not regulate the price of electricity at public DCFC stations. These charging rates are subject to the EVSPs or site hosts operating them and tend to be more expensive due to higher capital and operating costs.[112]

This issue of disparity in the affordability of fueling across population segments is also discussed within Chapter 6, "Equity" and Chapter 9, "TE and Customer Rates."

Discussion

Charging Infrastructure

SCE and SDG&E both currently have open proceedings requesting expansions of their light-duty infrastructure pilots—Charge Ready 2[113] and Power Your Drive Extension[114] respectively. As staff we do not prejudge these proceedings. However, any pre-TEP program application addressing customers without access to home charging should not be a replica of existing efforts within this sector. Any application addressing infrastructure within this segment should:

- Leverage lessons learned from existing IOU TE programs
- Demonstrate an innovative approach to meeting the infrastructure needs of this segment
- Seek community and stakeholder feedback in advance of submission to the CPUC
- Include a component to address ESJ communities (per chapter 6, "Equity" guidance)
- Seek to share costs with non-ratepayer sources

Cost of Fueling

This disparity in the cost of fueling across population segments results in customers without access to private home charging paying more to fuel their EVs due to lack of access. While cost causation principles should still apply to ratemaking, Energy Division staff sees opportunity for IOU and stakeholder innovation to address this issue. This could involve pilots partnering with public charging station providers, or a pilot involving charging vouchers, or other innovative ideas.

As with all of the pre-TEP topic areas, IOUs should consider any programs addressing customers without access to home charging within the larger context of their TEPs and long-term planning.

5.4 Medium- and Heavy-Duty Vehicle Infrastructure

[112] D.10-07-044 established that the CPUC does not regulate the rates that service providers use to sell electricity as a fuel for light-duty EVs. This Decision was later codified as Chapter 480 of the Statutes of 2011 (AB 631, Ma). http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB631

[113] A.18-06-015

[114] A.19-10-012

Summary

Providing TE infrastructure to support transition of California's medium- and heavy-duty (MD/HD) vehicle fleets to zero-emission vehicles is critical for several reasons. First, solving California's climate and air quality challenges will require broad and deep electrification of the MD/HD sector, including both on-road vehicles and many types of off-road vehicles. In addition, IOU investment in infrastructure solutions will be critical as CARB has found that "Infrastructure has emerged as the current largest issue, requiring increased attention as fleets transition from a handful of vehicles to larger deployments."[115] Furthermore, MD/HD charging infrastructure is at an early stage of development, and is less standardized than passenger vehicles.

Questions for Stakeholders
1. What gaps, if any, within existing investor-owned utility programs targeting medium- and heavy-duty vehicle electrification would be appropriate barriers to address within pre-Transportation Electrification Plan program applications? 2. Should the CPUC direct one IOU to coordinate state-wide medium- and heavy-duty issues or direct the IOUs to propose an IOU coordinator?

Background

Electrification of the MD/HD sector is critical to meet the State's climate and air quality goals. The MD/HD sector accounts for over 39 percent of the total mobile source ambient air quality emissions[116] and 21 percent of the total mobile source GHG emissions.[117] In addition, State and local air quality strategies rely on MD/HD electrification because high levels of ozone-forming pollutants and diesel particulates from these vehicles result in unhealthy air.

To respond to the transportation sector's ongoing environmental impact, California agencies, utilities, and other organizations offer significant amounts of incentive funding for vehicle procurement.[118] Additionally, the CPUC has approved nearly $700 million for the large IOUs to implement large-scale MD/HD programs that seek to address the high up-front barriers to installing MD/HD EV charging infrastructure. The IOUs are currently implementing pilots and full-scale MD/HD investment programs as shown in Appendix B.

Successful solutions for the MD/HD segments will require extensive collaboration with CARB, CEC, air quality agencies, and a broad range of stakeholders during the development of TEPs. For instance, CARB has prepared regulatory targets and timelines for a broad array of MD/HD vehicle technologies that will drive TE infrastructure needs, and in some cases an assessment of where markets have not yet reached commercial maturity. Likewise, the CEC will be preparing specific targets for TE infrastructure as described earlier in Section 3.1.

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[116] CARB 2016 SIP Emission Projection Data. https://www.arb.ca.gov/app/emsinv/2017/emssumcat_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA#7 (Accessed January 14, 2020)

[117] See CARBs 2019 GHG Inventory https://ww2.arb.ca.gov/ghg-inventory-data (Accessed on January 14,2020)

[118] See the Alternate Fuels and Data Center at https://afdc.energy.gov/laws/state_summary?state=CA (Accessed on December 20, 2019).

Discussion

The IOUs' approved MD/HD programs are still in the early stages of implementation. At this time, uncertainty remains regarding whether additional funding may be needed to address urgent State climate and air quality goals prior to filing applications based on approved TEPs. Thus, IOUs may submit applications for MD/HD infrastructure prior to TEP adoption only if they document:

- How specific State regulations require the support of ratepayers prior to applications submitted based on approved TEPs.
- How the IOU coordinated with State agency(s) to identify unaddressed, time sensitive needs and how the pre-TEP program addresses these needs.
- Why previously approved IOU program funding levels will not be sufficient to meet these needs, or why previously approved programs will end before these needs are met.

Many MD/HD issues and solutions could apply state-wide given similarities in technology and/or because many companies operate fleets across multiple IOUs. Thus, the CPUC should designate a statewide lead or direct the IOUs to designate a state-wide lead to coordinate, if multiple IOUs file applications prior to TEP adoption that aim address the same MD/HD segment. This coordination will help send a consistent signal to markets.

Subsequently, IOUs should include in TEPs long-term strategy for how they will address MD/HD sectors and determine appropriate IOU roles based on the process identified in Chapter 4 (IOU Roles to Accelerate TE Infrastructure Deployment). Appendix F contains examples of information specific to MD/HD sectors that should be used during that process. In addition to these resources, the IOUs should also leverage lessons learned from their current programs and carefully coordinate with other sources of incentive funding.

5.5 New Building Construction

Summary

Studies show that the installation of EV charging infrastructure during new construction is much less costly than retrofitting existing buildings later. A TE new construction program could result in several benefits including:

- Lower costs per charging port.
- Lower administrative burdens to customer participation.
- Increased participation by smaller buildings.[119]
- A strategy to affordable housing developers.

Given the lost opportunity when new construction is built without adequate EVSE infrastructure, and lead time needed to design EVSE in new construction, IOUs may propose approval of programs addressing TE infrastructure for new construction prior to CPUC adoption of their TEPs. Any new construction-focused applications filed prior to TEP adoptions could also address partnerships to facilitate State and local building codes to provide increased levels of TE

[119] Smaller buildings or those owned by small businesses are sometimes excluded from retrofit projects due to the high fixed costs and minimum port criteria of existing IOU TE programs.

infrastructure for similar reasons as described in Chapter 10. In addition, TEPs should address these opportunities.

Questions for Stakeholders
1. What, if any, coordination with existing energy efficiency new construction programs for the residential and commercial sectors would make a TE infrastructure program for new construction more effective? 2. Given the fact that the CPUC has not yet approved an IOU TE program that focuses on new construction specifically, what program design elements would be reasonable to require up-front to maximize ratepayer benefit? 3. Can fixed dollar per port incentives, with some case-by-case adders, be set at a level that motivates EVSE installation while also encouraging builder cost sharing? If so, what data should be used to set these levels? If not, should IOU programs cap rebates at a fixed percentage of costs to builders? Could IOUs verify builder self-reported cost estimates, and if so how? 4. How could new construction programs prioritize ESJ communities including affordable housing developments?

Background

The major IOU light-duty programs allow for participation from new construction sites and have received some new construction participation. However, these programs have largely supported EVSE retrofits at existing site for several reasons. First, the IOUs' have adopted a first-come, first-serve basis for program applications. In addition, IOU programs requirements may not match the needs of builders.[120]

In addition, this focus on retrofits typically exclude smaller buildings under the IOUs' existing light-duty infrastructure pilots, because 1) retrofit projects include high per project fixed costs and 2) thus small sites cannot achieve the economies of scale of larger sites with a higher number of ports. Conversely, the infrastructure costs per port during new construction tend to be relatively small for both small and large projects, as shown in Section 10.2 for the electrical infrastructure portion of project costs, providing a better opportunity for smaller buildings to participate in IOU programs.[121]

In comparison, the IOU's currently implement energy efficiency programs that focus on new construction. The program strategies including outreach to builders on opportunities to achieve energy efficiency levels that exceed minimum building codes and targeted rebates.

[120] For instance, new IOU easements are typically required based on the expectation that retrofit projects will require significant installation electrical infrastructure whereas for new construction, a significant level of electrical infrastructure must be designed into new buildings.

[121] See, for example, SCE's Charge Ready Pilot Report May 2016-March 2018, as amended on July 9, 2018, at 36. The utility found that sites that installed the minimum number of five ports "are significantly more costly to deploy, especially if they require new transformers to serve the incremental EV load." Available at https://www.sce.com/sites/default/files/inline-files/Charge%2BReady%2BPilot%2BReport%2BSummary_Amended.pdf (Accessed on January 15, 2020).

Discussion

New construction programs can aid in achieving State goals and provide low cost options to scale TE infrastructure for a number of reasons. First, several reports demonstrate that retrofitting EV charging infrastructure in MUDs and nonresidential buildings is two to eight times more expensive compared to implementing at the new construction or alterations phases.[122] In addition, TE installation during new construction could avoid major non-cost barriers that often stymie retrofit projects.[123] Furthermore, approximately 62,000-77,000 MUD units and 142,400-176,8100 non-residential parking spaces are constructed annually, providing an opportunity for large scale TE deployments starting in the near term.[124]

State building codes support TE goals but leave critical gaps that can be filled by private and public funding for developing charging at new construction sites through incentive programs and enhancing State and/or local building codes (described under Partnerships in Chapter 10). Therefore, Energy Division staff recommends allowing IOUs to submit applications prior to TEP adoption that focus on establishing new programs or expanding existing programs to add a focus on new construction.

5.5.1 Guidelines for Investor Owned Utility Role in New Construction Incentives

Any IOU new construction incentive program implementation strategies should leverage best practices from and coordinate outreach with existing IOUs energy efficiency programs while also addressing any specific unique needs for TE host sites.[125] Outreach should be coordinated to increase effectiveness and to leverage existing relationships to provide a more convenient customer experience. IOUs should coordinate with ESJ Communities, including affordable housing developers if not already included in ESJ Community outreach, during program development to ensure participation by a broad range of communities. IOUs should also include outreach strategies to smaller building/facility types, especially since they typically cannot participate in current retrofit programs.

Any new construction incentive should only apply to developments that exceed the minimum existing code in its local jurisdiction, including any local codes that exceed the existing CALGreen requirements. Builders or EVSE installation partners can exceed codes by adding EVSE to upgrade spaces with electrical infrastructure required by code; or adding more EV-ready infrastructure than

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[122] See, for example, CARB's EV Charging Infrastructure: Multifamily Building Standards, Technical and Cost Analysis for the 2019 Code Cycle. Available at https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf (Accessed on January 16, 2020).

[123] These barriers can include landlord or home-owner approval and the time required for project management.

[124] Data is calculated CARB annualized MUD estimates and non-residential estimates from CARB 2019 and CARB 2018. See Section 10 of this document.

[125] For instance, the "Southern California Edison Company's Amended Energy Efficiency Rolling Portfolio Business Plan For 2018-2025, SCE, 2017. Available at http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/48BA2F33CB7B727A882580C40007B747/$FILE/A1701013%20et%20al-SCE%20Exhibit%20SCE-02%20-%20Amended%20EE%20Rolling%20Portfolio%20Business%20Plan%20for%202018-2025%20(REDLINE).pdf, last (Accessed on January 16, 2020) contains detailed discussions of energy efficiency program design and implementation strategies for new construction throughout the plan and the "PG&E Energy Efficiency Business Plan 2018-2025", PGE, no date listed, available at https://www.pge.com/pge_global/common/pdfs/for-our-business-partners/energy-efficiency-solicitations/PGE-Energy-Efficiency-Business-Plan.pdf, (Accessed on January 16, 2020) also contains similar types of information in chapter Three and elsewhere. These examples are not intended to be comprehensive.

code requires. Builders in communities with local codes that require EVSE installations should have the opportunity to participate by exceeding those minimum code requirements.[126]

In addition, new construction incentive proposals should require some level of developer buy-in and cost sharing and be simple to understand and implement. Requiring developer buy-in will ensure that infrastructure will be installed in locations where it will be used and provide value.

5.5.2 Additional New Construction Related Activities

The California Green Building Standards Code (CALGreen) is located in Title 24 part 11 and requires EV charging infrastructure in 10 percent of parking spaces at new buildings.[127] CALGreen and similar local "Reach" codes are discussed in Sections 10.2 and 10.3. However, the amount of charging infrastructure projected to be installed as a result of CALGreen will not be enough to support State's 2030 goals of converting 18-24 percent of passenger vehicles to EVs and longer-term TE goals. IOUs could provide support to agencies seeking to expand these requirements.[128] Therefore, Energy Division staff recommends allowing IOUs to file applications to establish new programs or expand existing programs to add a focus on new construction prior to TEP adoption.

Conclusion

The investment priorities described in this section reflect Energy Division staff's assessment of current market conditions and time-restricted funding opportunities that should inform IOU programs. Energy Division staff recommends the CPUC should consider limiting its consideration of any applications filed prior to full adoption of the IOUs' TEPs to the priority issues identified above.

Recommendations

Prior to Transportation Electrification Plan (TEP) adoption, Energy Division staff recommends that the CPUC:

1. Limit consideration of new IOU applications or advice letters to those that address the following near-term transportation electrification (TE) barriers and/or regulatory priorities:
    a. Electric vehicles (EV) and resiliency
        i. Including within any future public safety power shutoff (PSPS) notification a directive for EV drivers in the affected areas to charge their vehicles before the PSPS goes into effect.
        ii. Identifying and implementing strategies that offer reduced rates for electricity consumed as a transportation fuel between the announcement and enactment of a PSPS.
    b. Customers without access to home EV charging
        i. Leveraging lessons learned from existing IOU programs targeting customers without access to home charging to either propose an innovative pilot

[126] Several local buildings codes require EVSE and set percentages between 1 and 10. For example, Menlo Park is an exception and requires a higher number of EVSE – 15 percent for new MUD households - per ordinance 1049 available at https://www.menlopark.org/DocumentCenter/View/18835/H5---CD---EV-chargers---18-193 (Accessed on January 15, 2020)

[127] EV charging is listed under current MUD codes (CALGreen chapter 4) and proposed revised nonresidential building codes (CALGreen chapter 5).

[128] For instance, see p 5 (Ed Pike e. a., Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update, 2019) https://caletc.com/caletc-research/

approach to EV charging infrastructure deployment, or a non-infrastructure approach to address cost of fueling disparity.
        ii. Including discussion within TEPs on addressing the disparity in the cost to fuel an EV for customers with and without access to home charging.
        iii. Considering whether incentives could be designed to help offset the cost of public charging for customers that lack home charging options.
    c. Medium- and heavy-duty (MD/HD) vehicle infrastructure
        i. Leveraging lessons learned from existing MD/HD programs to design programs that build on current investments and fill any gaps in current programs to meet time sensitive needs.
        ii. Participating actively in the California Air Resources Board's (CARB) regulatory proceedings to provide data and support for new MD/HD rule development and implementation under the Mobile Source Strategy.
    d. New Building Construction
        i. Supporting State agencies enhancing State or local building codes providing increased levels of TE infrastructure.
        ii. Providing incentives for new construction.
            1. Funding should be limited to "beyond code" EV charging infrastructure, including beyond any local "Reach Codes" that are stricter than statewide requirements.
            2. Incentive level(s) should generally require some level of building developer/owner cost-sharing.
            3. Evaluate coordination opportunities for the administration of any new construction TE incentive program(s) with existing energy efficiency new construction rebate programs.
            4. Describe strategies for outreach and other strategy(s) for targeting affordable housing developers, developers for smaller buildings, and Environmental and Social Justice (ESJ) communities in any new construction TE incentive program.
2. Host a public workshop to discuss the link between EVs and resiliency, and to discuss their TE resiliency plans. Feedback from the workshop should be used to improve IOU TE-related resiliency plans.

Energy Division staff further recommends the CPUC direct the IOUs to include strategies to address the priority issues discussed in this chapter in their TEPs, including the following:

1. Addressing strategies to improve grid and community resiliency including:
    a. How their TE infrastructure could be impacted by a changing climate and/or natural disasters and plans to address those impacts.
    b. Descriptions of how EVs can be part of the solution to adapt to the effects of climate change, and the IOU's plan to utilize TE to improve the resiliency of communities, including ESJ communities.[129]

[129] Goal 4 of the ESJ Action Plan identifies objectives for the IOUs to consider to increase climate resiliency in ESJ communities. The IOUs TEPS should detail the efforts that will and have already been taken to meet this goal. Available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/Env and Social Justice Action Plan_ 2019-02-21.docx.pdf (Accessed on January 15, 2020)

c. Demonstrations of how IOUs will collaborate with emergency service organizations and the local communities directly to prepare for events that can impact the ability for the IOUs to supply customers with electricity as a transportation fuel.
d. Coordinate with other IOU resiliency efforts, including but not limited to, R.19-09-009,[130] R.18-12-005,[131] and R.12-11-005.[132]
e. Coordinate with emergency services and local communities.

3. Proactively coordinating with emergency services organizations, local communities, and planning agencies to identify the infrastructure investments and information technology system upgrades that need to be made to enable vehicle-to-building functions.
4. Filing resiliency-focused pilots focused on installing EVSEs at Community Resource Centers.
5. Recording costs for ratepayer supported TE infrastructure damaged during a state emergency within the IOUs' Catastrophic Event Memorandum Accounts.
6. Designing programs that ensure any areas being rebuilt after fires and other natural disasters include sufficient transmission and distribution capacity to meet the region's future TE needs.
7. Collaborating with CARB, the California Energy Commission, and local air quality agencies and other stakeholders and utilize their MD/HD specific resources to determine the highest priority TE MD/HD sectors for investment
8. Addressing within their TEPs the potential for incentive programs designed to accelerate the installation of charging stations at new buildings.

6. Equity

Summary

The transformation of the transportation sector will require deep engagement with communities, particularly those who have been historically underserved. The core issues which widespread TE seeks to address—air quality and climate change—affect all Californians. However, as the Environmental and Social Justice Action Plan (ESJ Action Plan) affirms, some communities have a history of unfair treatment and disproportionate impacts from environmental hazards, economic burdens, or both.[133] As California moves beyond early adopters of EVs, the CPUC and IOUs must work to ensure all California IOU ratepayers have the opportunity to benefit from investments in TE.

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[130] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M314/K274/314274617.PDF (Accessed on January 15, 2020).

[131] https://apps.cpuc.ca.gov/apex/f?p=401:56:0::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R1812005 (Accessed on January 15, 2020).

[132] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M325/K979/325979689.PDF (Accessed on January 31, 2020)

[133] "Environmental and Social Justice Action Plan,", The California Public Utilities Commission", version 1.0, February 21, 2019, serves as a roadmap for implementing a process to increase equity through all programs and policies. It is available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/Env%20and%20Social%20Justice%20ActionPlan_%202019-02-21.docx.pdf (Accessed on November 29, 2019)

To prioritize equity, the TEPs must address barriers to widespread TE. We utilize the following resources to identify key barriers low-income residents, disadvantaged communities (DACs), and tribal communities (collectively referred to in this document as "ESJ communities") face in accessing renewable energy and clean transportation options:

- ESJ Action Plan
- Tribal Consultation Policy[134]
- CARB's Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents ("Low-Income Barriers Study")[135]

The TEF builds off these studies to further identify barriers and goals that are particularly relevant to the IOUs' TE investments. These barriers and goals will be critical for the CPUC to consider in developing policy and guidance on TE, and essential for the IOUs to incorporate into their TEPs.

This chapter also describes the IOUs' equity focused TE efforts to date and discusses the potential benefits of applying different equity designations (e.g. DAC, low-income) to different types of TE programs, rather than only using DAC.

Questions for Stakeholders
1. Please identify any additional barriers or communities that should also be considered to adequately address equity within the investor-owned utilities' transportation electrification programs. 2. Should any specific targets or metrics be added to the Scorecard to ensure there is measurable success in reaching environmental and social justice communities? 3. Should the final Transportation Electrification Framework (TEF) adopt specific definitions of disadvantaged communities (DAC), low-income, and medium-income? 4. Should the CPUC direct stricter guidance on the use of the different equity designations? 5. Should the Transportation Electrification Plans (TEPs) be inclusive of paratransit and providing for the disabled community, and if so, how?

Background

[134] "Tribal Consultation Policy of the California Public Utilities Commission," adopted, April 26, 2018; This was pursuant to Governor Brown's Executive Order B-10-11, which included direction to state agencies to "permit elected officials and other representatives of tribal governments to provide meaningful input into the development of legislation, regulations, rules, and policies on matters that may affect tribal communities." It is available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M212/K861/212861685.PDF (Accessed on November 29, 2019)

[135] "Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents", California Air Resources Board, February 21, 2018, pursuant to SB 350. It is available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/Env%20and%20Social%20Justice%20ActionPlan_%202019-02-21.docx.pdf (Accessed on December 9, 2019)

Light-Duty Infrastructure Programs

In 2016, the CPUC authorized the large IOUs to each implement a light-duty EV charging infrastructure pilot, each including targets for infrastructure deployment in DACs.[136] All three of the pilots have exceeded their individual DAC targets.[137]

PG&E's EV Charge Network

PG&E's program includes both utility and site host-owned charging stations. For site host-owned stations, PG&E provides rebates for 100 percent of the base charger cost for MUDs in DACs, and a rebate for 50 percent of the base charger cost for workplaces in DACs. For the PG&E owned stations, PG&E covers the full base charger cost for MUDs in DACs and requires a one-time participation payment of 50 percent of the base charger cost for workplaces in DACs.[138]

SCE's Charge Ready

For MUD and workplace site hosts located in DACs, SCE provides a rebate to offset 100 percent of the base cost of the charging station.[139] The customer is responsible for ongoing operating and maintenance costs, as well as any EVSE costs that exceed the base cost. This has been a financial challenge for some customers.[140]

SDG&E's Power Your Drive

SDG&E owns, operates, and maintains all of the charging stations at no cost to site hosts in DACs. Other site hosts, however, must commit to a one-time "participation payment" to participate in the program.[141]

NRG Settlement

The NRG Settlement with the State of California[142] predates CalEnviroScreen, the tool California uses to designate DACs, and instead includes investment targets in low-income areas as defined by Public Use Microdata Areas (PUMA).[143] The Settlement required 20 percent of the public EV

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[136] D.16-01-023 directed SCE to implement the Charge Ready pilot, which included a target for 10% in DACs; D.16-01-45 directed SDG&E to implement Power Your Drive, which included a target for 10% in DACs; and D.16-12-065 directed PG&E to implement EV Charge Network, which included a target for 15% in DACs.

[137] SCE's Charge Ready and SDG&E's Power Your Drive both define DAC as the top quartile of census tracts per the CalEnviroScreen scores on either a state-wide or utility territory-wide basis, whichever is broader. The definition of DAC for PG&E's EV Charge Network program is different, defining it as sites in the top quartile of census tracts defined through CalEnviroScreen, and which also meet the spirit of the definition. The "spirit of the definition" is mentioned on page 68 of D.16-12-065, and PG&E with guidance from its Program Advisory Council defined what "the spirit of the definition" entails. The program is using the Fortune 1,000 list as a means to eliminate companies that are located in DACs but do not meet the spirit of that definition.

[138] D.16-12-065 directed PG&E to establish a base cost and set the rebate and participation payment levels.

[139] D.16-01-023 directed SCE to establish a base cost, a predetermined amount that includes the cost of the charging station and its installation, based on a request for information (RFI) from prospective suppliers.

[140] At SCE's May 17, 2017 Charge Ready Program Advisory Council (PAC) meeting, SCE staff noted that on average, the pilot's rebate offset 49 percent of total purchase agreement costs and offset 62 percent of equipment and installation costs only. SCE staff noted that in addition to equipment and installation, customers were also purchasing management/maintenance packages, communication/data services, freight, and other misc. items. In summation, SCE staff noted costs customers paid after the rebate, which were $778 -$1,720 per port for site hosts in DACs.

[141] Participation payments outlined in SDG&E AL 2877-E and 2886-E Disposition

[142] NRG Settlement, approved by FERC on November 5, 2012. Settlement and associated amendment documents are available at https://www.cpuc.ca.gov/General.aspx?id=5936; accessed on November 29, 2019

[143] A Public Use Microdata Area is a statistical geographic area defined by the US Census Bureau.

charging stations ("Freedom Stations" and "High-Power Charging Plazas") to be located within low-income PUMAs.[144]

The NRG Settlement also required NRG to spend $4 million on specific "projects that enhance appreciation of the social benefits of [EVs] and create opportunities for residents of under-served communities to benefit from expanded use of [EVs] in California."[145] NRG allocated this funding between two projects: The Green Raiteros Project and the Electric Access Charging Hub Project.[146] Both of these projects support ridesharing or carsharing in DACs as defined by CalEnviroScreen.[147,148]

Medium- and Heavy-Duty (MD/HD) Infrastructure Programs

In 2018 and 2019, the CPUC authorized the IOUs' SB 350 programs, which included the first ratepayer-funded efforts to support electrification of the MD/HD vehicles sector.[149] Considering that DACs are often disproportionately affected by air pollution from transport, transit, and freight, the focus on the MD/HD sector is critical to addressing not only TE infrastructure barriers, but also equity and environmental justice.

All of the MD/HD infrastructure projects authorized to date have included budgetary targets for DAC deployments and other provisions intended to increase access to the program. The CPUC has directed PG&E,[150] SCE,[151] and SDG&E[152] to use their medium- and heavy-duty infrastructure programs to advance equity in the following ways:

1. Require a minimum of 15 percent of their infrastructure budgets to serve transit agencies.
2. Offer rebates of up to 50 percent of the EVSE cost for sites in DACs and sites that support transit and school buses.
3. Focus on shuttle, delivery, or transit routes that go through DACs
4. Spend 25 percent, 40 percent, and 30 percent respectively of the program's infrastructure budgets in DACs.

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[144] NRG Settlement Year 7 Final Report, submitted on September 5, 2019, includes a comparison of sites installed in PUMAs to DAC census tracts identified by the CalEnviroScreen

[145] The Settlement notes that the EV Opportunity Program funds may be used for (A) the deployment of EV charging infrastructure to support EV car sharing projects, in particular in low-income areas within California, (B) an EV job training program, and (C) other projects consistent with the objectives of the EV Opportunity Program.

[146] For its Green Raiteros Project, NRG agreed to spend $519,400 and partner with local nonprofits to deploy charging infrastructure that enables the use of EVs for ridesharing programs in Huron, CA. The funding supported an existing grassroot rideshare program and helped to establish a long-term business plan for this program.

[147] The CPUC granted two siting exceptions to NRG in siting their Electric Access Charging Hub stations in close proximity to but not within, a DAC.

[148] Electric Access Charging Hub Project: NRG agreed to spend $3,480,600 to install 7 EV charging hubs in DACs to support both public DC fast charging and EV carsharing.

[149] D.18-01-024 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M204/K670/204670548.PDF (Accessed on January 15, 2020)

[150] PG&E's Fleet Ready program is authorized to spend $236 million to support make-ready installations at a minimum of 700 sites, supporting the electrification of at least 6,500 medium- and heavy-duty fleet vehicles.

[151] SCE's Charge Ready Transport Program is authorized to spend $343 million for SCE to support make-ready installations at a minimum of 870 sites to support the electrification of at least 8,490 medium- or heavy-duty fleet vehicles.

[152] SDG&E's MD/HD infrastructure program is authorized to spend $107.1 million for SDG&E to support the electrification of at least 3,000 MD/HD vehicles and implement a V2G school bus pilot program.

Future program evaluation will inform whether these program requirements provide incremental benefits to DAC communities.

6.1 Equity Barriers

Background

The ESJ Action Plan, Tribal Consultation Policy, and Low-Income Barriers Study offer a solid foundation from which to begin outlining guidance on TE equity for the IOUs. The ESJ Action Plan identifies barriers to equity within CPUC proceedings and sets goals to better integrate equity and access considerations. Of the ESJ Action Plan goals, the following are especially relevant to TE:

- **Goal 2**: Increase investment in clean energy resources to benefit ESJ communities, especially to improve local air quality and public health.[153]
- **Goal 3**: Strive to improve access to high-quality water, communications, and transportation services for ESJ communities.
- **Goal 4**: Increase climate resiliency in ESJ communities.
- **Goal 5**: Enhance outreach and public participation opportunities for ESJ communities to meaningfully participate in the CPUC's decision-making process and benefit from CPUC programs.
- **Goal 9**: Monitor the CPUC's ESJ efforts to evaluate how they are achieving their objectives.

The CPUC also recently adopted the Tribal Consultation Policy in 2018, which was aimed at strengthening the CPUC's relationship with California Indian Tribes.[154] The document sets forth provisions for consultation, communication, and collaboration with tribes. The IOUs should also incorporate these into their TE equity efforts:

- Recognize and respect tribal sovereignty.
- Encourage and facilitate tribal government participation in CPUC proceedings.
- Give meaningful consideration towards tribal interests in issues within the CPUC's jurisdiction.
- Encourage and facilitate tribal government participation in CPUC-approved utility programs.
- Protect tribal cultural resources.
- Encourage investments by tribal governments and tribal members in onsite renewable energy generation, energy efficiency, low carbon transportation, and energy storage.

[153] Goal 2 specifically cites the replacement of ICE vehicles and the CPUC's commitment to hasten this transition in communities that bear an unduly high burden from these pollution sources by prioritizing additional investment in the area of EV infrastructure, among other clean energy goals.

[154] "Tribal Consultation Policy of the California Public Utilities Commission," adopted, April 26, 2018; This was pursuant to Governor Brown's Executive Order B-10-11, which included direction to state agencies to "permit elected officials and other representatives of tribal governments to provide meaningful input into the development of legislation, regulations, rules, and policies on matters that may affect tribal communities." It is available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M212/K861/212861685.PDF (Accessed on November 29, 2019)

Pursuant to SB 350, CARB released its Low-Income Barriers Study.[155] This study identifies the barriers low-income residents and DACs face to access clean transportation and mobility options. The Low-Income Barriers Study identified the following high-priority barriers:

1. Access, convenience, safety, and other barriers low-income residents face within a community,[156]
2. Affordability[157]
3. Funding for Clean Transportation Investments, and
4. Awareness of clean transportation and mobility options[158]

While all Californians face similar barriers to access clean transportation and mobility options, the barriers that ESJ communities face are amplified. In addition to socioeconomic and environmental burdens, decision-making processes have historically ignored the needs of ESJ communities. As a result, there has typically been under-investment in TE in these communities. For some, the under-investment goes beyond TE and has been ongoing over many decades, meaning the infrastructure investment needs may be much more than that of other communities.

Further, each community is unique and thus may have unique needs and barriers based on geographic, economic, demographic, or cultural factors. Californians who live in rural or tribal communities may be at an additional disadvantage when it comes to TE, as the distribution of charging stations tends to be concentrated in urban and suburban centers of the State, as the map in Figure 7 below illustrates.

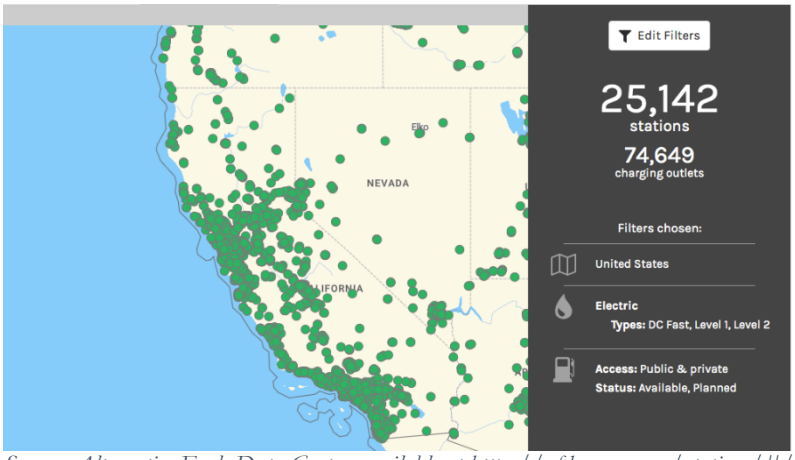
[155] "Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents", California Air Resources Board, February 21, 2018. It is available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/Env%20and%20Social%20Justice%20ActionPlan_%202019-02-21.docx.pdf (Accessed on November 29, 2019).

[156] E.g. lack of access to measures considered essential for walking, biking, and public transportation; lack of access to carsharing and TNCs; challenges accessing public funding opportunities; and high upfront costs of EVs; physical proximity; ability to travel at desired times and for desired reasons.

[157] E.g. low-income car buyers may not qualify for a low-interest loan or lease option or be able to afford the upfront price and wait for state rebate reimbursements; subsidized transit may not be accessible; residents using public transit may require additional last or first mile transportation.

[158] E.g. remote communities may lack broadband access and the information on clean transportation online; Community Based Organization (CBO)s and local transportation agencies may be unaware of clean transportation opportunities; residents often lack awareness of clean vehicles; outreach not conducted in predominant language(s); rural and tribal communities feel overlooked; outreach may not be targeting needs of low-income residents.

Figure 7: Charger Distribution in California



Source: Alternative Fuels Data Center, available at https://afdc.energy.gov/stations/#/find/nearest

Discussion

The ESJ Action Plan, Low-Income Barriers Study, and Tribal Consultation Policy serve to inform the following seven barriers that Energy Division staff recommends the IOUs should address in their TEPs and program design efforts moving forward:

1. Access to clean transportation options
2. Availability and affordability of EVs
3. Access to EV charging
4. Equity in the price of fueling
5. Consumer awareness
6. Community engagement
7. Measurable success

The following guidance provides a suggested framework for how the IOUs should address these barriers.

1. **Access to Clean Transportation Options:** The IOUs have a role to play in expanding access to diverse clean transportation technologies across ESJ communities. This includes access to light-duty vehicle charging infrastructure, and support for shared mobility, and public transportation options, as single-occupancy vehicles may not be the best way to address mobility in all circumstances (e.g., dense urban areas, regions with low vehicle ownership, areas that struggle with last-mile-transit, etc.). The IOUs should ensure that their TEPs and programs are supporting diverse mobility options to meet the needs of ESJ communities.

2. **Availability and Affordability of EVs:** The CPUC and IOUs should continue to collaborate with CARB and the CEC as they lead the effort to address barriers directly associated with vehicle cost. Providing incentives or financing for vehicles themselves should remain outside the scope of ratepayer investment. However, the IOU strategies on TE can support the efforts of other state agencies, companies, and organizations tasked with addressing the availability and affordability of EVs.

The one exception to this is programs funded through the Low Carbon Fuel Standard (LCFS). Specifically, the IOUs have a role in administering the statewide Clean Fuel Reward (CFR) program, which is funded through LCFS credit revenue. CARB has tasked the IOUs with supporting the CFR program, and the CPUC has directed the IOUs to utilize this program administration as an opportunity to better understand where charging is taking place in their territories, how to educate customers about EV rates, and whether there are other vehicle or charger incentives for which customers may be eligible.

While the IOUs are largely implementing this program outside of their TEPs, the IOUs should consider this investment within their TEP planning efforts, as is discussed in TEF section 11.3, "Low Carbon Fuel Standard" of the TEF.

3. **Access to Safe and Convenient EV Charging:** The TEF identifies a process for identifying the IOUs' investment role in building out EV charging infrastructure. Accordingly, the IOUs' TE infrastructure programs and TEPs should aim to equitably distribute funds across populations to the extent possible to ensure broad access to EV charging. The IOUs should provide higher program incentives for customers within ESJ communities, where appropriate. In addition, the IOUs should work closely with planning agencies, local governments, communities, and EJ groups to ensure build out and siting of EV charging are tailored to the needs of the region.

4. **Equity in the Price of Fueling:** Consideration of affordability of electricity as a transportation fuel across population segments is essential. The IOUs should include discussion on how to address the disparity in the cost of fueling an EV within their TEPs. This is discussed in more depth within section 5.3, "Customers Without Access to Home Charging," as well as in chapter 9, "TE and Customer Rates."

5. **Consumer Awareness:** The ESJ Action Plan identifies significant barriers for consumer awareness of TE in ESJ communities. As discussed further in TEF section 11.2, "Marketing, Education, and Outreach (ME&O)," the IOUs' TE Marketing, Education and Outreach (ME&O) should include strategies to increase awareness of TE in ESJ communities.

6. **Community Engagement:** The ESJ Action Plan outlines the need for greater input from ESJ communities early in the development of utility programs. This includes the IOUs' TEPs and future program applications. The IOUs should proactively reach out and be responsive to these community voices at the start of the process to develop TEPs, pilots, rates, and future programs. Prior to any future request for authorization for ratepayer funding, the IOUs should solicit feedback from low-income, tribal, and DAC community groups and demonstrate in their TEPs, applications, and advice letters how they are responding to this feedback.

7. **Measurable Success:** The IOUs should design their TEPs with meaningful reporting and metrics to measure a program's efficacy in addressing TE barriers in ESJ communities. The IOUs should work with Energy Division and stakeholders to develop additional Scorecard targets and metrics to ensure TE programs are effectively reaching these targeted customers and addressing identified TE equity barriers.

6.2 Equity Designations

Background

While there does not seem to be a perfect definition to ensure all underserved customers are accounted for, we can learn and continually improve. While each of the IOU TE programs to date have attained their program equity goals, there have been gaps in each. For example, clustering EV charging investment within urban or suburban areas that may exclude rural low-income customers, or customers that are one mile outside of a DAC census tract that cannot participate in an IOU program because they are not eligible to receive the higher incentive. One key insight from the existing programs is that no one definition will ensure all ratepayers benefit from the IOU TE programs they are funding, Energy Division staff recommends expanding beyond only using the DAC designation.

There are many terms and definitions that government agencies or stakeholders use to define or categorize underserved communities.

CARB has begun using the term "priority populations" to define an overarching group of California's DACs, low-income communities, and low-income households. The DAC definition is based on CalEnviroScreen. The definition for low-income communities and households are those with incomes either at or below 80 percent of the statewide median or below a threshold designated as low-income by the Department of Housing and Community Development.[159]

The CPUC's ESJ Action Plan defines ESJ communities as including, but not limited to:[160]

- DACs, as identified by CalEPA's CalEnviroScreen tool
- All Tribal lands
- Low-income households (with incomes below 80 percent of the area median income); and
- Low-income census tracts (where aggregated household incomes are less than 80 percent of area or state median income).

To target IOU TE spending, the CPUC to date has largely utilized the statewide DAC definition of the most-impacted quartile of census tracts within CalEnviroScreen. In part, this is due to SB 350 which states that widespread TE should benefit communities that are disproportionally affected by air pollution from transport, transit, and freight. The DAC designation assesses the relative pollution burdens and vulnerabilities in one census tract compared to others. It is made up of 20 indicators related to pollution burden and population characteristics associated with increased vulnerability including health effects and income. The correlation of pollution burden and income is consistent with SB 350's goal to improve air quality as a result of widespread TE.

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[159] "Priority Population Investments," California, Air Resources Board, October 1, 2018. It is available at https://ww3.arb.ca.gov/cc/capandtrade/auctionproceeds/communityinvestments.htm (Accessed on November 29, 2019)

[160] "Environmental and Social Justice Action Plan,", The California Public Utilities Commission", version 1.0, February 21, 2019, serves as a roadmap for implementing a process to increase equity through all programs and policies. It is available at: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/Env%20and%20Social%20Justice%20ActionPlan_%202019-02-21.docx.pdf (Accessed on November 29, 2019)

Discussion

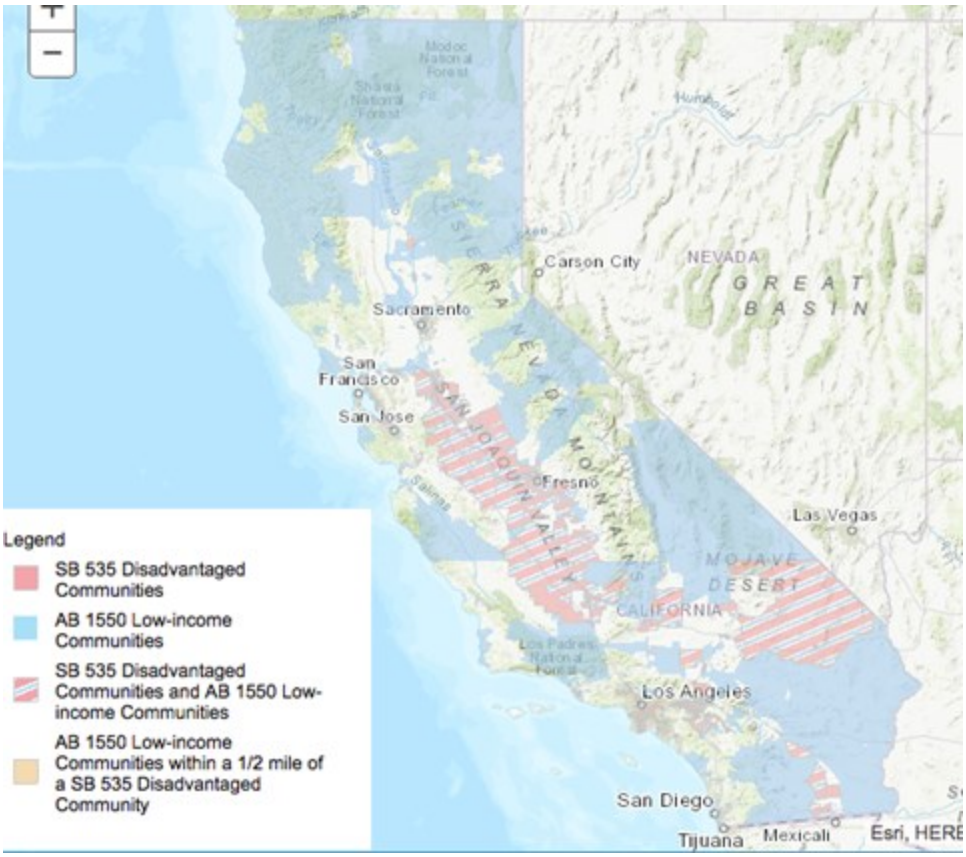
DAC-designated communities can be especially vulnerable to air pollution from medium- and heavy-duty vehicles, and thus DAC can be a useful means of identifying TE investment priorities, especially for electrifying MD/HD vehicles. However, this definition excludes low- and median-income residents who do not live in a DAC, including those rural and tribal communities that may not be as burdened by pollution. Energy Division staff thinks that these California ratepayers should also be able to accrue the benefits of TE investment.

While the DAC designation is one helpful tool to identify target populations for TE programs, it does not address all of our TE equity barriers. It does not necessarily ensure that all Californians have access to clean transportation, as other low- and median-income residents may be left behind.

Figure 8 below illustrates the inconsistencies and overlap between DACs and other low/moderate-income populations.

Figure 8: Map of low-income and DAC communities with California[161]

[161] Source: "Priority Population Investments", California Air Resources Board, 2018, https://ww3.arb.ca.gov/cc/capandtrade/auctionproceeds/communityinvestments.htm



The NRG Settlement's utilization of the PUMA low-income definition to target investment, as well as other low-income definitions, is not all encompassing either. While this designation can help to address some low-income populations in rural and tribal communities, it does not consider pollution burden, which is a key factor in understanding the benefits of medium- and heavy-duty vehicle electrification. The low-income designation can, however, be a useful tool for ensuring projects, such as light-duty electrification projects, benefit ratepayers in rural and tribal communities.

Table 4 below shows the various ESJ designations with Energy Division staff's recommendations on how the IOUs may utilize these different designations within their different programs to ensure the benefits of TE reach all relevant ESJ communities for the particular program. While these recommendations identify some specific use cases for focused investment based on TE sector, Energy Division staff does not propose to limit investment to any ESJ group based on program type. The recommendations in Table 4 are intended to help maximize TE benefits to ESJ communities.

Table 4: Energy Division staff recommendations for IOU TE program equity designations

Equity designation	Suggested investment focus	Equity benefits of utilizing this designation	Limitations of designation

DAC	MD/HD (including transit); off-road	Addressing regions in need of air quality improvements	Does not consider low- and medium-income customers who are not burdened by pollution (e.g., rural and tribal communities, low-income individuals not residing in DACs)
Low-income households	Light-duty	Reaching rural communities and individual low-income households that may not be within DACs	Does not consider pollution burden, nor medium-income households
Low-income census tracts	Light-duty; transit; shared mobility	Reaching rural communities and other low-income communities that may not be within DACs	Does not consider pollution burden, nor medium-income households
Tribal Communities	Light-duty; transit; shared mobility	Reaching tribal communities who may not be in DACs and may not be low-income	Does not consider pollution burden
Medium-income households	Light-duty	Affordable access to clean transportation for all	Does not consider pollution burden; may not be appropriate for all equity focused initiatives

The IOUs should utilize the different equity designations discussed above to ensure the TE program spending is providing benefits across applicable ESJ communities.

The IOUs should also coordinate with the Affordability OIR,[162] which is developing a methodology for calculating affordability of utility services across California. In the future, the IOUs may want to utilize the maps that the Affordability OIR is developing, which will show areas of higher and lower affordability.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Determine the appropriate equity designation(s) for each transportation electrification (TE) program depending on the focus of the TE investments, as outlined in Table 4 of this

[162] R.18-07-006

section. As this is intended to maximize benefits to environmental and social justice (ESJ) communities, each investment should be evaluated individually.

2. Include within their Transportation Electrification Plans (TEP) and future program applications plans for distributing funds across ESJ communities and address the equity barriers outlined in the Transportation Electrification Framework (TEF) section 6.1, "Equity Barriers," to the extent feasible, including:
   a. providing higher program incentives to ESJ communities, where appropriate; and
   b. designing programs to specifically address the needs of ESJ communities.
3. Partner with planning agencies, local governments, communities, and environmental justice groups to ensure equitable distribution of TE investments and should include discussion of this within their TEPs.
4. Seek input from ESJ communities and clearly incorporate the feedback into TEPs, program applications, and advice letters to better address the needs of these communities.
5. Work with Energy Division staff and stakeholders to incorporate Scorecard targets and metrics that measure program effectiveness in targeting TE infrastructure investments in ESJ communities and addressing TE equity barriers.

7. Safety

The CPUC is responsible for assuring the safety of all IOU operations, including "a goal of zero accidents and injuries across all the utilities and businesses we regulate." The CPUC has adopted a Safety Policy Statement and a Safety Action Plan intended to improve the safety culture within the CPUC and across the industries it regulates.[163] To better inform the IOUs' compliance requirements regarding safety specifically related to the TE programs, Energy Division and CPUC Safety and Enforcement Division staff developed a *Transportation Electrification Safety Requirements Checklist (TE Safety Requirements Checklist)* for the SB 350 programs authorized in 2018.[164]

IOU TEPs should address, at a minimum, the following safety related topics as explain further below:[165]

- Program requirements for consumer and installer safety
- Workforce training to support program and infrastructure safety
- Cybersecurity standards

The first two topics are discussed in this chapter below, while cybersecurity standards are addressed in Section 8.2.

7.1 Investor Owned Utility Program Requirements

[163] More information about the CPUC's Safety Policy and Action Plans is available at https://www.cpuc.ca.gov/general.aspx?id=7772 (Accessed December 13, 2019).
[164] The DRIVE Rulemaking also prioritizes safety aspects of IOU TE programs.
[165] Energy Division staff notes that other types of safety issues can be addressed in alternative venue(s).

Summary

Safety is a core mission that IOUs must integrated into all functions, including TE. The IOUs should address safety in their TEPs as follows:

1. Include current safety rules including the *TE Safety Requirements Checklist*.
2. Establish a process to re-examine safety rules and make enhancements when needed due to lessons learned from program experience to date, new technology or new market realities.
3. Identify appropriate IOU roles for pre-commercial equipment and identify special safety requirements if IOU programs propose to evaluate pre-commercial EVSE.

Questions for Stakeholders
1. What revisions, if any, are needed to improve the safety procedures and implementation processes for the investor-owned utilities' (IOU) transportation electrification programs? 2. Are specific procedures appropriate and necessary to allow IOUs to provide make-ready infrastructure intended to support testing of pre-commercial electric vehicle charging technology, and if so are any specific safety rules required? 3. What policies or procedures, if any, should be included in IOU program design to ensure TE infrastructure is safely maintained or decommissioned once a program period has ended?

Background

Energy Division and Safety and Enforcement Division staff established the *TE Safety Requirements Checklist* for IOU TE programs in 2018, with a separate checklist for small IOUs.[166] They require that EVSE meet equipment safety requirements; and that EVSE and electrical infrastructure installations meet appropriate safety requirements and were written based on equipment that was commercially available at that time.

Transportation Electrification Safety Requirements

Each IOUs' TEP should include a complete set of safety rules, including the latest version of the *TE Safety Requirements Checklist* and continue to report on implementation of safety requirements.

In addition, the IOUs should review the *TE Safety Requirements Checklist*, in collaboration with Energy Division staff and Safety and Enforcement Division staff, to determine whether any updates are needed based on the following factors or any other information indicating that revision(s) are needed: [167]

- IOUs' experience complying with the TE Checklist to date.
- Stakeholder feedback on new or evolving safety best practices.
- Technology that has recently entered the market, or may be introduced during the term of IOU TEPs, which could include but is not limited to:

[166] The CPUC's Safety and Enforcement Division staff initially developed a *Transportation Electrification Safety Requirements Checklist* (*TE Checklist*). The TE Checklist developed in 2018 is available at www.cpuc.ca.gov/sb350TE. (Accessed on January 15, 2020)

[167] This review should include whether current requirements are sufficient to ensure the safety of the contractors, utility employees, and customers participating in the IOUs' TE programs.

- Overhead gantries for charging battery electric transit buses or other vehicles.[168]
- Mobile charging.[169]
- Inductive charging technologies.[170]
- EVSE operating at 350 kW or more.[171]

The review should identify any gaps in current procedures, and if so whether existing or new procedures are necessary to address those gaps.

However, the IOUs should not wait for submittal of TEPs if additional safety requirements are needed, particularly if pilot or program proposals support new or evolving technology that was not available at the time of the program(s) approval. IOUs should incorporate safety best practices as the need arises, reflect these revisions in subsequent applications, and then modify TEPs at the next update.

For example, the IOUs may propose pilots to test pre-commercial technologies that do not fall within existing safety certification systems. Pre-commercial stationary EVSE protypes may contain features or configurations that appear promising but have not yet completed certification by a Nationally Recognized Laboratory (NRTL).[172] In addition, existing safety certification programs may not address some new technologies. The *TE Safety Requirements Checklist* contains both general safety requirements[173] as well as requirements for NRTL certification.

IOU TE programs may propose limited evaluation roles to increase understanding and/or safety for pre-commercial EVSE installed without ratepayer funding. These roles could include:

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[168] Battery-electric bus developer Proterra, for example, has both infrastructure-mounted and vehicle-mounted pantograph charging gantry equipment. Additional information is available at https://www.proterra.com/energy-services/charging-infrastructure/ (Accessed on January 15, 2020)

[169] See, for example, FreeWire's Mobi technology https://freewiretech.com/products/mobi-ev/. (Accessed on January 15, 2020) SCE's AB 1083 program that will be testing off-grid mobile charging solutions at parks/beaches in its service territory

[170] See, for example, Plugless Power https://www.pluglesspower.com/learn-about-plugless/ and WAVE https://waveipt.com/ (Accessed on December 9, 2019)

[171] A limited number of these units have recently entered the marketplace. See "About Electric Vehicle (EV) Charging", Electrify America, 2019. https://www.electrifyamerica.com/about-ev-charging accessed on December 9, 2019. at least one current proposal addresses standardization of 1MW or higher charge plugs for medium- and heavy-duty vehicle charging "High Power Charging for Commercial Vehicles request for submission", CharIN, accessed on November 25, 2019 CharIN has created a list of requirements to start the development of a high-powered charging standard for MD/HD vehicles. It is available at https://www.charinev.org/hpccv/?no_cache=1 (Accessed on January 15, 2020) and the Requirements List is available at https://www.charinev.org/fileadmin/HPCCV/High_Power_Commercial_Vehicle_Charging_Requirements_v2.0.pdf (Accessed on January 15, 2020)

[172] Safety certifications are typically conducted by a Nationally Recognized Test Lab such as Underwriters Laboratory (i.e. UL) or another lab.

[173] These requirements are available athttps://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442458882 (Accessed on January 15, 2020) and include general requirements such as:
"When not connected, the vehicle inlet and the EVSE connector must be designed to prevent direct contact with any live components;
• The vehicle inlet and EVSE connector shall be free of sharp edges and potentially injurious protrusions;
• The coupler between the vehicle and the EVSE should avoid or mitigate any potentially hazardous conditions such as fires, electrical shock to users, or other personal injuries."

- Provide education on utility-specific safety requirements regarding electric circuit and/or EVSE installation, including the general *TE Safety Requirements Checklist* requirements for EVSE.
- Fund data collection and evaluation.
- Revise or develop technical standards, including functionality and/or safety, based on lessons learned from demonstration(s).

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Include comprehensive safety rules in Transportation Electrification Plans (TEP).
2. Continue to report on safety procedure implementation and best safety practices for various transportation electrification program types.
3. Identify one IOU as lead to review existing safety procedures and determine whether revisions are needed prior to the initial TEP filings and each subsequent TEP update. The lead IOU should also consider whether to adopt safety procedures to ensure IOU-funded TE infrastructure is safely maintained or decommissioned once the program term has ended.
4. Consider limited roles for IOU pilot programs to evaluate pre-commercial technologies and associated safety needs.

7.2 Safety through Workforce Training

Summary

As California scales up TE to achieve it climate and reliability goals, it will require a well-trained workforce to support the State's safety requirements.[174] IOUs should work with educational and institutional partners to address any workforce training needed to ensure safe installation of IOU-funded TE. If any special training is needed for a specific TE programs or technology, IOUs should ensure that the training is available and does not become a barrier to otherwise qualified potential installation contractors.

Questions for Stakeholders
1. Should the investor-owned utilities (IOU) include workforce development plans in their Transportation Electrification Plans? a. If yes, what specific gap(s) should be addressed to ensure the availability of a sufficiently trained workforce to support IOU transportation electrification programs, and what organization(s) are best positioned to fill the gap(s)?

[174] The ETAAC as discussed in Section 4 identifies "Inadequate workforce training/expertise" as a barrier to introduction and commercialization of clean and efficient technologies including TE. "Advanced Technology to Meet California's Climate Goals: Opportunities, Barriers and Policy Solutions," Economic and Technology Advancement Advisory Committee, 2009. Available at https://ww3.arb.ca.gov/cc/etaac/meetings/etaacadvancedtechnologyfinalreport12-14-09.pdf (Accessed on December 9, 2019)

General workforce training

As noted earlier, California law directs that widespread TE should "create high-quality jobs for Californians, where technologically feasible."[175] The IOUs should coordinate with the California Labor & Workforce Development Agency (including the California Workforce Development Board or CWDB) to address workforce development needs and opportunities that support IOU transportation electrification programs. The CWDB helps develop workforce policy for the State, provides policy and programmatic guidance to the workforce system in California, and invests in high road sector-based workforce development. By investing in regional partnerships that deliver multi-craft pre-apprenticeships, CWDB's High Road Construction Careers initiative aims to develop a skilled and diverse construction workforce in California capable of performing the full array of building and construction trades work including but not limited to installation of transportation electrification infrastructure.

Electric Vehicle Infrastructure Training Program (EVITP)

In each of the prior TE proceedings, parties have taken conflicting positions on whether an 18-hour training called the Electric Vehicle Infrastructure Training Program (EVITP) should be required for electricians installing TE infrastructure in addition to meeting California Contractors State License Board licensing and certification requirements.[176] The EVITP certification includes training on topics such as customer interactions, EVSE equipment, and electrical code requirements; availability of this training varies between different areas.

EVITP was included in several early TE programs for large IOUs, though not for the three small IOUs due to the lack of training availability in their territory.[177] More recently, however, the CPUC determined that requiring EVITP is unnecessary for a PG&E residential TE infrastructure.[178] Some parties have asserted that the training does not provide any additional safety benefits and that it could deter qualified electricians from participating in IOU programs.[179, 180] Therefore, Energy

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[175] Public Utilities Code §740.12 (a)(1)(F)

[176] The 2019 version of the Contractors State License Board's California Contractors License Law & Reference Book is available at http://www.cslb.ca.gov/Resources/GuidesAndPublications/LawReferenceBook2019.pdf (Accessed on December 9, 2019)

[177] D.16-01-023, D.16-01-045, and D.16-12-065 each adopted modified settlements that included a requirement that contractors have EVITP training to be eligible to participate in the TE infrastructure programs for large IOUs. Small IOUs were addressed in D. 18-09-034. EVITP is not required in small IOU programs because there are few, if any, electricians in their service territories certified by EVTIP.

[178] Decision 19-09-006, *Decision Approving the Application of Pacific Gas and Electric Company for the Empower Electric Vehicle Charger Incentive and Education Program (A.18-07-021)*, states "The Commission finds it unnecessary to require the use of EVITP-certified electricians for purposes of this residential program and declines to adopt such a requirement."

[179] ChargePoint addressed concerns about the EVITP requirement in comments to the Proposed Decision in A.18-07-021 (http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M311/K582/311582494.PDF). Similar party comments were filed on the safety requirements checklist when it was under development in A.17-01-020 et al by the National Diversity Coalition (http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M204/K646/204646978.PDF) and Tesla, in response to proposed edits to the draft TE Safety Requirements Checklist filed on July 26, 2018 in A.17-01-020 et al.

[180] A 2016 report tasked with evaluating the impacts of occupational licensing found that "[w]hen government limits the supply of providers the cost of services goes up. Those with limited means have a harder time accessing those services. Consequently, occupational licensing hurts those at the bottom of the economic ladder twice: first by imposing significant costs on them should they try to enter a licensed occupation and second by pricing the services provided by licensed professionals out of reach." Jobs for Californians: Strategies to Ease Occupational Licensing Barriers, Report #234, October 2016. Accessed at https://lhc.ca.gov/sites/lhc.ca.gov/files/Reports/234/Report234.pdf in October 2019.

Division staff recommends that the CPUC broaden the decision adopted for PG&E's residential 'Empower EV' program (D.19-09-006) to apply to all residential programs to avoid creating barriers to high-quality jobs.[181]

Instead, IOUs should regularly evaluate whether new or incremental training is necessary above the existing State licensure and certification requirements. For instance, if IOUs were to install new technologies, complete and correct equipment installation and configuration could require specialized training beyond the scope of California Contractors State License Board licensing and certification requirements.

If IOUs determine any training beyond existing State requirements for practicing electricians is necessary for specific programs or EVSE technology types, they should ensure the additional training is available to all otherwise qualified installers. Otherwise qualified bidders should be allowed to obtain this training before they start work.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. The IOUs should coordinate with the California Labor & Workforce Development Agency to address workforce development needs and opportunities to create high-quality jobs that support IOU transportation electrification programs.
2. Evaluate whether any additional installer safety-related training is necessary beyond State licensing requirements.
    a. Ensure that any such training is readily available.
    b. If possible, allow installers seeking to bid on IOU TE installation programs to obtain this training after bidders are selected.

8. Technology and Standards

IOU TEPs should ensure that TE programs include the requisite technology and meet existing standards to ensure TE infrastructure meets State TE goals, is coordinated with other State TE investments, and can be leveraged for vehicle-grid integration programs. The guidance in this section is intended to support consistent standards across publicly-funded TE infrastructure and ensure transparent and fair procedures for all EVSE site hosts seeking new or upgraded utility service to power TE infrastructure. IOUs' program requirements and vendor criteria for like infrastructure deployment efforts should also be aligned to promote consistent standards and achieve economies of scale.

TEPs should address all relevant technology and standards including:

- Standards for EVSE deployed by IOU TE programs, including standards to facilitate Vehicle-Grid Integration Technology (Section 11.1 discusses Vehicle-Grid Integrations strategies more broadly)
- Technology needs for IOU TE programs

[181] The eligibility for electrician certification is described in the California Code of Regulations, Title 8, §291.1 available at https://www.dir.ca.gov/t8/291_1.html.

- Cybersecurity standards
- Standards and processes for non-IOU applications for utility service

8.1 Electric Vehicle Supply Equipment (EVSE) Standards

Summary

IOU TE infrastructure requirements should be consistent with minimum requirements of other public agencies. This will provide consistency in overcoming technology challenges.

CARB has set standards for consumer protection and open access for public-facing EVSE to ensure all publicly-accessible charging stations have options for any driver to pay for charging, and the Division of Measurement and Standards has adopted standards to ensure each kWh is properly measured and accurately priced after the start of a charging session.

In addition, the CEC has adopted minimum standards and capabilities to support potential vehicle-to-grid functionality as part of its infrastructure investment program CALeVIP, and the Division of State Architects (DSA) has developed requirements for EV charging station ADA accessibility. The IOUs must require that EVSE supported by ratepayer-funded programs meet the same public protection and accessibility standards already adopted by other state agencies. This section describes the technology requirements and standards the IOUs should consider when proposing their TEPs.

Questions for Stakeholders
5. What are the expected costs of requiring vehicle-grid integration (VGI)-enabled electric vehicle supply equipment (EVSE) across all investor-owned utility (IOU) EVSE investments? a. What are the projected costs of requiring all ratepayer funded EVSE meet International Organization for Standardization (ISO) standard 15118, and aligning with the protocol updates currently underway? b. What are the projected costs of installing VGI-enabling hardware after EVSE are deployed for existing and forecasted IOU-funded programs? 6. How can IOUs account for and/or project the scale of vehicle-to-grid enabled EVs in their service territories within their Transportation Electrification Plans? a. Without existing interconnection standards, how can vehicle-to-grid (V2G) technology be tested and scaled? b. How should V2G electric vehicles (EV), which can serve power back onto the grid, be forecasted differently than load-only EVs in IOU planning processes?

Standards for Public-Facing Electric Vehicle Supply Equipment (EVSE)

CARB and the California Department of Food and Agriculture's Division of Measurement and Standards (DMS) have adopted standards for publicly accessible EVSE that sell kWh of electricity as a transportation fuel:

- CARB adopted standards in June 2019[182] that require credit-card readers and/or other individual session payment options at all public charging stations. They also require that station operators allow 'roaming' across multiple EVSP platforms so that customers do not have to have separate memberships to access various EV charging station networks across California. The rules will phase-in over time beginning in 2021.[183]

- DMS proposed standards in September 2019 for EVSE to provide consumer information and accurately displaying the cost per kWh of electricity sold commercially as a transportation fuel. These standards take effect in January 2020, with compliance requirements rolling in starting in 2021, in line with CARB's SB 454 regulations.[184]

IOUs must verify that public-facing EVSE incentivized by ratepayer funds comply with standards adopted by CARB and DMS no later than the deadlines set by CARB and DMS.

In 2017, the CPUC led a joint agency working group focused on determining whether the state should mandate a specific communication protocol to enable VGI use cases to be deployed at scale.[185] No consensus was reached during that working group to lead to the adoption of any specific protocol, or combination of protocols, that are necessary to enable VGI at scale. However, ongoing research and the current state of the market suggest that high-level communication between the vehicle and a grid-connected actor is necessary to fully enable VGI.

While a new, ongoing working group seeks to evaluate which VGI use cases are most valuable to pursue,[186] this TEF recommends the IOU TE programs only support EVSE that are capable of high-level communication to ensure they can enable most, if not all, VGI use cases.

Standards to Enable Vehicle-Grid Integration

The DRIVE Ruling prioritizes VGI policy and technology development and adoption.[187]Accordingly, IOU TE programs should ensure EV load is integrated in a way that provides grid benefits.[188] Section 11.1 below contains additional details regarding policies to accelerate the deployment of technology that supports these capabilities to enable VGI at scale.

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[182] https://ww2.arb.ca.gov/sites/default/files/2019-03/evse-399-031119.pdf. (Accessed on January 15, 2020). The standards are required by SB 454 (Corbett, 2013).

[183] EVgo announced peer-to-peer roaming agreements with ChargePoint and EV Connect in June 2019 https://www.prnewswire.com/news-releases/evgo-announces-new-roaming-access-for-ev-charging-300870294.html; (Accessed on January 15, 2020). ChargePoint and Electrify America entered a roaming agreement in June 2019, building off its existing agreements with Greenlots, EVBox, and FLO https://www.greencarreports.com/news/1123582_chargepoint-and-electrify-america-simplify-charging-access-with-roaming-agreement (Accessed on January 15, 2020)

[184] The proposed standards are available at https://www.cdfa.ca.gov/dms/regulations.html

[185] All of the documentation and references developed during the 2017 VGI Communication Protocols Working Group are available at www.cpuc.ca.gov/vgi. (Accessed on January 15, 2020)

[186] All of the documentation and resources associated with the DRIVE OIR VGI Working Group are available at https://gridworks.org/initiatives/vehicle-grid-integrationwg/. (Accessed on January 15, 2020)

[187] VGI is identified as Topic 2.4 in the DRIVE OIR Scoping Ruling and Memo, available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M285/K712/285712622.PDF. (Accessed on January 15, 2020)

[188] VGI use cases include TE-specific rates, load-management strategies, demand response programs, and co-locating TE infrastructure at sites where transmission and distribution capacity are available, as required by Chapter 368 of the Statutes of 2018 (SB 1000) and Chapter 484 of the Statutes of 2019 (SB 676).

IOU supported EVSE must be capable of receiving and responding to an open standard signal from a grid manager to participated in a demand response or other events. The EVSE could receive a signal directly or from a third party that then communicates with the EVSE. This will require communication between the EVSE and a "power flow entity"[189] as shown below in Table 5.

Table 5: Communication Protocols to Enable VGI High Level Communication for Level 2, AC conductive EVSE[190]

Domain of Communication	Communication Protocols Currently Recognized and Available[191]
Power Flow Entity to EVSE	1. OpenADR 2.0b 2. IEEE 2030.5 3. OCPP 1.6
EVSE to EV	ISO 15118
Vehicle OEM to EV	Telematics (using OEM proprietary protocols or IEEE 2030.5)

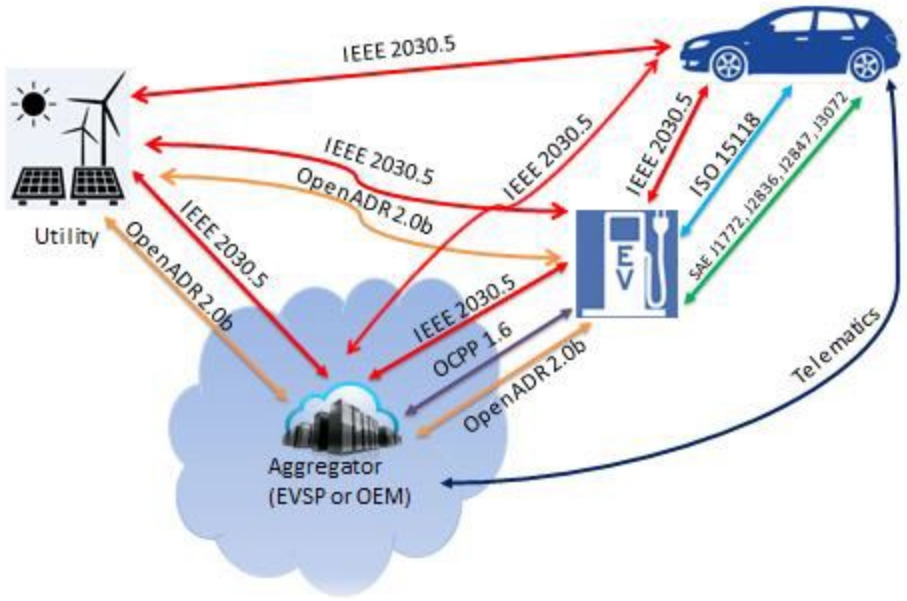
Second, EVSE should include hardware capable of deploying standards to communicate VGI signals that can flow to and/or through the EVSE. The full communication chain also includes other market actors and entities that could enable implementation of VGI services without requiring that those communications pass through the EVSE. For example, the full suite of pathways to communicate VGI-related signals between the vehicle and the grid through AC conductive charging is illustrated in Figure 9 below:

[189] Power flow entities include utilities, aggregators, EV service providers, alternative energy suppliers, energy clearing houses, and other entities that provide power to an end user through an EV charging station.

[190] Table 5 of Appendix C of the DRIVE OIR, available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M252/K033/252033222.pdf. (Accessed on January 15, 2020)

[191] The current protocol versions, as listed here, serve as a minimum threshold for high-level communication between the EV and the EVSE. Future versions of the protocols are expected to also meet use case requirements. This table assumes that all EVSEs have J1772 pulse width modulation capabilities for low-level communication. Other PFE to EVSE protocols, including IEEE P2690191 and IEC 63110191, were identified by stakeholders but were not discussed in detail during the Working Group because they are still under development.

Figure 9: Diagram of Communication Pathways for AC Conductive Charging[192]



Communication Capabilities and Standards for Communications Between Power Flow Entity and Electric Vehicle Supply Equipment (EVSE)

EVSE with external communication capabilities can enable several potential features including, but not limited to, VGI capabilities.[193] EVSE with these capabilities are commonly referred to as networked EVSE, though this term is not linked to a specific industry or other standard to determine what criteria EVSE should meet to be considered "networked." High-level communication capabilities are already widely available in a wide range of TE products.

[192] Figure 2 of Appendix C of the DRIVE OIR, available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M252/K033/252033222.pdf. (Accessed on January 15, 2020). The red arrows signify pathways for IEEE 2030.5, the yellow arrows indicate OpenADR 2.0b pathways, the purple arrow indicates a pathway for OCPP 1.6, the light blue arrow shows ISO 15118's pathway, the green arrow shows the pathway of SAE J1777, J2836, J2837, and/or J3072, and the dark blue arrow shows the existing communication pathway for vehicle telematics.

[193] Networked EVSE typically support services such as user authentication and payments for public-facing EVSE. Networked EVSE are connected to the Internet via a cable or wireless technology and can communicate with the computer system of a charging network. Being connected to a network lets station owners, site hosts, and/or drivers manage who can access stations, how much it costs drivers to charge, and when charging occurs. An EVSE network service provider (EVSP) typically manages a group of networked EVSE and uses its communication capabilities to monitor and share real-time station status information and usage data, as well as to control access and facilitate payment. EVSE networks may provide VGI services to electrical utilities, as well as customized services to site hosts or station owners.

The SCE Charge Ready program, for instance, has 55 models of networked EVSE on its eligible vendor list.[194] The ENERGY STAR® program lists products from ten different manufacturers with communications capabilities including cellular, WiFi and/or Gigabit Ethernet or other LAN.[195] In many cases, EVSE will have networking capabilities to provide services such as user authentical and payment processing, and these existing capabilities could further be used to enable VGI services. [196]

Energy Division staff recognizes the cost of networking capabilities may still be unclear for some deployment types, and that requiring these capabilities at every site could lead to overly costly or underutilized assets. Host sites may not have network infrastructure in parking areas and/or may not wish to participate in VGI programs beyond a static time-of-use rate. A survey of 48 SCE Charge Ready host sites surveyed found that 29 either did not respond to TOU rates or didn't know whether they did, indicating a low level of understanding and participation in the Charge Ready load management program.[197] The still-evolving TE market could move toward technological solutions that make the communication between EV and EVSE less critical moving forward, causing EVSE hardware necessary for high-level communication to go unused in the charging stations in the future.

Energy Division staff will review the results of the VGI Working Group, including but not limited to the use cases with the greatest potential VGI benefit, along with parties' comments on this section and its proposed requirements, prior to issuing guidance on this topic in the final TEF.

Standards for Communications from Electric Vehicle Supply Equipment (EVSE) to Electric Vehicles

ISO 15118 as drafted can communicate many of the critical aspects of VGI requirements, such as battery state of charge and departure time, and supports automated user authentication and payment processes.[198] ISO 15118 also supports energy transfer between an EV and the grid using a variety of connector formats.[199]

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[194] The charging stations qualified for Southern California Edison Company's Charge Ready program is updated quarterly. The current list is available at https://www.sce.com/sites/default/files/inline-files/APL_12042019.xlsx (Accessed on January 13, 2020). More information about the Charge Ready eligibility requirements is available at https://www.sce.com/business/electric-cars/Charge-Ready. (Accessed on January 15, 2020)

[195] ENERGY STAR does not mandate that units contain communications capabilities but rather provides an optional platform to list them for products that meet ENERY STAR programs requirements. See https://www.energystar.gov/productfinder/product/certified-evse/results (Accessed on January 15, 2020)

[196] Networking capabilities could also be leveraged to provide additional services such as: 1) Products that allow access via open standards to physical connectivity layers create options for consumers to change service providers if they are not satisfied with their service provider, or if their service provider exits the market or stops supporting a given product.
2) Data collection for informational purposes (and potential support of a submetering standard).
3) Communication capabilities can support "over the air" upgrades to mitigate the need for hardware modifications and on- site software upgrades.

[197] Southern California Edison Company's Charge Ready Pilot Quarterly Report 2nd Quarter, 2019; August 30, 2019; available at https://www.sce.com/business/electric-cars/Charge-Ready. (Accessed on January 15, 2020)

[198] ISO 15118 is intended to specify terms and definitions, requirements, and use cases for high-level communication between the PFE and the EVSE. It is part of the Combined Charging System standard adopted for may EV charging ports and could be developed to enable communication standards that enable drivers to charge seamlessly across EVSP networks while also sending demand-response signals during a charging session. Because the standard is under review and not fully implemented in the US yet, Energy Division staff recommend the IOUs track and monitor the development of the standard and deploy the provisions that are ultimately adopted industry wide. More information about the current status of the standard is available at https://www.iso.org/standard/69113.html.

[199] https://www.iso.org/standard/69113.html

All publicly funded EVSE that are intended for use as a VGI resource should meet the hardware and software requirements consistent with CEC planned requirements. Energy Division staff recommend the IOUs should collaborate with industry stakeholders working to improve and finalize ISO 15118 as a solution for VGI communication needs, in alignment with the efforts already underway at the CEC's CALeVIP program.[200]

The CEC has proposed to establish ISO 15118 as a requirement for EVSE supported by the CALeVIP program commencing with 2021 grants.[201] Based on stakeholders' responses in the VGI Communication Protocols Working Group and the CEC's analysis supporting its proposal for CALeVIP, the cost of including ISO 15118 capabilities in IOU-supported EVSE will be relatively low if deployed at scale across publicly-funded EVSE in California, and has the potential for broad deployment. ISO 15118 has been implemented or considered as a requirement for EVSE in the European Union[202] the Netherlands,[203] Germany,[204] South Korea, and India.[205] [206] [207] Further, auto manufacturers indicated they intend to deploy ISO 15118 as a communication solution for AC and DC conductive charging (as well as wireless charging technology)[208] and generally do not want to support multiple protocols.[209]

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[200] The CALeVIP program provides public funding

[201] See CEC Staff Presentation for the CALeVIP Future Equipment Technology Workshop, CEC Docket 17-EVI-01, available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=230794&DocumentContentId=62410 (Accessed on January 15, 2020)

[202] See the European Commission's Sub-Group to Foster the Creation of an Electromobility Market of Services Memorandum of Understanding on fostering seamless and valuable EV customer experience in Europe at 10 https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=36206&no=2.

[203] https://www.rvo.nl/sites/default/files/2017/05/Vision%20on%20the%20charging%20infrastructure%20for%20electric%20transport.pdf (Accessed in October 2019)

[204] Venselarr, Idema (APPM GmbH) and Endriβ (SuMoCo); German Charging Infrastructure Regulations Report, March 2019, Available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwi8tIip0YrlAhVBLlAKHdHHCN4QFjABegQIAhAC&url=https%3A%2F%2Fwww.nklnederland.com%2Fuploads%2Ffiles%2FElectric_Vehicle_Charging_-_Definitions_and_Explanation_-_january_2019.pdf&usg=AOvVaw0SdD-C0UcCi9xUlpwO1mRm in September 2019. (Accessed on January 15, 2020)

[205] https://www.rvo.nl/sites/default/files/2017/05/Vision%20on%20the%20charging%20infrastructure%20for%20electric%20transport.pdf (Accessed in October 2019)

[206] Tesla, which has a proprietary connector port, as of this 2019 offers an adapter for all new and existing vehicles to be able to charge with CCS, which staff believes would allow the use of ISO 15118. The CCS adapter comes as a standard feature on all new Model S and Model X vehicles sold in European markets. See: https://www.greencarreports.com/news/1119938_tesla-will-soon-be-compatible-with-all-dc-fast-chargingin-europe; (Accessed on January 15, 2020) https://electrek.co/2019/05/07/tesla-ccs-adapter-model-s-x-retrofits/ (Accessed on January 15, 2020)

[207] See, for example, ChargePoint comments on the Draft Energy Division Staff Report 2017 VGI Working Group at 3; OEM Joint Comments on the Draft Energy Division Staff Report on the 2017 VGI Working Group at 3.

[208] See Energy Division Staff Report on the 2017 Communication Protocols Working Group, Table 2, Protocols included in participating automakers' 10-year time horizon, 2017 (page 17). Available at https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442460144. (Accessed on January 15, 2020)

[209] See, for example, the joint comments from Porsche AG, Audi AG, Volkswagen AG, Daimler AG, Lucid Motors, BMW AG, and IoTech on the Draft Energy Division Staff Report on the 2017 VGI Communication Protocols Working Group at 3. https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457082 (Accessed on January 17, 2020)

Stakeholders assert the CPUC should not establish a standard for EVSE to EV communication at this time, given the nascent EVSE market.[210] Energy Division staff understands this concern but finds that establishing a standard communication pathway could send a strong signal to the EVSE market that public charging stations deployed in California must be capable of these types of functions. To prevent the deployment of EVSE that will be obsolete as standards are being developed and updated to reflect current market needs, the IOUs should support EVSE with the capability to accept "over-the-air" updates to avoid the need for new hardware to be installed if the communication standards are modified..[211]

The IOUs are also encouraged to design pilots to test and support alternative communication pathways offered by the market, such as vehicle telematics that are integrated with IOUs VGI programs via a cloud solution, as illustrated in Figure 9 above.

Vehicle to Grid Interconnection Standards

The CPUC is working to streamline the IOUs' interconnection queue and shorten interconnection timelines via the Rule 21 proceeding (R.17-07-007).[212] Rule 21 is the CPUC's interconnection proceeding and applies specifically to resources that send power onto the grid such as solar generation and battery storage. The same Rule 21 requirements established through the Rule 21 proceeding for generation resources apply to the discharge of power stored in a vehicle's battery onto the grid. This bidirectional power flow is often referred to as vehicle-to-grid (V2G). More information about Rule 21 and how it relates to the IOUs' other TE-related rules is included in Section 8.3 (EVSE Interconnection).

The Rule 21 Working Group 3 final report listed interconnection of V2G resources as a priority issue (Issue 23). Consensus was achieved in a number of areas surrounding stationary inverters embedded within a DCFC EVSE. A Sub-Working Group was convened to evaluate the potential of using existing interconnection and automobile standards for EV-based inverters.[213] Pursuant to the outcomes of this effort in early 2020,[214] Energy Division staff expects the assigned Administrative Law Judges to adopt a schedule for the IOUs to change their existing tariff(s).[215]

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[210] See for example the joint comments from the California Electric Transportation Coalition, Electric Power Research Institute, Fiat Chrysler Automobiles, Ford Motor Company, American Honda Motor Co., Inc., Kitu Systems, Inc., Nissan North America, Inc., Pacific Gas & Electric Company, Plug In America, San Diego Gas & Electric Company, Southern California Edison, Southern California Public Power Authority, and Toyota Motor North America on the Draft Energy Division Staff Report on the 2017 VGI Communication Protocols Working Group at 7. https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457079 (Accessed on January 17, 2020)

[211] The ISO is currently developing "2nd generation requirements" as part of planned 15118-20, for example. See https://www.iso.org/standard/77845.html. (Accessed on January 15, 2020)

[212] Information about the CPUC's Rule 21 interconnection proceeding (R.17-07-007) is available at https://www.cpuc.ca.gov/General.aspx?id=6442455170. (Accessed on January 15, 2020)

[213] Joint Administrative Law Judges' Ruling Establishing Subgroup and Schedule to Develop Proposal on Mobile Inverter Technical Requirements for Rule 21 and Noticing Workshop, filed in R.17-07-007 and R.18-12-006 on August 23, 2019.

[214] The final workshop for this Sub-Working Group will be held on December 17, 2019, with final comments filed in R.17-07-007 and R.18-12-006 no later than January 13, 2020.

[215] Resources from this joint procedural working group are available at https://strategen-my.sharepoint.com/personal/jnoh_strategen_com/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fjnoh%5Fstrategen%5Fcom%2FDocuments%2FV2G%20AC%20Interconnection%20Subgroup&originalPath=aHR0cHM6Ly9zdHJhdGVnZW4tbXkuc2hhcmVwb2ludC5jb20vOmY6L3Avam5vaC9FZ0x0ZGdPUnVGVklzQmJHVUhzY2JQVUJFV08tQXdoLU8yTWQxc0w1Y1ZBQTR3P3J0aW1lPU1Ma1RURmFaMTBn.

Recommendations

Energy Division staff recommends the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Establish program requirements that ensure publicly accessible, ratepayer funded electric vehicle supply equipment (EVSE) meet all existing state regulatory requirements.
2. Require that EVSE funded through their transportation electrification (TE) programs contain networking capabilities and can implement International Organization for Standardization (ISO) standard 15118 and other communication enabling requirements adopted by the California Energy Commission.
    a. In instances where multiple IOUs propose similar programs, they shall collaborate to adopt similar participation and vendor criteria to support economies of scale.
    b. IOUs shall propose exceptions only for specific use cases that may not require vehicle-grid integration (VGI) capabilities.
    c. IOUs will not preclude VGI communication pathways between the IOU and the vehicle.

8.2 Cybersecurity

Summary

Cybersecurity measures for TE infrastructure will promote safety and security as more networked EVSE are deployed to support wide-spread implementation of VGI use cases. The IOUs should ensure that TE infrastructure follows current best practices such as standards established by the National Institute of Standards and Technology and identify whether any additional standards are needed to provide adequate cybersecurity.

Questions for Stakeholders
7. Are any cybersecurity standards beyond those described in the Transportation Electrification Framework available to be deployed by IOU transportation electrification (TE) infrastructure programs now? 8. Do the existing cybersecurity standards leave any gaps? If so, how should the IOUs endeavor to fill those gaps? 9. Are any new, more effective cybersecurity standards under development? a. If so, when are the new standards expected to be adopted and available for deployment? b. Would the standards currently under development leave any remaining gaps? If so, what is the best process to address those remaining gaps?

Background

Cybersecurity has been a growing issue in the utility sector for many years. The increasing number of distributed energy resources, including EVs, connecting to the grid poses new challenges that are driving the development of new security measures. For example, a joint research effort was launched between the IOUs and Lawrence Livermore National Laboratory in 2014 to identify

strategies to proactively identify and act on cybersecurity threats to utility systems.[216] The 2018 Annual Report, titled *California Energy Systems for the 21st Century (CES-21)* states that "cyberattacks on [Industrial Control Systems] and Operational Technology (OT) systems continued to be prominent."[217] While the 2018 report does not directly address TE programs, IOUs should also ensure their TE investments support technology that does not make the grid susceptible to cybersecurity threats.

Discussion

As an increasing number of EV charging stations are deployed across California, there will be new paths for hackers to attempt to install malware or other software that could infiltrate the grid and spread to other interfaces such as EVs, smart meters, DERs, building or load management systems, and others. There are some existing cybersecurity best practices that could already be deployed in the IOUs' TE programs in the near-term, including:

- **Authentication:** Any software update packages, such as firmware, operating system upgrades, and new applications should have their authenticity and integrity verified cryptographically with a private key that corresponds to a public key known to the device. A Certificate Authority or similar Public Key Infrastructure may be used to improve key management. This verifies that the downloaded update was agreed upon by the vendor and has not been modified when it is uploaded.[218]
- **Transport Encryption:** Using Secure Socket Layer (SSL) or Transport Layer Security (TLS) are recognized strategies to encrypt network traffic and/or authenticate the source of an update.[219]

However, moving forward the IOUs should collaborate with national cybersecurity and standards organizations to identify the most secure requirements for TE infrastructure and identify any remaining cybersecurity gaps. If any gaps are identified, the IOUs should consider whether any additional new or revised standards are needed to ensure TE infrastructure is secure from cyber-threats in the long-term.

In the meanwhile, the IOUs should address any cybersecurity issues specific to pre-TEP programs within any program applications filed before their TEPs are adopted by the CPUC.

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[216] A 2012 Decision (D.12-12-031) authorized the three large IOUs to collaborate with Lawrence Livermore National Laboratory. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M041/K694/41694931.PDF (Accessed on January 15, 2020)

[217] *California Energy Systems for the 21st Century (CES-21) Program 2018 Annual Report* March 29, 2019 p. 5 https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442461102 (January 15, 2020). A January 2020 report is also available at https://www.cpuc.ca.gov/General.aspx?id=6442463728.

[218] Information and guidance about signed firmware is available within the National Institute of Standards and Technology's Special Publication 800-53, Security and Privacy Controls for Federal Information Systems and Organizations Revision 4, SI-7, available at https://nvd.nist.gov/800-53/Rev4/control/SI-7. (Accessed on January 15, 2020)

[219] Information and guidance about proper use of SSL and TLS encryption is available within the National Institute of Standards and Technology's Special Publication 800-52, Guidelines for the Selection, Configuration, and Use of Transport Layer Security (TLS) Implementations, Rev. 2, available at https://csrc.nist.gov/publications/detail/sp/800-52/rev-2/final (Accessed on January 15, 2020)

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Identify within their initial Transportation Electrification Plan (TEP) filing the cybersecurity standards that they will implement. The IOUs should file any confidential information on cybersecurity topics as a confidential supplement to their TEPs.
2. Identify any gaps in available standards that cause threats to their system due to increased deployment of networked electric vehicle supply equipment (EVSE).
    a. Address appropriate confidentiality requirements for the gaps assessment.
    b. Designate a lead IOU to identify venues, timelines, and potential IOU strategies and budgets for adopting standards to address any these gaps.

8.3 Electric Vehicle Supply Equipment Interconnection

Summary

Scaling EV charging infrastructure deployment to meet State goals and growing demand will require frequent utility service upgrades to accommodate load increases.[220] The current cost allocation structures, uncertain timing, and application process for utility service upgrades could slow down or discourage TE infrastructure installation.[221] Modification to the current processes can help to streamline TE interconnection and ensure EVSE are installed at the rate needed to meet the state's ZEV adoption and GHG reduction goals.

The IOUs should ensure that utility service upgrade application processes are transparent and fair for site hosts that are not participating in IOU programs. The IOUs and the CPUC must also consider strategies to ensure no single customer bears the cost of upgrades that are necessary to support broader and accelerated TE.

New reporting and tracking requirements described below, including some already implemented, will help the CPUC determine whether an existing utility service upgrade cost exemption for single family homes[222] should be expanded to MUD and commercial consumers broadly or under specific circumstances.

Questions for Stakeholders
1. How would stakeholders rank the following potential barriers resulting from the utility service application process? Please explain why. a. Length of process b. Uncertainties regarding process c. Cost

[220] Some very large industrial or commercial customer could also own a sub-station receiving primary service such as 12,000 kVa service depending on their utilization and availability of this type of service at their location. In other areas, utilities typically offer "secondary" customers service at 480 volts or 208/240 volts

[221] See, for example, the California Energy Storage Alliance draft briefing document on R.17-07-007 Working Group 3 Issue 23 https://gridworks.org/wp-content/uploads/2019/01/2019-01-16-Rule-21-WG-3-Issue-23-Brief-Proposal-DRAFT-v2.docx (Accessed on January 15, 2020) and EVgo Opening Comments on the DRIVE OIR http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=269479995 (Accessed on January 15, 2020)

[222] D.11-07-029 authorizes the IOUs to socialize the cost of upstream upgrades that are triggered when residential customers add EV load to their existing service.

    d. Uncertainty regarding cost
    e. Competitive treatment
2. Should the CPUC direct the IOUs to meet specific connection deadlines or establish clearer timeframes for electric vehicle supply equipment (EVSE) application and energization processes?
3. Should EVSE connection and application timelines be tiered based on the type of upgrade required and/or the size of the incremental load?
4. Have stakeholders encountered other barriers that are not listed above? If so, please explain and propose potential solutions.
5. Should the Rule 15/16 exemption that has been offered to residential customers for over ten years be made permanent, or should other revisions to the IOUs' rules be made to help socialize the cost of upstream upgrades that may be triggered by new residential electric vehicle load?
6. What data is needed to determine whether utility distribution and service connection costs for commercial electric vehicle charging infrastructure should be treated as common costs for all ratepayers?
7. What data should be regularly reported by the IOUs to provide third-party EVSE installers and site hosts information needed to assess projected installation costs?
    a. Should the EVSE installation data be incorporated in the existing IOU interconnection reports or provided separately?
    b. Should the data for IOU transportation electrification (TE) programs be directly compared to EVSE installations not participating in the IOU TE programs?

Background

EVSPs assert that the IOU service connection application processes are not clear or well-suited to EVSE installations.[223] Parties have also suggested it takes an inconsistent and sometimes inexplicably long time for a filed application to result in the completion of the necessary IOU response.

Most EVSE site applicants apply to connect to the distribution grid under CPUC Electric Rules that apply to load-only resources. Increasingly, however, some EV charging station operators and EV manufacturers have expressed interest in interconnecting EV batteries to the grid to serve as back-up or storage generation-side resources. The following tariffs apply to various types of service connections necessary to deploy EVSE:

- Rule 2 applies to special facilities that would be installed in addition to or in substitution of the standard distribution facilities a utility would otherwise provide for delivery of service, such as dual service feeds or EVSE make-ready stubs.[224]

[223] See, for example, the California Energy Storage Alliance draft briefing document on R.17-07-007 Working Group 3 Issue 23 https://gridworks.org/wp-content/uploads/2019/01/2019-01-16-Rule-21-WG-3-Issue-23-Brief-Proposal-DRAFT-v2.docx (Accessed on January 15, 2020) and EVgo Opening Comments on the DRIVE OIR http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=269479995 (Accessed on January 15, 2020)
[224] For more details, see https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457790 at slides 7-11.

- Rule 15 applies to distribution line extensions (less than 60kV), or new distribution facilities that are a continuation of, or branch off of, the nearest available existing distribution line. It includes facility rearrangements or relocations needed to support the new line or converting existing single-phase lines to three-phase ones, but excludes transformers, meters, and service.[225]

- Rule 16 applies to Service Extensions, which are primary or secondary facilities needed to accommodate the new load extending from the point of the IOUs' distribution line facilities to the service delivery point, including any service-related equipment required on the customer's premises necessary to add the incremental load.[226]

- Rule 21 applies to generation facilities, including customer-sited storage and bidirectional EV charging equipment, seeking to be connected to a utility's distribution system.[227]

Existing CPUC policies exempt single family homes from paying for a utility service upgrade under Rules 15 and 16 in the infrequent instances when incremental EV-related load at a single family home would require a utility service upgrade but these policies do not address other classes of customers.[228] Utilities have been reporting costs associated with residential-scale TE-related system upgrades since 2011.[229] The DRIVE Rulemaking recognized the need to evaluate costs and processes at other customer class sites to ensure a transparent and reasonable process for allocating utility-side infrastructure costs associated with new EV-related load. The Scoping Ruling requires the IOUs to begin reporting the actual costs associated with EV infrastructure upgrades associated with commercial-scale EV load for both customers participating in their TE programs and those installing the infrastructure on their own, where feasible, starting with the 2019 Load Research Report due in March 2020.

Discussion

While most existing EVSE sites have not been subject to Rule 21 interconnection review, they are often required to enter an IOU's Rule 21 interconnection queue. As described above, Rule 21 is designed for more complex interconnection projects that provide power to the grid. However, the IOUs use their Rule 21 queue to schedule a required utility engineer site visit. When queue priority is determined on a first-come, first-served basis, this can delay load-only EVSE installations until more complex, power generating projects are fully connected.

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[225] See https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457790 for more details.(Accessed on January 15, 2020)

[226] See https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442457790 for more detailed information. (Accessed on January 15, 2020)

[227] Each of the three large IOUs' Rule 21 tariffs are available at https://www.cpuc.ca.gov/Rule21/. (Accessed on January 15, 2020)

[228] D.11-07-029 found that electric vehicle load is a new and permanent load as defined under Electric Tariff Rule 15 (Distribution Line Extensions) and Rule 16 (Service Extensions) and determined that, on an interim basis, facility upgrade costs associated with electric vehicle chargers at residential sites would be treated as a common facility, rather than a cost paid by the individual customer. This treatment thereby shifts these costs to all residential ratepayers. The IOUs have been collecting and reporting on the socialized costs associated with any residential class EV load upgrades since 2011.

[229] The 2011-2019 versions of the Load Research Report are available at https://www.cpuc.ca.gov/zev/#History. (Accessed on January 15, 2020)

Additional standards and/or transparency of IOU processes is necessary to determine where and when IOU system upgrades are needed to support new TE-related load. The IOUs' TEPs should discuss methods to streamline their EVSE connection processes including:

- The IOUs' current process to determine existing system capacity at proposed EVSE sites and whether a new load only EVSE installation will trigger the need for upgrades.
- How to leverage Integration Capacity Assessment Maps[230] to provide third parties with more accurate, timely information about existing distribution system capacity.
- Additional distribution system planning efforts necessary to better track EVSE installations and their impact on the distribution system.
- How diversity factors are determined and updated related to translating individual end loads into the maximum theoretical load expected to occur simultaneously on individual circuits and distribution feeders during peak demand.
    - Not every EVSE at one site or circuit will simultaneously be operated during periods of peak demand. For example, workplace charging will likely occur mainly off-peak.[231]
    - Vehicles have different on-board capacities for charging rates. Particularly, plug-in electric vehicles typically have lower charging capacities than pure battery-electric vehicles.
    - Appropriate diversity factors are not necessarily static and may change over time with changes in technology, even if the total electrified vehicle population were to remain relatively consistent. How frequently should the IOUs update their diversity factors to account for evolving EV populations?

Equitable Treatment and Improved Reporting of Electric Vehicle Supply Equipment Installations

The CPUC has previously adopted requirements for the IOUs to ensure that their TE programs do not unfairly result in, higher costs and/or delayed utility service connections for EVSE host sites that do not participate in IOU programs.[232] Streamlined processes and transparent CPUC rules could minimize the potential for differential treatment. Improved reporting should help identify any current instances of differential treatment and inform the development of new requirements to ensure equitable treatment going forward. In the near-term, the IOUs should adopt "firewalls," similar to those adopted for SDG&E's Power Your Drive Program, between IOU TE projects and the utility's service connection staff to ensure EVSE being installed outside of IOU-run programs do not face undue delays.

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[230] Chapter 611 of the Statutes of 2013 (AB 327, Perea) created PU Code §769 requiring all electrical corporations to file distribution resources plans. This is being implemented through CPUC Rulemaking 14-08-013. More information is available at https://www.cpuc.ca.gov/General.aspx?id=5071. (Accessed on January 15, 2020)

[231] See, for example, Figure 4.1 of SCE's Charge Ready Pilot Quarter Report for the 3rd Quarter, 2019 dated December 2, 2019. Available at https://www.sce.com/sites/default/files/inline-files/5227_SCE_CReadyQuarterlyReport_2019Q3_WCAG.pdf (Accessed December 30, 2019).

[232] For example, the CPUC in D.16-01-045 adopted Settlement Term 24, requiring SDG&E to create firewalls to ensure that (1) any non-utility EV site installation are not shared with or disclosed to personnel at SDG&E engaged in EV-related activities; (2) third-party EV site installations are queued fairly in the interconnection process so that SDG&E-owned sites are not given priority; and (3) third-party EV charging station developers have information about the utility's distribution system and potential upgrade costs. See D.16-01-045 Attachment 2 at 12.

Going forward, the IOUs' should develop a more publicly accessible report on pending EVSE installations, either as part of their existing interconnection reports or a separate filing.[233] More accessible reporting of pending EVSE installations should provide several benefits. The California Solar Statistics program, for example, has provided data to summarize solar residential and non-residential interconnection statistics, including the cost of installation, the time it takes to have a system energized, and issues that cause or alleviate potential bottlenecks to scaled deployment of new systems..[234]

Some of the IOUs' current TE programs include a starting point for developing these more detailed reports on cost and project timelines. For instance, SCE's current quarterly reports for its Charge Ready program provides an aggregate summary of "Average time to complete T&D[235] final design" as well as certain EVSE application processing timelines.[236] Each decision authorizing the IOUs to invest in TE programs to implement SB 350 adopted a data collection template that includes customer and IOU cost fields.[237] These data collection and reporting requirements should be clarified and standardized across all EVSE installation projects, including those that do not participate in IOU TE programs.

Not all EVSE installations will require IOU approval for new or upgraded service. Some sites, for instance, have capacity on an existing electrical panel to support the incremental EV load expected at the EVSE. At this time, these sites should be held to the same reporting requirements as those sites that require a full IOU site assessment if the site host is receiving a customer-side infrastructure rebate through a CPUC-approved TE program.[238]

These data collection requirements could be incorporated as metrics or targets the IOUs must address in the Scorecard, described in Section 3.2 or included within existing IOU reporting efforts such as their annual Load Research Reports or their quarterly interconnection reports.

Cost for Rules 15 and 16 Transportation Electrification-Related Upgrades

The DRIVE Rulemaking asks: "Should Rules 15 and 16 be modified to better accommodate incremental ZEV load, and if so, what ratepayer protections should be incorporated in the rule changes." As currently written, customers pay any costs above the allowances calculated in Rules 15

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[233] The IOUs already regularly report interconnection and distributed generation applications and installations, available at https://www.californiadgstats.ca.gov/downloads/, (Accessed on January 15, 2020) but those data sets do not include load-only EVSE applications or installations.

[234] For instance, see Figures 13 and 14 of the CPUC's "California Solar Initiative Progress Report 2014 Annual Data Annex, 4/27/2015" available https://www.cpuc.ca.gov/csireports/ (Accessed on January 15, 2020)

[235] T&D is referencing transmission and distribution.

[236] See Figure 2.10 Southern California Edison Company's Charge Ready Pilot Quarterly Report 2nd Quarter 2019, August 30, 2019. https://www.sce.com/sites/default/files/inline-files/SCE%20Quarterly%20Charge%20Ready%20Pilot%20Report%202019%20Q2_WCAG_0.pdf (Accessed on January 15, 2020)

[237] The SB 350 TE reporting requirements and associated data collection and reporting templates are available at https://www.cpuc.ca.gov/sb350te/. (Accessed on January 15, 2020). The decisions requiring IOU reporting based on these templates as of the publication of this TEF are: D.18-01-024, D.18-05-040, D.18-09-034, D.19-08-026, and D.19-11-017.

[238] Each of the large IOUs' medium- and heavy-duty EV infrastructure programs include a provision for customers that have existing service capacity to install, own, and operate the EV infrastructure needed to install charging stations and receive a rebate of up to 80 percent of the cost. See D.18-05-040 at 108-109; D.19-08-026 at 25.

and 16 if their incremental EV load triggers any utility distribution or service line upgrade even if the upgrade will likely be used by other customers in the future.[239]

The CPUC in 2011 directed the IOUs to treat any residential service facility upgrade costs associated with incremental EV load as "common facility costs," even when the upgrade costs exceed the individual customers' Rule 15/16 allowance.[240] This policy requires that IOUs treat the cost of upgrades to utility distribution or service lines necessary to accommodate residential EV load as common costs to be recovered from all ratepayers.
A workshop on IOU distribution and service line extensions for commercial customers will be necessary to develop a CPUC record on whether a similar exemption or modification to Rules 15/16 is necessary to support larger-scale EV adoption by non-residential customers[241]. Key issues to be addressed in this workshop include:

- Which utility distribution and service line extension costs should be treated as a "common cost" to be recovered from all ratepayers?
- Should the "common cost" treatment should be a permanent policy for new EV-related load?
- The projected frequency and estimated costs of upgrades needed to support EV charging at MUDs and other nonresidential buildings.
- Whether certain types of EV-related projects could be defined that would not significantly impact costs or trigger system upgrades;
- Typical cost ranges for projects that do trigger Rule 15 and/or 16 system upgrades.
- The cost data associated with upgrades for commercial EV load, which the IOUs must report in their Load Research Reports starting in 2019.[242]

8.4 Submetering

Background

The IOUs' EV rates are designed to incentivize EV drivers to charge their vehicle during off-peak periods that are beneficial to the grid. While the IOUs offer both whole house EV rates and EV-only rates to residential customers, to date, the whole house rates have seen greater uptake. There is,

[239] Rules 15 and 16 include allowances intended to cover distribution line/service extension costs so long as the estimated costs do not exceed the projected revenue associated with the incremental load. The allowances are calculated based on the projected cost of revenue from the incremental load over three years and the expected cost of service. Typically, a customer's allowance is first applied to any service extension covered by Rule 16, and any remaining allowance goes toward the costs of the distribution line extension(s) covered by Rule 15.
[240] This exemption to Rule 15/16 upgrade costs only applies to residential customers that trigger system upgrades by adding incremental EV-related load. The policy was initially adopted in D.11-07-029, and extended in D.13-06-014, and R.18-12-006. An assigned ALJ Ruling dated December 13, 2019 extends this Rule 15/16 exemption for residential EV load through December 31, 2020.
[241] The specific venue for decision-making on this issue may be within the TEF Decision/Rulemaking or a separate Rule 15/16 decision.
[242] DRIVE OIR Scoping Ruling at 13. We note that commercial load typically includes high-rise MUD housing. Energy Division Staff has not yet received the first report.

however, value to separately metering EVs, including the ability to manage vehicle load, and participate in third-party aggregation.

The cost of a dedicated second utility-grade meter for the EV-only rates is a substantial disincentive to customer acceptance.[243] Thus, since 2011, Energy Division staff have worked toward the development of a PEV Submetering Protocol to provide opportunities for residential customers to leverage submeters embedded in the EVSE.[244] Since the CPUC issued D.11-07-029, the IOUs completed a two-phase PEV submetering pilot with the intent of informing stakeholders on the outstanding issues and rules for customer-owned submeters that needed to be addressed to develop the PEV Submetering Protocol, such as communication requirements and minimum equipment functionality. [245] [246] Energy Division staff hosted a public workshop on June 24, 2019 to discuss the Phase II pilot evaluation report and the next steps to develop the PEV Submetering Protocol.

The PEV Submetering Pilot Phase I and Phase II reports demonstrate that there is strong customer support for PEV submetering and that customers are motivated to utilize submeters to have the opportunity to pay a lower rate for electricity used to fuel their EV. [247] [248] This is reflected in the Phase II report, which implies the ability to directly measure an EV charge load and receive off-peak pricing helped shift customer charging behavior from anytime to primarily off-peak hours.[249] This information supports PEV submetering advocates position that enabling PEV submetering will encourage EV owners to enroll in EV-only TOU tariffs that currently require the installation of a second utility meter.

The evaluation report also identified challenges to establishing a PEV submetering protocol. Customers were generally unhappy with the issue-resolution process.[250] Confusion stemmed from the uncertainty of who the primary point of contact was for the customer to reach out to once an issue arose, and how the IOUs and Meter Data Management Agents (MDMAs) should collaborate to ensure a quick resolution to the problem.

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[243] PG&E's EV-B plan requires customers to install a second meter. The installation costs range from $2,000 to $8,000. See PG&E's EV Rates Calculator for more information. Available at https://ev.pge.com/rates/ (Accessed on January 31, 2020).

[244] See D.11-07-029 Available at http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/139969.PDF (Accessed on February 3, 2020).

[245] See D.13-11-002, available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K786/81786001.PDF and Resolution E-4651, available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M097/K049/97049639.PDF (Both Accessed on February 3, 2020)

[246] See Phase I Evaluation Report (https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=64424533950 and Phase II Evaluation Report (http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M325/K033/325033739.PDF) (Both accessed on February 3, 2020)

[247] 91% of responding participants in Phase II stated they were "extremely satisfied" or "somewhat satisfied" with their experience. See Page 70 of the Phase II Evaluation Report

[248] 97% of responding participants. See Page 59 of the Phase II Evaluation Report.

[249] At the start of the pilot, 43% of participants charged their EV during off-peak hours. Off-peak charging rose to 89% of participants during the pilot, then fell to 67% after the pilot's completion and the lower charge rates were discontinued. See Page 69 of the Phase II Evaluation Report.

[250] 31% of respondents claimed an issue was never resolved once brought to the utility and MDMA's attention. See page 65 of Phase II Elevation Report

Another issue was the realization that the MDMA submeters potentially do not meet the required field and laboratory accuracy testing thresholds.[251] Only 9.6% of the equipment tested within the evaluation met the ±2% daily testing accuracy threshold and 5.2% met the ±2% 15-minute interval thresholds.[252] Party responses at the June 24th public workshop suggest that the testing procedures were not followed correctly and the statistical analysis of the testing results failed to properly account for null values.[253] Nexant suggested that the sources of the submeter inaccuracies could be attributed to four items: 1) the submetering equipment, 2) the customer WIFI connection, 3) the MDMA data processing, storage, and transmission system, and 4) the IOUs process to accept, process, and analyze the MDMA data.[254]

Next Steps

The PEV Submetering Phase 2 pilot evaluation report identified a number of issues that need to be resolved before permitting customer use of third-party submetering equipment for billing. These outstanding issues include, the certification and suitable level of the PEV submeter accuracy, the process of communicating PEV submeter data from the MDMA meter to the utility, and the appropriate pathway to remedy customer issues as they appear.

A January 23, 2020 Administrative Law Judge's ruling directs PG&E, SCE, and SDG&E to jointly develop, with input from parties, and file a PEV Submetering Protocol for Commission vote by June 2020.[255]

8.5 Emerging Technology

Summary

TE technology continues to evolve, and further evolution of emerging technologies will be necessary to meet long-term State TE goals. The IOUs should collaborate with key stakeholders and evaluate the need for an TE program to support emerging technology, considering the model of the current IOU Emerging Technology Program for energy efficiency. A TE-oriented emerging technology program could engage with developers and evaluate pre-commercial emerging technology that IOUs could potentially leverage in IOU TE programs once commercialized.

Questions for Stakeholders
10. What additional evaluation would be necessary to determine whether a program similar to the existing energy efficiency Emerging Technology Program is necessary for TE and what the scope of such a program could be? 11. Are the type of activities addressed by the energy efficiency Emerging Technology Programs currently addressed by other organization(s) for TE charging technologies? 12. Is it an appropriate IOU role to create an emerging technology program for TE and leverage existing energy efficiency Emerging Technology Programs experience? Why or

[251] All submeters were to meet an accuracy standard of ±2% in field testing and ±1% in laboratory testing.

[252] See section 4.3 Accuracy of Submeter in the Phase II Evaluation Report.

[253] For a summary of party concerns regarding the submetering testing, see pages 54-55 of the Phase II Elevation Report

[254] See page 53-54 in the Phase II Evaluation Report

[255] The ruling is available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M325/K033/325033739.PDF (Accessed on January 31, 2020)

why not? If not, is there any other role IOUs should play in identifying emerging technology that may be needed for future TE programs?

Background

IOUs currently implement an Emerging Technology Program to support non-TE programs, including both technology development and technology assessment. The program is focused on early stage technologies that can be developed into market-ready technologies that support IOU TE goals. The electric program scope includes but is not limited to laboratory testing, several types of small-scale field trials and demonstrations, development of testing standards, and paper studies.[256] The program is not intended to displace private sector research and development, or to duplicate the Electric Program Investment Charge (EPIC), but rather to create a pipeline for technology evaluation followed by potential participation in IOU programs.

Discussion

IOU TE programs will also need emerging technologies to help overcome a range of technology barriers and support the State's ambitious TE goals. The standards development needs identified by the V2G AC Working Group (as described earlier) is just one example of the challenges facing emerging TE technologies. In addition, several MD/HD segments may rely on TE infrastructure technologies that do not yet exist in the commercial market. A coordinated long-term process should effectively identify needs and gaps and prioritize investments rather than addressing them on ad-hoc basis in individual applications.[257] IOUs should also collaborate with the CEC and other key stakeholders to determine whether IOU involvement is necessary to supplement other efforts.

Therefore, Energy Division staff recommend that the CPUC consider whether an emerging technologies program would be appropriate for an IOU or the IOUs to administer for TE.

Recommendations

Energy Division staff recommends the California Public Utilities Commission should direct the investor-owned utilities (IOU)s to:

1. Ensure that streamlined processes are in place to expedite load-only electric vehicle (EV) charging installations
    a. Provide clear criteria for electric vehicle supply equipment (EVSE) applications to connect to the grid in one document available for download, rather than requiring applicants to follow a step-through portal process to determine the full application criteria. These criteria should be available for EVSE sites seeking to install load-only charging station resources as well as sites seeking bi-directional EVSE interconnection, where vehicle batteries may feed power back onto the grid.
    b. Include 'EVSE' as an option on their interconnection portals.
    c. Conduct a stakeholder workshop that determines the scope of changes that may be needed and propose revisions and address topic number two below.

[256] "Southern California Edison Company's Amended Energy Efficiency Rolling Portfolio Business Plan For 2018-2025." Southern California Edison, February 10, 2017, p 257.

[257] IOUs applications that address technology status and development activities appear to do so on a case-by-case basis. For instance, see "Prepared Testimony in Support of Southern California Edison Company's Application for Approval of its Charge Ready 2 Infrastructure and Market Education Programs." Southern California Edison. 2018. page 60.

2. Provide transparent timelines and processes to determine whether utility service upgrades are needed
    a. Identify strategies to reduce the time between EVSE site application filing date and site energization, including a separate queue for load-only applications.
    b. Track and report the number of applications specifically for EVSE sites and the number of EVSE sites electrified each quarter.
    c. Track and separately report the costs associated with EVSE site application processing and the costs for any associated upstream upgrades. These reports can be a subset of the IOUs' existing annual Load Research Reports or provided as a separate report under the Rulemaking to continue the Development of Rates and Infrastructure for Vehicle Electrification.
    d. Creating transparent diversity factors for use when calculating the impacts of EV charging load on utility infrastructure.
    e. Set timelines for determining whether utility service upgrades would be needed, which may vary based on customer type and project size.
3. Report on requirements for utility service upgrades at IOU owned vs. non-IOU owned facilities.
    a. Track and report the time required to provide upgrades for EVSE installed outside of IOU programs compared to EVSE installed under utility programs.
    b. Provide guidelines for determining whether utility service upgrades will be required, including any differentiation by customer type and type of expected new load.
    c. Provide guidance on criteria used to determine the cost for utility-side infrastructure upgrades for larger commercial customers that are not covered by Rule 15/16 allowances.
4. Collaborate with Energy Division staff and other stakeholders to hold a workshop regarding the allocations of utility service costs for multi-unit dwellings and commercial transportation electrification customers; and whether specific timelines should be established for new or upgraded utility service.
5. Evaluate the need for an IOU emerging technology program for transportation electrification.
6. Consider requiring IOUs to consult with the California Energy Commission, Energy Division staff and other stakeholders to propose an emerging technology program scope and budget.

9. Transportation Electrification and Customer Rates

Summary

The CPUC has a legislative mandate to ensure customers have EV charging options that are cleaner and lower cost than fossil fuels.[258] While access to infrastructure is critical to encouraging customers to adopt EVs, rate design is key to reducing the cost of electricity as a transportation fuel. At the same time, one of the CPUC's goals in designing electric rates is meeting cost-causation principles to ensure customers are paying for their cost of service and making economically-efficient decisions in their energy usage.[259] Importantly, rates should ensure EV charging supports the growth of clean electric generation.

Most California IOUs offer opt-in EV-specific rates.[260] These rates provide price signals that encourage customers to charge during off-peak hours and at times when there is high renewable generation. Some of the EV rates currently offered make charging cheaper than or cost-competitive with traditional fuels, especially for residential customers that are able to charge at home.[261] Customers that lack access to home charging, or are converting a commercial fleet to EVs may face additional costs beyond the price of energy, such as demand charges and service fees. Some IOUs have piloted or proposed rates designed to address these higher costs for specific customer classes. Lessons learned from the IOUs' existing EV rates can help inform innovative strategies to ensure all customers have access to cleaner fuels and lower costs while still allowing the IOUs to fully recover their cost of service.

The IOUs also play an essential role in providing education on EV rates and charging behavior that provides benefits to the grid. Familiarizing customers with this new fueling paradigm and providing signals to optimize customer behavior will be critical to the successful adoption of EVs. As enrollment in TOU-based rates increases, real-time and locational pricing will need to be explored as critical tools for maintaining the integrity of the grid as it becomes more saturated with EVs. The IOUs' TEPs should reflect collaboration in the creation and promotion of innovative and grid-beneficial rates and ensure any new rate offerings are coordinated with the evolution and roll-out of more dynamic and locational rates more broadly.

Questions for Stakeholders
1. To what extent should investor-owned utilities (IOU) collaborate on rate designs and related customer education efforts across service territories? Could one IOUs take the lead in providing guidance on future electric vehicle (EV) rate design plans or should each IOU file separate plans that comply with the guidance described below? 2. What aspects of rate design and related outreach are most important to improve the customer experience and advance widespread transportation electrification?

[258] PU Code 740.12 (a)(1)(H): "Deploying electric vehicle charging infrastructure should facilitate increased sales of electric vehicles by making charging easily accessible and should provide the opportunity to access electricity as a fuel that is cleaner and less costly than gasoline or other fossil fuels in public and private locations."

[259] See Assigned Commissioner's Ruling on Residential Rate Reform http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M031/K735/31735324.PDF (Accessed on January 15, 2020) These principles have also been incorporated into various rate design decisions applicable to all IOUs in California, including D.15-07-001, D.17-01-006, and D.17-08-030.

[260] See Appendix G for details of the California IOUs' existing EV rates.

[261] Cost-comparisons are available on a variety of websites including https://ev.pge.com/vehicles (Accessed on January 15, 2020) and https://www.driveclean.ca.gov/pev/Costs.php. (Accessed on January 15, 2020)

a. Is there a better framing of the concept of "EV rates" that would improve the customer experience?
b. How will the concept of "EV rates" evolve as customers experience numerous prices for different use cases and in different locations?
c. How can IOUs help reduce confusion and enhance understanding of the delivery of electricity as a fuel as well as the need to vary prices based on time and location?

3. How could the CPUC coordinate internally to ensure that CPUC rate design efforts are better aligned with grid conditions and consistently provide meaningful price signals based?

Background

Relevant Legislation

Pub. Util. Code §740.12, as created by SB 350 (DeLeon, 2015), directed the CPUC to create rates that ensure that EV charging is both affordable and that it benefits the grid.[262]

SB 1000 (Lara, 2018)[263] further requires the CPUC to explore more targeted rate-design strategies for commercial EV customers and fleets and to deploy charging stations where there is existing excess grid capacity.

The DRIVE Rulemaking responds to the legislature by seeking IOU proposals that "reduce the cost of using off peak electricity as a transportation fuel **well below the cost of conventional fuels.**"[264] The Rulemaking directs IOUs to provide opportunities for EV drivers to access affordable fueling in both private and public locations. CPUC policies seek to ensure that customers have opportunities to charge affordably regardless of their living situation.

In 2019, SB 676 (Bradford) directed[265] the CPUC to use rates to influence customer behavior in support of vehicle-to-grid integration. This legislation requires the CPUC to adopt targets for each IOU to ensure the transition to electrified transportation does not adversely impact the grid. The targets should identify price signals and load management strategies that can, either alone or in collaboration with other technology solutions, encourage charging at times that provide grid benefits.

CPUC Rate Design Principles

AB 327[266] (Perea, 2013) ordered the CPUC to implement residential rate reform. The CPUC implemented this law through its Rulemaking on Residential Rate Reform[267] to realign rates to reflect

[262] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350 (Accessed on January 15, 2020)
[263] Pub. Util. Code Section §740.15
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1000
[264] DRIVE Rulemaking, p.17 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M252/K025/252025566.PDF (Accessed on March 12, 2019).
[265] Chapter 484 of the Statutes of 2019 created Pub. Util. Code §740.16, setting new requirements for the CPUC to adopt targets for the IOUs to deploy vehicle-grid integration strategies, including rate designs.
http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB676 (Accessed on January 15, 2020)
[266] Chapter 611 of the Statutes of 2013 created Pub. Util. Code Section §745, authorizing the CPUC to require or authorize IOUs to employ default time-variant rates for residential customers.
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB327 (Accessed on January 15, 2020)
[267] R.12-06-013 https://www.cpuc.ca.gov/General.aspx?id=12154 (Accessed on January 15, 2020)

a number of guiding principles.[268] These principles are relevant to guiding the development of TE rates:

1. Low Income and medical baseline customers should have access to enough electricity to ensure basic needs (such as health and comfort) are met at an affordable cost
2. Rates should be based on marginal cost
3. Rates should be based on cost-causation principles
4. Rates should encourage conservation and energy efficiency
5. Rates should encourage reduction of both coincident and non-coincident peak demand
6. Rates should be stable and understandable and provide customer choice
7. Rates should generally avoid cross-subsidies, unless the cross-subsidies appropriately support explicit state policy goals
8. Incentives should be explicit and transparent
9. Rates should encourage economically efficient decision-making
10. Transitions to new rate structures should emphasize customer education and outreach that enhances customer understanding and acceptance of new rates that minimize and appropriately consider the bill impacts associated with such transitions

In June 2018, the CPUC hosted a two-day ZEV Rates Forum[269] to explore EV rate design strategies more specifically and to begin to chart the course forward for a new generation of EV rates. Through presentations from and discussions with CPUC staff, researchers, academics, IOUs, and other stakeholders, three main themes emerged from the event:

1. **TOU rates** are critical for integration of EV load onto the grid, but off-peak rates should not reflect/include on-peak costs. *(Bob Levin - CPUC & Carl Linvill - RAP)*
2. **Critical Peak Periods** should be adopted to send strong price signals to deter charging during the highest stress hours *(Levin & Linvill)*
3. **Demand charges** should not apply to off-peak EV charging. Non-coincidental demand charges do not align the system costs with the rate. Also, coincident peak demand should have a higher charge (*Levin; Linvill; Chris Nelder - Rocky Mountain Institute; Michele Chait – E3; Ryan Schuchard – CALSTART; Andrew Campbell – Energy Institute at Berkeley Haas*)

9.1 Electric Vehicle Rate Evolution Plan Development Guidance

As directed in SB 350, the IOUs should build on the CPUC's rate design guiding principles to propose new rate options as part of their TEPs. In some instances, the IOUs may need to cross-subsidize these EV-specific rates in the near-term, to support the state policy goals of widespread transportation electrification. The overarching goal should be rates that are designed to reflect the cost impact of EVs on the grid and appropriately recover those costs from EV customers.

Commercial fleets and high-powered EV charging site hosts may face high demand charges during the early stages of TE, when their charging equipment sees low utilization. Demand charges reflect the cost of the utility's infrastructure needed to support the full load at a new EVSE site, but when fleets only have one or two electric vehicles, the demand charges make up the majority of their

[268] See Assigned Commissioner's Ruling on Residential Rate Reform http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M031/K735/31735324.PDF (Accessed on January 15, 2020) These principles have also been incorporated into various rate design decisions, including D.15-07-001, D.17-01-006, and D.17-08-030.

[269] https://www.cpuc.ca.gov/energy/electricrates/ (Accessed on January 15, 2020)

bill.[270] As more vehicles are incorporated into a fleet, or start using a DCFC site, the demand charges become more manageable across the growing EV fleet and/or can be recovered across a higher number of kWh sold.

Similarly, residential customers that do not have access to home charging are typically reliant on public EVSE, which often come at a higher cost than the off-peak residential EV charging rate options offered by the IOUs. The IOUs should consider strategies to help offset the cost of public charging for customers who may lack access to home charging options to ensure all customers can benefit from their EV-specific rates.

The CPUC should consider adopting additional rate design policies within the TEF including:

1. Mitigate the economic impact of demand charges in new rates while still reflecting cost-causation principles. EV rates should:
    a. Lead to more effective utilization of renewable resources by encouraging charging during periods of high solar and wind energy generation.
    b. Enable the conversion of transit, school bus, shuttle, and other commercial fleets as directed under CARB regulations.[271]
2. Ensure EV-specific rates facilitate and encourage customers' participation in all other state, local, and IOU programs to better integrate vehicle charging load onto the grid.[272]
3. Use the appropriate rates, subsidies, and/or customer bill credits to offset the cost of public charging for customers who do not have access to low residential off-peak charging rates.

The IOUs have made progress on developing innovative rates intended to make EV fueling affordable, especially given the two commercial rate designs adopted in 2018-2019 for SCE and PG&E, SDG&E's recently filed high-powered EV charging rate application,[273] and recent efforts to advance load management strategies within the IOUs' TE programs. Appendix G includes a full summary of current IOU EV rates that are approved and under review at the CPUC. However, IOUs must do more to ensure that customers have access to rates that implement legislative directives for charging affordability and grid benefits. To advance California to the next phase of EV

[270] Demand charges are largely reflective of a customer's peak energy use over the course of a month, regardless of when that peak usage occurs. Customers are unable to schedule EV charging to reduce or avoid demand charges in most utility rate structures. As the $/kW charge is spread across more kWh of usage, it the demand charge makes up a lower portion of the customer's bill and bill management can be achieved by scheduling charging for lower-cost, off-peak periods. See Table 1 of "Driving Transportation Electrification Forward in New York, Considerations for Effective Transportation Electrification Rate Design," Prepared by Synapse Energy for Natural Resources Defense Council, June 2018. Available at https://www.synapse-energy.com/sites/default/files/NY-EV-Rate-%20Report-18-021.pdf (accessed December 30, 2019).

[271] CARB has or will be implementing regulations requiring a transition to zero-emission vehicles for most MD/HD and off-road sectors over the next two years. See Slide 15 of Emissions Modeling, ZEV Programs, & Data Collection - Joshua Cunningham and Yachun Chow from the May 9, 2019 Energy Division Staff Workshop on SB 350 Data Collection and Reporting for a timeline of anticipated CARB regulations. Available at https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442461296 (Accessed January 15, 2020).

[272] This is in response to the DRIVE OIR directive to "Align with other demand response and load management programs to facilitate and encourage customers to participate in all existing applicable efforts to better integrate ZEV charging load onto the grid. This includes the IOUs' and third party demand response programs, energy efficiency programs operated by third party aggregators, and the Low Carbon Fuel Standard (LCFS) incentive mechanisms that encourage ZEV charging at off peak periods when the grid has an overall lower carbon intensity" (DRIVE OIR p.18)

[273] A.19-07-006 and related documents and testimony is available at https://www.sdge.com/rates-and-regulations/proceedings/ev-high-power-charging-rate. (Accessed on January 15, 2020)

ratemaking, the IOUs should submit an EV Rate Evolution Plan ("EVREV"). The EVREV should include a collaborative, stakeholder guided strategy for improving the customer experience in paying for EV fueling and potentially receiving compensation for discharge of their EV batteries at times of grid congestion.

The topics described in detail below should be included in the EVREVs, along with any other proposed rate design issues the IOUs wish to address in their 10-year TEPs. IOUs should coordinate with CCAs operating in their service territories to ensure the rates designed through their EVREVs can be offered to CCA customers and that any educational materials for new rate structures are distributed to bundled and unbundled customers alike.

Dynamic Rates

EVREVs should include a plan to make dynamic rates available soon after submission of the IOUs initial TEPs. Dynamic rates generally provide a different price per kWh over the course of the day and can range from relatively simple time-of-use (TOU) rates to hourly or sub-hourly prices based on day-ahead or five minute-ahead wholesale electric rates, also known as "real-time" pricing. The EVREVs should also address locational pricing that accounts for residential customers in hot climate zones that are more reliant on air conditioning and reflects the conditions on different systems and circuits.

The rates proposed in the EVREVs should be developed in direct coordination with VGI and other dynamic ratemaking efforts at the CPUC, including but not limited to the dynamic rates discussion underway in SDG&E's current GRC Phase 2 proceeding.[274]

The IOUs should conduct a coordinated and cohesive statewide approach to better align various grid/procurement planning efforts, and capture the potentially enormous benefit of smart charging and VGI.[275] Accordingly, the IOUs should incorporate the CPUC's guiding rate design principles in the context of evolving advanced dynamic rates that consider widespread TE. Table 6 is an illustration of staff's vision of how rates might evolve over the coming years.[276]

Table 6: Illustrative Timeline for Evolution of EV rates

	Now	Soon (2-5 years)	Later (5-10 years)

[274] In A.19-03-002, the CPUC is considering strategies to utilize existing dynamic rates and pilots to further implement real-time pricing as an option for customers in SDG&E's service territory. A workshop focused on this effort was held in October 2019, materials related to which are available at https://www.cpuc.ca.gov/General.aspx?id=6442462894 (Accessed on January 15, 2020). Similar strategies are being considered in PG&E's current GRC 2 application (A.19-11-019).

[275] "Clean vehicles as an enabler for a clean electricity grid." Jonathan Coignard, Samveg Saxena, Jeffery Greenblatt, and Dai Wang. *Environmental Research Letters*. 16 May 2018. This study finds that EVs with uni-directional charging could provide the same benefits of California's stationary storage mandate for mitigating renewable intermittency at a lower potential cost. Further benefits and lower costs for mitigating intermittent renewables may be available as more bi-directional EVs are deployed. Available at https://iopscience.iop.org/article/10.1088/1748-9326/aabe97/meta. (Accessed on January 15, 2020)

[276] Table 4 provides illustrative examples of time frames and not recommendations.

Time of Use Rates (Different prices during different times)	Available to all + Optional	Default for all drivers	Default for all drivers
Dynamic Rates (More granularly differentiated pricing; could include critical peak pricing, etc.)	Pilot	Available to all + Optional	Default for all commercial EV customers + Optional for residential EV drivers
VGI Payments (Compensation for discrete grid services via IOUs or 3rd parties)	In development	Pilot	Available to all + Optional

Use Case-Specific Rates

Some stakeholders have expressed that ratemaking should be technology neutral, and that EV-specific rates are not necessary to further the adoption of EVs.[277] EV-specific rates could be viewed as subsidizing a particular strategy for meeting state renewable energy integration or GHG reduction goals above and beyond other technologies, such as stationary storage or energy efficiency, which have been prioritized through other technology-specific rates. The patchwork of rates designed to support specific technologies may create barriers and discourage the adoption of EVs by drivers and hinder the development of sustainable business plans for charging networks. Drivers may find it difficult to comprehend variations in end-use pricing that reflect temporal and geographic differences. Under existing rate structures, companies operating charging networks may have to choose between technology-specific rates that could otherwise be combined to lower their operating costs, such as stacking net-energy metering of on-site renewable and storage with super-off-peak EV charging rates.

However, EV-specific and use case-specific rates may be a reasonable near-term strategy to spur market transformation. These more targeted rates will subsidize the transition of the transportation sector to electrification in the near term, to help achieve state policy goals, while also reducing the $/kWh electric rates over time, as utilities are able to spread the cost of infrastructure across more customer sales.

For example, demand charges are widely seen as impediments to early-stage deployment of charging infrastructure, particularly for DCFC and electric MD/HD vehicles. High levels of demand coupled with low usage can create unfavorable economics for charging station operators, site hosts, and EV drivers. IOUs have attempted to address demand charges in early commercial EV rate options via one-size-fits-all solutions, which may provide various degrees of relief across use cases. IOUs should propose rates that address the unique characteristics of various use cases and associated demands on the electrical grid. For example, workplace charging and transit buses have very

[277] See, for example, the California Energy Storage Alliance's Response to PG&E's Commercial EV Rate Application 18-11-003 at 3, available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M247/K318/247318482.PDF. Accessed on January 15, 2020)

different energy needs and usage patterns; a singular rate will not benefit every use case.[278] Accordingly, IOUs should explore commercial EV rates that:

- Consider demand charge modifications and low-cost/off-peak charging options specifically for customers early in the transition to EVs including:
    - TE-specific rates based on the price floor of established Economic Development Rates.[279]
    - Rates that adjust demand charges based on charger utilization. For example:
        - Eliminate or significantly reduce demand charges for low-utilization charging stations. As utilization increases, use a formula to increase demand charges.
        - Determine how many times daily that a DCFC is being utilized so that IOUs will have load profile data based on 15-minute intervals.
- Propose MD/HD, transit-, and fleet-specific rates that comply with the directives of SB 1000 (Lara, 2018).[280] These use case-specific rates should account for various MD/HD fleet duty cycles, route configurations, and existing and forthcoming charging technologies to help reduce the impact of demand charges, accelerate the adoption of EVs, and encourage the deployment of EVSE at locations where there is exiting grid capacity.

It may be most effective to offer additional use case-specific rates as different TE market sectors transition from early staged to higher levels of EV adoption. Further, new EV-specific rates should continue to be considered outside of the GRC process in the near-term, to encourage the full participation of stakeholders that are most knowledgeable about TE without requiring them to become parties in utilities' overarching rate cases.

Longer term, the IOUs should explore the concept of technology-neutral ratemaking and its implications for EV fueling affordability and customer acceptance. Similarly, the development of any EV-related rates in the future (e.g., 2030s) may be consolidated into the CPUC's formal GRC process in conjunction with a potential transition to technology-neutral rates.

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[278] For example, the IOUs' light-duty vehicle infrastructure pilot results have illustrated that utilization of the EVSE at workplaces tends to peak in mid-morning and decline before peak hours start, and see little utilization at all on weekends (See SCE's Charge Ready Q2 2019 Quarterly Report at 28, SDG&E's September 2019 Power Your Drive bi-annual report at 9). An analysis conducted by E3 for the California Transit Association, however, suggests that transit agencies' charging profiles will vary based on the type of bus and charging technology adopted, the transit bus routes, and daily service schedules. See "Rate Design for Electrified Transit, Technical Memorandum" as attached to the CTA Opening Comments to the DRIVE OIR, available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M266/K859/266859206.PDF. (Accessed on January 15, 2020)

[279] Economic Development Rates (EDR) provide discounted prices to attract, retain, and expand load, as long as the price offered to participating customers still provides a positive contribution to margin, and have been approved in D.05-09-018, D.06-05-042, D.07-09-016, D.07-11-052, D.10-06-015, and D.13-10-019. https://www.cpuc.ca.gov/general.aspx?id=12182. (Accessed on January 15, 2020). SCE in its Testimony for A.17-01-021 stated that customers enrolled in its TOU-EV rates would provide a positive contribution to margin each year as an analogy to the EDR price floor that was most recently adopted in D.13-10-019.

[280] Chapter 368 of the Statutes of 2018 created Pub. Util. Code Section §740.15, directing the CPUC to, within an existing proceeding, explore policies to support technologies and rate strategies to reduce the effects of demand charges on EV drivers and fleets, help accelerate the adoption of EVs, and encourage the use of charging stations when there is excess grid capacity.

Residential Electric Vehicle rates

Residential EV charging has the potential to result in significant impacts on the grid, given that more than 80 percent of personal EV charging currently occurs at home.[281] Given the current low levels of penetration, IOUs have reported relatively minimal needs to upgrade the grid to accommodate residential EV load to date, but with California's policies driving increasing EV adoption[282] residential EV TOU rates will be a critical element in realizing charging behavior that provides grid benefits.

Many customers stand to benefit economically from enrolling in an EV rate, given that the IOUs' off-peak EV rates are often the lowest volumetric energy rates offered. For some customers, however, EV-specific rates may be less advantageous. For example, if some portions of home electricity usage cannot be shifted to off-peak hours, it may be billed at on-peak prices that are higher than other residential rate options. There may be opportunities to offset customers who charge off-peak, such as enabling submetering so that the remainder of the home can utilize TOU with a lower on-peak rate. The CPUC and IOUs' work to advance submetering technologies are discussed in more detail in Section 8.4 above.

One potential solution to the issues related to whole-house EV rates described above would be a more wide-spread deployment of submetering technology, which could ensure more accurate, separate accounting for EV charging load without the need for a separate utility-owned meter.[283] In the near-term, however, the IOUs should enhance education efforts around EV rates to increase enrollment and influence customer charging behavior. IOU residential EV rate outreach at a minimum should:

1. Use the ongoing TOU default rollouts to increase education around EV-specific TOU rate options.[284]
2. Partner with EV dealerships to provide education to customers at the point-of-sale.
3. Automate outreach, e.g., monitoring when consistent spikes in customer energy usage are detected and target those high-use customers regarding potential enrollment in EV rates.

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[281] See Table 3.1 of California Plug-In EV Infrastructure Projections: 2017-2025 by the National Renewable Energy Laboratory and the CEC. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=224521&DocumentContentId=55071 (Accessed January 15, 2020).

[282] While IOUs report that enrollment on residential EV rates is steadily increasing, enrollment levels remain low. For example, approximately fourteen percent of the estimated EV customers are enrolled in a whole-home EV TOU rate in in SCE territory, with approximately eighteen percent enrollment for EV customers on the equivalent PG&E rate. For separately-metered residential EV rates, enrollment is in the 100s of customers' range, presumably due to the high cost of installing a separate meter and the lack of financial incentives. 2017-2018 Load Research Report, available at http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442461674 (Accessed January 15, 2020)

[283] The CPUC has been evaluating polices to overcome the barriers to enable residential PEV submetering for almost a decade. Although not scoped into the TEF, action to further the development of a PEV submetering protocol is continuing through the DRIVE OIR, and the next steps on this issue are described in Section 8.4.

[284] D.17-21-023 authorized the IOUs to contract with a firm to create a strategy and education and outreach content to inform customers of the transition to default TOU rates. This contract was authorized to be extended through 2021 in D.19-01-005, and is the subject of Phase 5 of R.12-06-013 as set forth in President Batjer's September 2019 Scoping Ruling available at http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=312064166. (Accessed on January 15, 2020)

4. Build off tools such as PG&E's EV Savings Calculator,[285] which is an outstanding example that allows customers to easily compare rate plans and enroll in the most beneficial EV rate.

To accelerate the adoption of EVs by residential customers without access to home charging, the IOUs' TEPs should consider:

1. Rate designs and/or customer bill credits to offset the cost of public EV charging for customers who do not have access to lower priced residential off-peak charging rates.[286]
    a. This topic could be explored through Energy Division staff workshops or the IOU-led EVREV development process described above.
    b. LCFS holdback funds could be used to create an incentive for non-single-family residents to utilize public charging in the form of a bill credit, gift card, free charging network subscription, discounted electricity at IOU-owned/operated charging stations, or other rebates.
2. Subscription-based charging models that provide unlimited or high amounts of "free" charging within or across service territories during off-peak or super off-peak time periods.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission (CPUC) should direct the investor-owned utilities (IOU) to:

1. Develop and submit an Electric Vehicle Rate Evolution (EVREV) plan as part of their initial Transportation Electrification Plans (TEP). The EVREV plan could be proposed in each investor-owned utility's (IOU) TEP separately, or within one lead IOUs' TEP. The plan(s) should reflect full coordination across the IOUs, feedback from stakeholders, and address, at a minimum, the following issues.:
    a. An evaluation of current electric vehicle (EV) rates with lessons learned that proposes a schedule for convening a periodic evaluation and public discussion of EV rates and strategies to improve the IOUs' existing EV-specific tariffs. This evaluation should report the number of customers enrolled on each existing EV rate, the existing EV rates' effectiveness in shifting load, and whether customers enrolled in each rate are realizing cost savings relative to their otherwise-applicable tariff option(s).
    b. A survey of ratemaking efforts in other states and countries with recommendations for applying successful practices and promising ideas in California.
    c. A coordinated strategy across IOUs that outlines a plan for evolving rates towards more dynamic and locational pricing with the assumption that EVs are one component of a system of "smart" devices that are dynamically responsive to grid conditions and other on-site/connected load-management technology.
    d. Proposals for optional real-time, dynamic rates to all EV customers within the next five years.
    e. A plan to default all commercial EV customers to dynamic rates over the next decade.

[285] https://ev.pge.com/ (Accessed on January 15, 2020)

[286] This issue is also discussed in Chapter 6, "Equity" and in section 5.3, "Customers Without Access to Home Charging."

    f. Consideration of how vehicle-grid integration (VGI) use cases should and will interact with ratemaking.
        i. Identify strategies to return the value of VGI services to the customer providing the service(s)
    g. A discussion of how EV ratemaking interacts with demand response and load management programs.
    h. A discussion of the need to foster growth in for specific EV use cases e.g., transit-specific rates
    i. Exploration of eventually transitioning use case- or class-specific EV rate(s) to more technology-neutral rate designs, including how EV rates should interact and correspond with other technologies (e.g., smart water heaters, battery storage, solar photovoltaic, etc.).
    j. Strategies to ensure rates are equitably designed and implemented.
    k. A plan for incorporating driver/customer feedback into the evolution of rates, including surveys, focus groups, and pilot rates.
    l. Strategy for interaction with community choice aggregators around ratemaking issues.
2. Initiate a collaborative process among IOUs and stakeholders to develop EVREVs that explores, at minimum, the topics listed above and utilizes:
    a. A process that builds off ongoing proceedings and identifies "quick wins" that can be implemented prior to the submission of EVREVs.
    b. Longer-term strategies that flow from those "quick wins" into their EVREVs.
3. Provide a proposed scope and schedule of EVREV development to Energy Division staff within 60 days after the TEF is adopted by the CPUC.
4. Require the California small and multi-jurisdictional utilities (CASMU) to submit individual or joint EVREV(s) in 2025 to allow for learning from large IOU experience. CASMUs should participate in the large IOUs' EVREV collaborative process to ensure their perspectives are incorporated.
5. Propose revised rates as part of regular TEP revisions to align with the EVREV process and plans.
6. Adhere to the CPUC's Residential Rate Design principles when designing both commercial and residential rates.
7. Increase enrollment in residential EV time-of-use rates via enhanced education and outreach to maximize grid benefits and customer savings, with certain exceptions (e.g., similar to those in the TOU default roll-out).
    a. If and when submetering is available, require customers with home smart chargers to enroll in a separately metered EV rate.
8. Explore means of using rate design and/or customer bill credits to offset the cost of public charging for customers who do not have access to low residential off-peak charging rates.

The CPUC should also direct Energy Division staff to:

1. Internally coordinate CPUC proceedings and rate design efforts to move towards a more unified and technology-neutral approach to rates.
2. Ensure that dynamic/real-time pricing is explored consistently across rate cases and other open proceedings and seek to identify "quick wins" and pilot opportunities.

9.2 Transportation Electrification Program Cost Recovery and Allocation

Summary

Issues surrounding cost recovery and the allocation of TE costs across customer classes has been historically controversial and separately litigated in each TE-related decision. Parties have questioned whether the use of distribution rates to recover costs for TE programs is appropriate. In addition, the costs of the TE programs are sometimes perceived to be unfairly allocated when the primary beneficiaries of the programs are not the ones who bear most of the program costs. One approach is to allocate the costs of the TE investments to the customer class(es) that are most likely to benefit from the program. This section explores the strategies that have been proposed to allocate TE program costs and methods to more equally recover the cost of IOU investments to meet broad state policy directives.

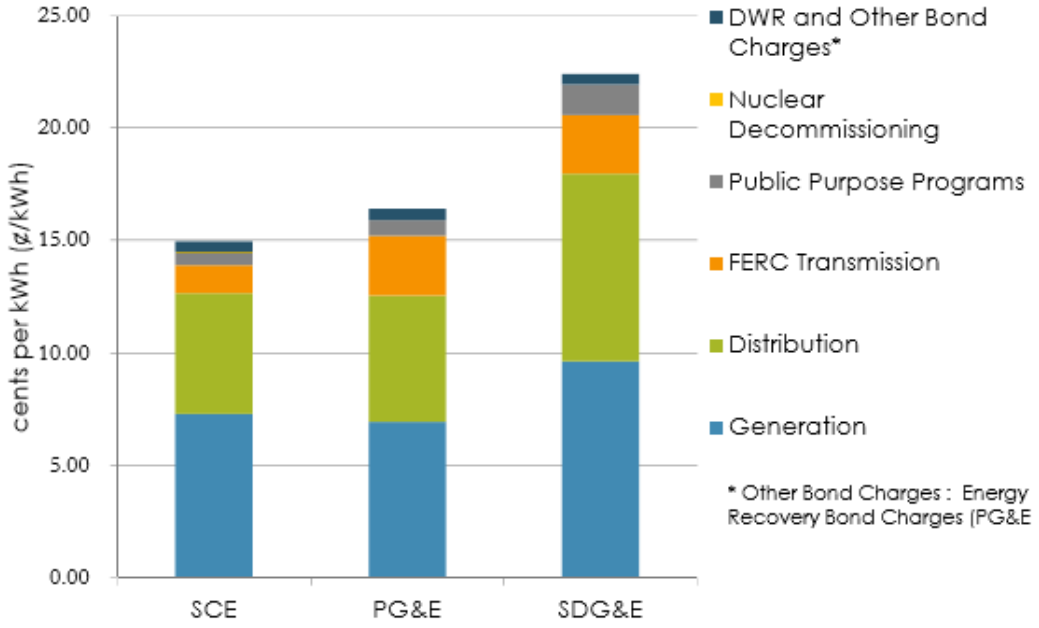
Background

Every three years, each IOU files a Rate Design application with the CPUC. This includes establishing marginal costs and allocating the IOU's approved revenue requirement established in the first phase of its General Rate Case (GRC). The Rate Design proceeding (GRC Phase 2) allocates the IOU's revenue requirement by customer class via demand charges, fixed fees, and volumetric charges that are included in a customer's rate.

Electric bills are comprised of a number of rate components. As shown in Figure 10, electric generation and distribution are the largest components of electric rates and collectively account for approximately 80 percent of utility rates.[287] The public purpose programs surcharge is another rate component, primarily used to recover costs of state-mandated programs such as low-income and energy efficiency programs.

Figure 10: 2018 Electric Rate Components

[287] "California Electric and Gas Utility Cost Report – AB 67 Annual Report to the Governor and Legislature 2019" https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/Office_of_Governmental_Affairs/Legislation/2019/2018%20AB%2067%20Report.pdf (Accessed on January 14, 2020)



Source: California Electric and Gas Utility Cost Report – AB 67 Annual Report to the Governor and Legislature 2019

While the issue has been contested, all approved utility TE programs recover program costs through the distribution component of rates.[288] All retail customers, including any that choose to enroll in service through another load-serving entity such as a community choice aggregator or direct access provider, are responsible for paying the distribution component, as all customers utilize the IOU's distribution assets and benefit from its electric services.

The CPUC assigns the costs of the utility's distribution-based investments across customer classes according to each customer class's share of the marginal distribution revenue requirements.[289] As a simple generalization, the distribution allocator assigns a higher proportion of the distribution costs on residential and small commercial & industrial (C&I) classes in relation to the gross sales of these customers. This is due to the higher costs and larger demand for distribution infrastructure needed to serve residential or smaller C&I customer compared to the cost to serve larger customers.

For example, Table 7 presents PG&E's 2019 Omnibus Rate Proposal, which allocates approximate 60 percent of the revenue for all programs recovered through distribution rates to residential and small C&I classes. Residential and small C&I classes, therefore, pay for the majority of costs for programs recovered through distribution rates even if the programs that have a specific benefit for larger commercial customers. That said, one TE program has authorized the utility to allocate costs on an equal cents per kWh basis.[290]

[288] See D.18-05-040 at 123-124, which states "[EVs] provide opportunities for grid integration and enhanced distribution system management…[the costs associated with TE infrastructure] are related to the distribution system and are appropriately recovered through distribution rates."
[289] The individual classes share of the total cost of the distribution investments the utility seeks to recover.
[290] SDG&E's MD/HD Infrastructure Program (D.19-08-026) approves a Settlement that includes provision that the IOU will recover the program costs through distribution rates and be allocated to customer classes on an equal cents per kWh basis.

Table 7: PG&E 2019 Omnibus Rate Proposal

Customer Class	Distribution Allocation Factor
Residential	44.7%
Small C&I	15.2%
Medium C&I	11.7%
Medium C&I TOU	11.2%
Maximum C&I TOU	7.0%
Agriculture	9.3%
Streetlights	0.7%
Standby	0.2%
Total	100%

Cost Allocation Impacts Discussion

Ratepayer advocacy groups have argued[291] that although widespread TE does generate a wide range of benefits for all ratepayers, the costs for programs designed to directly benefit medium and large C&I customers should not be disproportionally placed on residential and small C&I customers, and vice versa. They have concluded that TE program costs should not be recovered through distribution rates, but rather through the public purpose programs surcharge which uses an equal cents per kWh allocator.

However, some parties' comments[292] reject moving away from the current practice, as the TE program investments provide system-wide distribution benefits that are sharable among all ratepayers. For example, a TE program that electrifies a transit operator's fleet will likely require distribution and transmission upgrades to enable the customer to fuel their vehicles. These upgrades, though triggered by the individual project, benefit all ratepayers in two notable ways. First, TE provides the opportunity to use the electric grid more efficiently, through managed EV charging and ancillary services (i.e. battery storage, frequency and voltage regulations, emergency power supply, etc.).[293] Second, the infrastructure investments are made in response to an expected increase in load and corresponding electric sales and IOU revenue. A reduction in electricity rates for all customers can be realized if the revenue from EV charging exceeds the IOU's service costs.[294]

With these benefits largely associated with distribution assets,[295] the current method of cost recovery through the distribution rates is appropriate. However, the current process of allocating customer costs on a program basis through the TE proceeding is repetitive and inefficient. Instead, the CPUC should utilize the GRC process to assess TE infrastructure investments holistically, where

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[291] See comments filed by Cal PA and TURN to A.18-01-012, A.18-06-015, A.18-07-020 et al., and A.18-07-021

[292] See SCE, and SDG&E Reply Briefs to A.18-07-020 et al.

[293] Aziz,M. "*Electric Vehicles Utilization for Ancillary Grid Services*". Institute of Innovative Research, Tokyo Institute of Technology. 2018. https://aip.scitation.org/doi/pdf/10.1063/1.5024128 (Accessed on January 15, 2020)

[294] According to a June 2019 NRDC report, "*Electric Vehicles are Driving Down Rates*" from 2012-2018, EV charging revenue in PG&E's and SCE's service territory has contributed $584 million more than the costs to service the TE infrastructure. This benefits all of the IOU's ratepayers through a reduction in total electric rates. https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf (Accessed on January 15, 2020)

[295] For example, 71 percent of the approved budget for SCE's Transit and School Bus and DAC rebate program is allocated to directly install the distribution asset or O&M to support the asset.

stakeholders with expertise in cost allocation can have a system-wide view of investments and benefits and allocate the costs to be recovered appropriately.

Recommendations

Energy Division staff recommends the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Recover transportation electrification (TE) program costs through the distribution rate component of the customer's bill.
2. Address the allocation factor for TE program costs through Phase 2 of the IOUs' General Rate Case proceedings.

9.3 Alternative Financing

Summary

The costs to install the necessary TE infrastructure will continue to grow as the State ramps up EV deployment to meet its climate goals. The CPUC has taken steps to reduce ratepayer costs to support these TE efforts, notably through the limitation of rebates for EVSE costs that mitigate upfront equipment costs.[296] Although cost containing measures are necessary, limitations on rebates adversely impact participation for customers who might otherwise be interested in the TE program. As TE programs move beyond early adopters, attracting new customers will depend on offering a low-cost option to participate.

One potential solution that can reduce the upfront participation costs, while also minimizing ratepayer responsibility, is to encourage the IOUs to explore the use of On-Bill Financing (OBF)[297] or Tariff-Based Recovery (TBR).[298]

Questions for Stakeholders
1. Would an investor-owned utilities (IOU) On-Bill Financing or Tariff-Based Recovery program help to overcome significant barriers to wide-spread transportation electrification (TE)? Why or why not? 2. If the IOUs were to pursue an alternative financing program, would an On-Bill Financing or a Tariff-Based Recovery program be more effective at addressing the barriers to wide-spread TE? a. What are to benefits of selecting one of these options over the other? b. Are there other options that the California Public Utilities Commission should consider? 3. What lessons learned from the Energy Efficiency On-Bill Financing pilots be used to inform the development of a TE On-Bill Financing or Tariff-Based Recovery program? a. What information, if any, from the Energy Efficiency On-Bill Financing pilots should not be used for informing the development of a TE program?

[296] For example, D.16-12-065 ordered PG&E to provide EVSE rebates of 100 percent for sites located in a DAC, 50 percent for non-DAC MUD sites, and twenty-five percent for non-DAC workplace site-hosts.
[297] On-Bill Financing is a financing mechanism that has the utility provide financing to a customer for energy specific improvements. The loan is recovered through a charge on the customer's monthly bill.
[298] Tariff-Based Recovery sees the utility add a charge to a specific customer's monthly bill to recover the costs for an energy improvement. The charge is applied to the monthly bill up until the investment is fully paid. Once this occurs, ownership of the investment is transferred from the utility to the customer.

Background

In 2005[299] and 2007[300], the CPUC directed the IOUs to explore OBF pilot programs for energy efficiency measures. Subsequently, the legislature issued AB 1613 (Blakeslee, 2007), AB 2791 (Blakeslee, 2008), AB 758 (Skinner, 2009) that required the CPUC to investigate the utilities' ability to provide financing options for energy efficiency measures. In 2009, the CPUC authorized OBF pilots for commercial and institutional customers.[301]

OBF programs were designed to target higher cost measures that could result in deeper energy savings. These higher cost measures required access to capital markets, on attractive terms, to fund the improvements. Third party financing of the energy efficiency improvements was challenging due to a number of barriers that dissuaded private financers from approving loans, including:

- Long payback period that exceeds the customer's expected use of the equipment
- High transaction costs
- Principal-Agent/Split Incentive
- Higher competition for borrowed funds

Residential customers were excluded from these programs based on the added complexity and the overhead costs to adhere to federal and state consumer lending laws. However, MUDs were scoped into the commercial sector as long as the building was not owner occupied.

As a result, the initial funding for the approved utilities EE OBF programs was seeded through ratepayer funding and placed into a revolving loan fund account. The IOUs distributed these funds to approved customers who repaid loans via their utility bills. These repayments were deposited into the revolving loan fund to finance additional projects.

The four IOU's full-scale OBF programs started to issue loans in 2011. Each IOU OBF program used a similar implementation process, including utility bill repayment, zero percent interest, bill neutrality, and maximum loan terms and caps.

Energy Division released the Phase II performance report for these programs in 2015, which reviewed the program's performances in 2013/14. Overall, the OBF programs appeared to induce participation and energy savings. The Phase II report attributes 75 percent of the total energy savings to OBF, based on customers who would not otherwise undertaken upgrades. The Phase II report also found that 68 percent of the projects financed through the OBF program received a loan that covered the full cost of the measures. The importance of the OBF programs was underscored in the finding that 64 percent of the pilot participants would not have completed the projects if not for the OBF loan.[302]

[299] See D.05-09-043
[300] See D.07-10-032
[301] See D.09-09-047
[302] See PY 2013/14 On-Bill Finance Programs: Impact Evaluation (Accessed on January 15, 2020)

Table 8 provides a summary of each utilities loan programs.

Table 8: Summary of IOU OBF Programs

Utility	# Loans	Loan Amount	Average Loan	Loan Pool	Default Rate	Rejection Rate
PG&E	783	$26,666,180	$34,056	$50.5 M	Low	Low
SCE	713	$14,202,298	$19,919	$43.7 M	0.4% of total funds loaned	~50%
SDG&E	308	$11,711,986	$38,025	$26 M	2.12%	38%
SCG	9	$153,497	$17,055	$2 M	11%	0%
Statewide	1,813	$52,733,961	$29,086	-	-	-

Applying Energy Efficiency Lessons to Transportation Electrification Programs

On-Bill Financing Model

The energy efficiency OBF program offers lessons on the successes of the utility loan program. However, a number of differences would need to be addressed if a TE OBF program were to be adopted. First, unlike energy efficiency program outcomes which seek to lower a customer's monthly energy consumption, EV charging will inherently raise the customer's monthly kWh demand. Energy efficiency uses expected monthly costs savings to repay the outstanding debt balance. The simplest alternative is to forgo the energy efficiency pay-as-you-save model for TE programs and add the true monthly costs for repaying the loan over the programs predetermined payback timeframe to the customer's monthly bill.

Second, the costs for installing an EV charge port are typically higher than the costs of energy efficiency measures. Table 9 presents each utility's cost per port based on their light-duty infrastructure programs.[303]

Table 9: Average IOU cost per L2 port installed

Utility	Program	Average Costs per Port (L2)	Average Costs per Site
PG&E	EV Charge Network	$17,956	$287,296 (16 ports per site)
SCE	Charge Ready	$13,430	$204,637 (15 ports per site)
SDG&E	Power Your Drive	$23,000	$275,000 (10 ports per site)

Each utility's average costs per site is significantly higher than the average loan issued in the energy efficiency OBF program. Accordingly, the TE utility loan fund would need to be:

1) Larger than the loan pools approved in the energy efficiency programs; or
2) Similar to the energy efficiency pool size but will be able to issue loans to a considerably smaller number of applicants which could minimize the program's effectiveness.

[303] See the 2019 Q2 PAC reports for PG&E's EVCN and SCE's Charge Ready, and the September 2019 Semi-Annual Report for SDG&E's PYD.

Finally, the energy efficiency OBF program offers customer's a number of efficiency measures tailored to the characteristics of the building and its energy consumption. Most of the site requirements to install EV charging are fairly constant across all customers sites, with the exception of charger model selection. This limits the customer's opportunity to choose TE infrastructure measures that can lower the total installation costs.

Tariff-Based Recovery Model

A potential alternative to a TE OBF program is the Tariff-Based Recovery (TBR) model. TBR is similar to an OBF program in that repayment to the utility is made directly through a customer's utility bill as an account specific surcharge. The key differences between OBF and TBR are that the upfront costs are paid for ratepayer funds instead of utility financing, and the investment costs are attached to the IOU account holder instead of a specific customer. The ratepayer risk for defaulted loans is mitigated by a monthly surcharge on the borrower's monthly energy bill, in addition to the costs remaining with the address in the event the original account holder moves.

A variety of parties recommended[304] the CPUC explore allowing TE programs to use the TBR model. These stakeholders suggested that a TBR pilot to reduce upfront costs for charging equipment, performance of a site assessment, installation of the necessary make-ready infrastructure, and the EV charger, as well as cover the equipment's warranty. As proposed, the most significant liability is the utility's inability to recover the infrastructure installation costs given that the utility maintains ownership until fully repaid. Once paid in full by the account holder, ownership transfers to the customer. Customer default allows the utility to remove the equipment from the customers premises and install at another location. However, it does not allow the IOU to recover the costs of the installation and removal of the infrastructure. These costs would be borne by ratepayers.

Unlike OBF, TBR does not require billing system upgrades. The IOUs have the ability to add a tariff charge so that payment will be automatically applied to the customer's bill. Similar to OBF, TBR has a zero percent financing rate and are limited to recovering costs associated with TE infrastructure and those expended for installation.

While energy efficiency OBF programs have shown some successes, comparable TE successes will be difficult to replicate. This is primarily due to the comparatively higher costs per site for TE programs. Further information will be necessary to demonstrate the likelihood of success for an OBF or TBR program designed to address barriers to widespread TE. Accordingly, based on currently available information, the CPUC should not approve an OBF or TBR program at this juncture.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Host a public workshop to discuss their capacity of administering an on-bill financing or tariff-based recovery program and the potential structure(s) for such programs.

[304] In the CPUC's SB 350 proceeding A.17-01-020, Greenlining Institute, The Utility Reform Network, Union of Concerned Scientists, Clean Energy Works proposed a TBR model to support the electrification of transit buses. See Attachment A of Opening Brief of Greenling Institute on the Priority Review Transportation Electrification Proposals of San Diego Gas & Electric, Southern California Edison, and Pacific Gas and Electric. http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M195/K587/195587269.PDF (Accessed on January 15, 2020)

10. Partnerships

Achievement of California's 2025 EV deployment goals will require broad, coordinated efforts across a wide range of utility and public-private partnerships. Such partnerships will be necessary to fill projected charging gaps in California including the need for 78,000 L2 and 3,600 DCFC public charging ports[305] as well as significant scale-up of non-public funded TE infrastructure.[306] Such partnerships are necessary to complement ratepayer investment by:

- Financing, administration, and operations of the TE infrastructure and outreach efforts by non-IOU entities
- Coordinating with CalGreen codes and local governments that are implementing PEV-Readiness Plans
- Coordinating with local agencies that develop and implement PEV-Readiness local building codes and coordinate with IOUs to apply for TE grants

To achieve these objectives and reduce dependency on ratepayer funding, the IOUs should leverage relationships and complement ratepayer investment working in conjunction with public-private partnerships, building code enhancement, regional coordination, and community energy choice aggregators.

10.1 Public-Private Partnerships

Summary

Successful partnerships will leverage private resources to optimize ratepayer dollars to build out California's TE infrastructure. There are several national and international partnership models the IOUs can use to support the installation of large-scale charging infrastructure including in addition to streamlining education and outreach efforts. California can glean many lessons from existing public-private partnership models. These models demonstrate potential benefits through cost sharing, optimizing availability and interoperability, data sharing, and access to expertise.

Questions for Stakeholders
1. Should the investor-owned utilities (IOU) be required to identify partnership opportunities during program design before filing program applications, or should they have the flexibility to pursue partnerships after an application is approved by the California Public Utilities Commission (CPUC)? 2. What role should the IOU have if they were to pursue partnership with other stakeholders (i.e. program administrator, program financer, supporting role, etc.)?

[305] "2019-2020 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program", CEC, 2019. Available at https://ww2.energy.ca.gov/altfuels/2018-ALT-01/documents/. (Accessed on January 15, 2020)

[306] As of September 2019, 4,764 charging ports were installed through IOU programs, the costs of which will be fully recovered from the utility ratepayers, and another 3,486 ports are committed and waiting for installation (in addition to at least 561 ports and 6,875 makeready stubs installed through the EVgo/NRG settlement program under CPUC oversight).

a. How much autonomy should the other entity or entities in the partnership have in administering a CPUC approved program?

Background

Public-Private Partnerships (P3) enable contracts between a public agency and a private firm to bundle finances, construction obligations, the maintenance and operation of TE infrastructure, and to conduct outreach to encourage infrastructure use. Successful P3s encourage additional EV charging infrastructure deployment through co-funding and/or increased capacity. P3s can serve to measure the maturity of the private EV charging market and promote efficiency gains (i.e., more infrastructure rolled out at a lower cost, faster infrastructure installation time, etc.).[307]Agreements and partnerships with third parties could allow the IOUs to maintain an active role in accelerating the buildout of the EV charging infrastructure, while also reducing their overall financial and resource obligations and the ratepayer costs associated with infrastructure construction; marketing, education, and outreach efforts; and the operation and maintenance of the EVSEs.

10.1.1 Models of Electric Vehicle Infrastructure Partnerships

Programs in other countries have demonstrated successful application of P3s to fund a significant portion of EV infrastructure programs. Efforts in the United States have been smaller scale and focused on education and outreach, as described below.

Japan: In 2013, the Development Bank of Japan partnered with Nissan, Toyota, Honda, Mitsubishi, and the power company TEPCO to construct a nationwide network of DCFCs. This partnership created the SPV, Nippon Charge Services (NCS). NCS is a single public charging network that offers drivers a universal credit card. The charging infrastructure is subsidized through grants provide by the Development Bank of Japan, while NCS manages the charges and supports host sites. The site-host is responsible for bridging the costs that are not covered by the subsidy. By the end of 2018, almost 7,500 charging stations were installed through this partnership.[308]

France: Launched in 2016, the Corri-Door EV charging network is a partnership between IZIVIA, a subsidiary of Électricité de France (EDF)–- France's largest public utility–- and vehicle manufacturers, including BMW, Renault, Nissan, and VW.[309] The partnership provided €10m to install the first round of chargers.[310] The Corri-Door network provides enrolled EV drivers with a subscription card that is used to record their monthly charging sessions. As of 2019, the program has grown to 200 DCFC and over 3,000 L2 ports installed throughout France. In addition, IZIVIA, which is the Corri-Door network provider, has

[307] P3s are often financed through Special Purpose Vehicles (SPV), which are created solely to develop a project. The formation of the SPV can establish specific guidelines for how the SPV will operate and serve its purpose, while also agreeing to metrics to measure the success or failure of the SPV to live up to its intended feature(s). The SPV's contract should detail the role of each party and have specific requirements that will need to be achieved for full compensation. One such stipulation can be a requirement for the SPV to maintain the EVSEs to a minimum condition for the full 8-10 years of the equipment's expected service life.

[308] 'Emerging Best Practices for Electric Vehicle Charging Infrastructure', H. Dale, N. Lutsey, International Council on Clean Transportation. October 2017. https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf (Accessed on January 15, 2020)

[309] https://www.izivia.com/en (Accessed on January 15, 2020)

[310] Hale, Dale; Lutsey Nic "*Emerging Best Practices for Electric Vehicle Charging Infrastructure*". International Council on Clean Transportation. October 2017. Link

interoperability agreements with over fifty European EV charging network providers to allow IZIVIA customers access to over 50,000 EV charge ports throughout the continent.[311]

Quebec: As of 2019, the province of Quebec is home to roughly half of the EVs in Canada (40,000). Hydro Quebec, a publicly owned utility that serves all of the province, plans to install over 1,600 DCFC stations over ten years through its Electric Circuit EV charge network partnership. The partnership was cofounded with the Quebec grocery store chain Metro, St. Hubert restaurant chain, home and garden store Rona, and the greater Montreal public transit system, Exo. Electric Circuit installs chargers at partner locations, including over 100 companies, cities, and universities. As of December 2019, 276 DCFC have been installed in addition to over 2,290 publicly accessible L2 EVSEs.[312] Electric Circuit has recently expanded into Ontario and has interoperability agreements with the New Brunswick based EV charging network provider eCharge Network, and the privately held FLO charging network.[313]

Colorado: In 2018, the Colorado Office of Energy developed an EV adoption plan that emphasizes the acceleration of EV infrastructure deployment through the creation of a "fast highway" throughout Colorado. To roll out this plan, the State sought partnerships with the City and County of Denver, local universities, NREL, Regional Air Quality Councils, and a number of other stakeholders[314], and devised host site match funding to assist in the installation of at least 53 DCFC for a total of 138 charging ports to fill in gaps in the Electricity America network. The program will provide additional funding to sites participating in the VW Settlement to reimburse infrastructure costs not covered through the VW Mitigation Trust. Additionally, 5% of the funding for each site will be held for five years to ensure participants properly maintain the infrastructure and timely report the required data.[315]

Washington: In 2015, Washington State added a chapter to the Revised Code of Washington[316] that requiring the Washington State Department of Transportation's (WSDOT) Office of Public-Private Partnerships to develop and maintain a program to deploy and maintain TE infrastructure that is supported through private financing.[317] The Electric Vehicle Infrastructure Partnership Program (EVIPP) was conceived in response to this directive, which is a coalition of public state agencies and private businesses that would collaborate to develop electric transit hubs located near highly congested multi-transportation centers, and is a component of the larger West Coast Green Highway. A P3 was signed between WSDOT and Webasto (formerly AeroVironment) which owns, operates, and maintains the EV chargers. WSDOT and Webasto to serve as the site hosts for

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311 https://www.izivia.com/en (Accessed on January 15, 2020)
312 Each charging session is charged CA $11.50 per hour plus any addition parking fees levied by the parking space owner.
313 See Circuit Electric's FAQ webpage. https://lecircuitelectrique.com/find-a-station (Accessed on January 15, 2020)
314 See US DOE's description of the Colorado Energy Office: EV Fast Charging Corridors Grant Program. Link
315 See "Colorado Electric Vehicle Plan: In Support of Executive Order, Supporting Colorado's Clean Energy Transition" January 2018. https://afdc.energy.gov/case/3083 (Accessed on January 15, 2020)
316 The Revised Code of Washington is a compilation of all permanent laws in force, either enacted by the legislature and signed by the governor, or enacted via the initiative process.
317 See RCW 47.04.350 https://app.leg.wa.gov/RCW/default.aspx?cite=47.04.350 (Accessed on January 15, 2020)

EVSEs installed along the West Coast Green Highway.[318] Webasto serves as the customer of record for the charges and pays a minimal site host fee to the property owner. The partnership has secured a total of $2.5 million - $1 million in WSDOT funded grants and $1.5 million in private funding, for the purchase and installation of L2 and DCFC. As of December 2019, the partnership has helped install 15 new chargers along 40 miles of the West Coast Green Highway.

10.1.2 Models of Education and Outreach Partnerships

As discussed further in Section 11.2 (Marketing, Education, and Outreach Issues), the IOUs have crafted and the CPUC has approved, significant roles for the IOUs in spreading EV awareness. To date, the CPUC has approved the IOUs to spend more than $34 million in ME&O programs. In addition to program specific information, the IOU ME&O budgets have sought to improve broad EV awareness. However, as discussed in Section 11.2, other organizations are also working to spread EV awareness. Three such organizations are the following.

Veloz: Formerly the Plug-in Electric Vehicle Collaborative, Veloz is a collaboration between California state agencies, utilities, automakers, EV charging service providers, and others sustainable transportation focused organizations. Veloz's mission is to educate the public on the benefits and ease of driving an EV. To achieve this, Veloz launched *Electric For All*, which is the largest EV awareness campaign in the United States. This campaign spreads broad EV awareness through multimedia commercials, online resources to learn which EV is best for the individual customer, financial resources to lower the costs of purchasing an EV, and referrals from a diverse set of EV drivers. Veloz also hosts reoccurring forums throughout the state to connect the public with EV stakeholders and lead discussions on EV topics. Veloz also organizes ride-and-drive events.[319]

Drive Electric Vermont: Established in 2012 by a coalition of 21 businesses, hospitals, universities, and other groups, Drive Electric Vermont is coordinated by the Vermont Energy Investment Corporation, a corporation whose mission is to achieve a 20 million tons GHG emission reduction through various methods by 2027. Drive Electric Vermont provides EV education materials, which include a Total Cost of Ownership tool, EV comparison tool, and EV purchase incentives as well as a list of all car dealerships in Vermont that sell EVs and offer test drives. The Drive Electric webpage also includes information on how driving an EV can contribute to helping the state meet its climate and environmental goals.[320] Drive Electric Vermont has been a key factor in the growth of EV ownership in Vermont, which differs from other states that have a high EV penetration rate, given the state is largely rural, with a cold environment.[321]

Forth Mobility: An Oregon and Washington collaboration that was created in 2011, Forth Mobility was established by EVSE providers, vehicle manufacturers, utilities, government

[318] See "*Washington Selects AeroVironment to Light Up Nation's First Electric Highway*". https://investor.avinc.com/printed-materials (Accessed on January 15, 2020)
[319] https://www.veloz.org/ (Accessed on January 15, 2020)
[320] See Drive Electric Vermont. https://www.driveelectricvt.com/ (Accessed on January 15, 2020)
[321] See NREL's "Drive Electric Vermont Case Study" https://avt.inl.gov/sites/default/files/pdf/evse/DriveElectricVermontCaseStudyMarch2016.pdf (Accessed on January 15, 2020)

agencies, non-profits, and other private companies. The collaborative performs EV demonstration projects at showrooms and across communities to spread awareness of the EV ownership and the ease of charging. Forth Mobility also facilitates education of prospective EVSE owners on the EVSE siting process, negotiation and executing a site host agreement, navigating local permitting, and overseeing EVSE installation. The organization also works to advocate smart local, state, and national TE policy that can advance the adoption of EVs and support EV related industries.[322]

10.1.3 Discussion: Lessons for California from Partnership Models

As demonstrated in the above partnership models, EV charging programs are heavily dependent on the public sector for the funding and resources necessary to achieve successful TE infrastructure deployment. Yet, there are important lessons that can inform P3s as California moves toward sharing responsibilities and benefits for widespread TE across regions and market sectors. These lessons include:

1. **Implement Cost Sharing:** A robust infrastructure of coordinated networks should utilize partnerships to share costs between public-interest funding, site-hosts, and automakers and/or EV service providers. These models should be used to promote similar efforts in the U.S. to demonstrate that TE can be a desirable business opportunity. The IOUs current "partnership" model of requiring a participation payment from customers is a limited example of how they leverage funding for the programs. However, the IOUs could seek additional support from third parties to further drive down the program costs.
2. **Demonstrate Market Benefits:** Robust charging networks can provide benefits ranging from infrastructure availability to interoperability. France's IZIVIA charge network and Japan's Nippon Charge Service Network demonstrate that close partnerships with domestic car manufacturer brands can promote easy access to charging for EV drivers. These models should be used to promote similar efforts in the U.S. to demonstrate to automakers that investing in TE infrastructure can help with the success of their EV models.[323]
3. **Utilize Data Sharing:** To receive full reimbursement of the TE infrastructure costs in the proposed Colorado programs requires an active site-host and a long-term commitment to share the EVSEs data with the state. This comprehensive data sharing agreement will help to ensure a seamless customer experience and the ability to actively improve the program based on lessons learned from the data analysis.[324]
4. **Define Clear Goals:** Partnerships such as EDF and Hydro Quebec show how clearly defined goals lead to success and may be most open to a cost-sharing agreement. Any P3 agreement should be accompanied by a list of goals and the timeframe that they should be achieved.

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[322] See Forth Mobility. https://forthmobility.org/ (Accessed on January 15, 2020)

[323] This could be potentially due to domestic vehicle manufactures not viewing EVs as an attractive revenue stream. Freelance auto industry reporter, John Voelker claims car manufactures view the U.S. as a "backwater" in regard to the transition to electric vehicles. Most vehicle manufacturers offer EVs in the U.S. market as compliance vehicles, while the market is driven by consumers in China and the EU. This could be a reason for the lack of O&M participation in the rollout of EV charging infrastructure throughout the U.S. "The Increasing Demand for Cars", National Public Radio, March 6, 2019, https://www.npr.org/2019/03/06/700873537/the-increasing-demand-for-electric-cars, (Accessed on December 2, 2019)

[324] "Electric Cars: Some are Real, Most are Only 'Compliance Cars'—We Name Them". Green Car Reports. May 2012, https://www.greencarreports.com/news/1068832_electric-cars-some-are-real-most-are-only-compliance-cars--we-name-names, (Accessed on December 2, 2019).

5. **Promote Adoption through Education and Outreach:** The efforts of Veloz, *Forth Mobility* and *Drive Electric Vermont* demonstrate the ability for a private firm to perform the necessary ME&O efforts that are needed to drive customers to purchase an EV. The private ME&O firm will be able to perform duties at an expertise level that is needed to enable a successful outreach campaign.
6. **Leverage Grants:** Colorado's "fast highway" and Washington's "West Coast Green Highway" utilize the ability for public agencies, municipalities, and non-profits to apply for grants to fund infrastructure programs. California has a number of funding opportunities available to allow for an effective mimic of Colorado and Washington's efforts.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1) Host a roundtable discussion between the vehicle manufactures, electric vehicle service providers, and other stakeholders to discuss potential partnership opportunities and ensure broad, expert input.
   a) Compile relevant results within their Transportation Electrification Plans (TEP) by highlighting new partnerships that emerge through the discussion and, highlighting any progress in gaining vehicle manufacturers' support for investing in electric vehicle (EV) infrastructure. This report should be attached to each IOUs' TEP.
   b) Identify how the IOUs can leverage the roundtable discussion to develop new transportation electrification (TE) program proposals.
2) Demonstrate in their program applications and pilot advice letters that the IOUs have created Public Private Partnerships (P3) that take the best practices from national and international models, including cost sharing, market benefits, data sharing, clearly defined P3 goals, outreach and education, and leveraging grant opportunities.

10.2 CALGreen Building Code Enhancements

Summary

The California Green Building Standards (CALGreen) Code includes a range of green building requirements including mandatory State requirements to install electrical charging capacity and full or partial raceway infrastructure, such as pipes to hold electrical wires. These requirements typically apply to a specified number of parking spaces for new residential and non-residential buildings.[325] CALGreen also contains voluntary stricter model codes that local governments may choose to adopt. To surpass State standards, the IOUs should cooperate with the Building Standards Commission (BSC) and the other State agencies that develop CALGreen. CALGreen enhancements will significantly increase the deployment of TE infrastructure in new construction (including alterations to existing buildings).

Energy Division staff recommends that IOUs address this opportunity to encourage higher installation of lower-cost infrastructure at new buildings in their TEPs. In addition, any applications filed before TEPs are filed and approved may also request funding for opportunities to support

[325] California Code of Regulations Title 24 Part 11. The electrical panel and raceway must support the future installation of 40 Ampere and 208/240 Volt circuits.

State agencies adoption of CALGreen enhancements if not already provided by an existing IOU building code program.

Questions for Stakeholders
1. Should one investor owned utility (IOU) propose a specific budget within their Transportation Electrification Plan to support updates an implementation of the California Green Building Standards, including research, stakeholder coordination and advocacy, or do existing IOU energy efficiency business plans provide sufficient resources for IOU support of State building codes? 2. How should potential IOU CALGreen activities be coordinated with other IOU TE program activities? 3. Do the metrics and targets in the Scorecard adequately address potential CALGreen building code activities, or are additional metrics and/or targets needed?

Background

The CALGreen Code[326] is found in Part 11 of Title 24, the California Building Standards Code. The CALGreen Code contains mandatory green building requirements for single family and MUD residential and nonresidential construction (which includes high-rise MUD). The BSC formally adopts CALGreen code change proposals submitted by the Department of Housing and Community Development, the Division of the State Architect, and BSC staff. CARB typically provides subject matter expertise related to infrastructure needed to meet State vehicle electrification goals. In addition, local governments have authority to adopt stricter voluntary model codes contained in CALGreen or write their own based on local conditions as discussed in Section 10.3. CALGreen is revised every three years along with other Title 24 requirements, such as electrical, plumbing, mechanical, and energy codes. CALGreen is also revised every 18 months during "interim" code cycles. For instance, the next revision will be adopted July 1, 2020 and take effect July 1, 2021.[327] Proactive planning is critical because about two years are typically needed to develop an idea for code revisions, create a well documented proposal, and move through the informal and formal adopt process.

The CPUC oversees the IOU codes program efforts to support State code adoption and implementation. The CPUC has found "[o]ne of the largest factors in California's energy efficiency success story is progressive appliance codes (Title 20) and building codes (Title 24)."[328] The CPUC has found that IOUs "are well positioned to advise [S]tate agencies to adjust building … codes."[329]

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[326] See Chapters 4 and 5 and the relevant general provisions and definitions in other Chapters in Title 24, Part 11 of the California Code of Regulations

[327] The Building Standards Commission (BSC), CARB, the California Department of Housing and Community Development and/or the Division of the State Architect typically draft building codes based on building types and their specific expertise. After an ad hoc informal stakeholder engagement process by the lead agency, BSC adopts updates through a formal public comment and adoption process.

[328] "Regulating Energy Efficiency", CPUC, 2016. p 4. Available at file:///C:/Users/EPI/AppData/Local/Temp/Regulating%20Energy%20Efficiency%200216-1.pdf, last accessed Jan 16, 2020.

[329] "Regulating Energy Efficiency", CPUC, 2016. p 4. Available at file:///C:/Users/EPI/AppData/Local/Temp/Regulating%20Energy%20Efficiency%200216-1.pdf, (Accessed January 16, 2020).

IOUs have the capability to fill key resource gaps and inform CALGreen updates by providing technical support and other resources to overcome State agency resource limitations. IOU code budgets are typically limited. For instance, the statewide budget was equal to approximately 2.2 percent of the energy efficiency portfolio total as of 2016.[330]

The IOUs' codes program's approved business plan for CALGreen activities does not appear to specifically say whether the resources approved under this plan will support enhancements to CALGreen EV infrastructure requirements.

10.1.1 CALGreen Electric Vehicle Infrastructure Opportunities

The IOUs' TEPs should address opportunities to provide technical and cost data to support CALGreen updates in cooperation with BSC, CARB, HCD, and other relevant agencies for the following reasons:

1. New construction building codes, including CALGreen TE infrastructure requirements, are more cost-effective compared to retrofits.
2. Updating building codes to align with the State's overall TE goals to address GHG emissions is a significant and time sensitive opportunity.
3. Enhanced building codes could provide more electrical infrastructure that could be leveraged via EVSE installation incentives.

10.2.2 New Construction Codes Could Reduce Transportation Electrification Infrastructure Costs

Numerous studies show that the cost of retrofitting electrical infrastructure for EV charging is typically two to eight times more expensive than when completed during the new construction or alterations phases.[331, 332, 333,334] Table 10 presents results from a September 2019 study of CALGreen EV charging electrical infrastructure requirements for "EV capable" parking spaces with electrical panel capacity and conduit.[335]

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[330] PG&E's Energy Efficiency Business Plan for 2018-2025, no date, Appendix B page 8. PG&E is the IOU state-wide lead for codes & standards. The portfolio also includes other types of programs such as rebates.

[331] "Electric Vehicle Charging Infrastructure: Green Building Standards (CALGreen) Code Suggested Code Changes for Nonresidential Buildings Technical and Cost Analysis," California Air Resources Board, October 2015, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2015.pdf, (Accessed on December 2, 2019).

[332] "Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards, CARB Technical and Cost Analysis: 2019 Code Cycle," California Air Resources Board, April, 2018, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf, (Accessed on December 2, 2019).

[333] "Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update," E. Pike, C. Kido, E. Kamei, K. DoVale, September 16, 2019, https://caletc.com/wp-content/uploads/2019/10/CALGreen-2019-Supplement-Cost-Analysis-Final-1.pdf, (Accessed on December 2, 2019).

[334] "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco," E. Pike, J. Steuben, E. Kamei, November 17, 2016, http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf, (Accessed on December 2, 2019). The potential cost-effective trigger points for alterations and additions are discussed here.

[335] "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco," E. Pike, J. Steuben, E. Kamei, November 17, 2016, http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf, accessed on December 2, 2019. The study excludes wiring, which is not required by CALGreen mandatory codes, EVSE equipment and installation costs, any posts or bollards, potential loss of parking due to ADA compliance, signage, etc.

Table 10: Cost Analysis of EV Capable Nonresidential Parking Spaces (per space)[336]

	Number of Parking Spaces	New Construction	Alterations & Additions	Stand-Alone Retrofit
Small Office/ Retail Surface Parking	4	$905	$925 to $1,178	$5,540
Medium Office/ School Surface Parking	15	$907	$928 to $1,322	$4,155
Large Office/ Retail/ Hospital Enclosed Parking	40	$739	$741 to $1,052	$2,779

Opportunities to achieve lower-cost infrastructure installation in new and modified buildings are very time sensitive, as over 100,000 new residential units will likely be constructed between each CALGreen update along with significant numbers of new non-residential buildings.[337]

10.2.2 Investor Owned Utility Support to Align CALGreen with 2030 and 2050 State Transportation Electrification Goals

Current codes, including recent revisions BSC plans to adopt in July 2020, are an important step to meet 2025 TE adoptions goals. Further revisions would help align CALGreen with the State's 2030 and 2050 goals for passenger vehicles and address MD/HD vehicles.

For instance, CARB recommends revising CALGreen during future revision cycles to require that 20 percent of new nonresidential and MUD parking spaces contain electrical infrastructure to support EV charging.[338, 339] As shown in Figure 11, achieving this target for both nonresidential and MUD parking within the next two code cycles would result in the forecasted installation of significant EV charging electrical infrastructure:

- 342,000-425,000 nonresidential and MUD spaces between mid-2021 and 2030 based on levels required by potential code enhancements.
- 841,000 to 923,000 total residential and nonresidential parking spaces including single family housing included in existing codes.

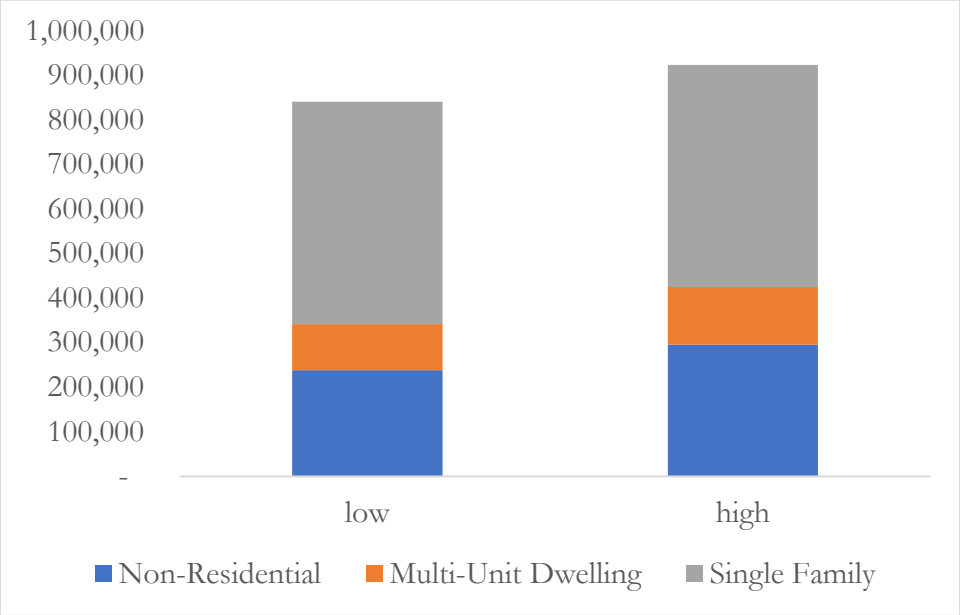
[336] Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update," E. Pike, C. Kido, E. Kamei, K. DoVale, September 16, 2019, https://caletc.com/wp-content/uploads/2019/10/CALGreen-2019-Supplement-Cost-Analysis-Final-1.pdf, accessed on December 2, 2019 p8, 12

[337] Data is calculated by annualizing CARB MUD estimates. (California Air Resources Board, 2018) and estimating annual single family construction estimates based on annual housing starts from 2015-2019 based on CBIA data available at https://cbia.org/cirb-housing-statistics/

[338] "Electric Vehicle Charging Infrastructure: Green Building Standards (CALGreen) Code Suggested Code Changes for Nonresidential Buildings Technical and Cost Analysis", California Air Resources Board, October 2015, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2015.pdf, p.14. (Accessed on December 2, 2019)

[339] "Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards, CARB Technical and Cost Analysis: 2019 Code Cycle," California Air Resources Board, April, 2018, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf, p.17. (Accessed on December 2, 2019)

Figure 11: Potential EV Ready Spaces 2021-2030[340]



Support of CALGreen revisions to address alterations and additions of existing buildings would likely also result in significant increases in TE infrastructure.[341, 342] Alterations and additions represent about 21 percent of the value of permitted construction for both residential and nonresidential construction statewide, indicating that such building codes would significantly expand TE infrastructure and provide broader access to TE infrastructure.[343]

These revisions and others to support passenger and medium and heavy-duty vehicle infrastructure as described in Table 11 can provide a major boost to the State TE goals but could also impose resource burdens on State code adoption agencies.

[340] Data is calculated based on CARB annualized MUD estimates and non-residential estimates from CARB 2019 and CARB 2018. Annualized new construction rates are 52,500 single family homes; 62,000-77,000 MUDs, and 142,400-176,810 non-residential parking spaces. Estimated number of parking spaces with PEV infrastructure due to CALGreen are estimated at one per single family home, and 10 percent of MUDs and non-residential from July 2021 (as currently required for MUDs and proposed for non-residential); increasing to 15 percent 18 months later; and then increasing 20 percent after an additional 18 months. ARB provided both low and high estimates of housing construction rates based on different estimates of underlying new construction rates from different sources. Single family construction estimates are based on one EV Ready space per home, and averaging annually housing starts from 2015-2019 based on California Building Industry Association (CBIA) data available at https://cbia.org/cirb-housing-statistics/ (Accessed on January 15, 2020)

[341] "Electric Vehicle Charging Infrastructure: Green Building Standards (CALGreen) Code Suggested Code Changes for Nonresidential Buildings Technical and Cost Analysis," California Air Resources Board, October 2015, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2015.pdf, p.14. (Accessed on December 2, 2019)

[342] "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco," E. Pike, J. Steuben, E. Kamei, November 17, 2016, http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf, accessed on December 2, 2019)

[343] Ibid page 7 based on CBIA data.

IOUs have opportunities to fill gaps to expand CALGreen requirements by providing data on technical feasibility, cost-effectiveness data, and by participating in code language development. The IOUs can also serve to fill gaps through advocacy and stakeholder coordination.[344]

Table 11: Opportunities for IOU programs to support or exceed CALGreen code compliance[345]

Segment	Current CALGreen	Potential Opportunity
Single-family	Electrical panel capacity and empty conduit (2019 CALGreen)	Full make-readies including wiring
MUD	Electrical panel capacity and any conduit in areas that would later be inaccessible (i.e. underground, inside of walls, etc.) for 10% of new parking spaces (2019 CALGreen)	Full make-readies; higher percentages could range from 20% (highest voluntary level in CALGreen) to some level of infrastructure at one space per unit (based on local reach codes); and potentially EVSE installation[346]
Non-residential[347]	Electrical panel capacity and conduit for 10% of new parking spaces (proposed 2019 CALGreen Supplement)	Full make-readies; higher percentage of 20% (highest voluntary level in CALGreen) or greater; one or more EVSE installed[348]
Additions & alterations	no requirements	Address reconstruction and other projects involving repaving or electrical system upgrades[349]

[344] PG&E's Energy Efficiency Business Plan for 2018-2025, no date, Chapter 8 page 11.

[345] "EV Charging Infrastructure: Nonresidential Building Standards." California Air Resources Board, 2019
"Electric Vehicle (EV) Charging Infrastructure Multifamily Building Standards." California Air Resources Board, 2018, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf
"Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update." Ed Pike et. al., 2019, https://caletc.com/caletc-research/ (Accessed January 16, 2020)
"Driving EV Adoption with Green Building Code", Ed Pike et al, 2018.
https://aceee.org/files/proceedings/2018/#/event/event-data/details, (Accessed on January 16, 2020).

[346] "Driving EV Adoption with Green Building Code", Ed Pike et al, 2018.
https://aceee.org/files/proceedings/2018/#/event/event-data/details, (Accessed on January 16, 2020).
Some local codes require even more aggressive targets such as partial or full infrastructure at one parking space per MUD unit with parking. "Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards, CARB Technical and Cost Analysis: 2019 Code Cycle," California Air Resources Board, April, 2018, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf, p.17. (Accessed on December 2, 2019).

[347] Passenger vehicle requirements are for schools are drafted by the Division of the State Architect in collaboration with other state agencies and have followed the BSC non-residential standards.

[348] "EV Charging Infrastructure: Nonresidential Building Standards." California Air Resources Board, 2019
"Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update." Ed Pike et. al., 2019, https://caletc.com/caletc-research/ last accessed Jan 16, 2020
"Driving EV Adoption with Green Building Code", Ed Pike et al, 2018.
https://aceee.org/files/proceedings/2018/#/event/event-data/details, last accessed Jan 16, 2020.

[349] Alterations and additions are addressed by several recent reports. (California Air Resources Board, 2019) (Ed Pike e. a., Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update, 2019). A coalition of 29 stakeholders have already recommended addressing alterations and additions in CALGreen and several municipalities have created precedents in a letter "Proposed CALGreen Electric Vehicle Infrastructure Amendments". to Batjer, M., Marvelli, M., Metclaf, B. Letter from 29 stakeholders to 3 agencies. 29 October 2018.

Good design practices		Ensure that new EV parking spaces designed with EVSE electrical infrastructure are also designed to allow compliance with accessibility requirements[350]
Transit and school buses		Develop "make-ready" standards and targets to support state adoption goals[351]
Warehouses		Require "make-readies" for forklift and electric stand-by transportation units[352]
Other medium/heavy-duty		Determine other potential options in consultation with CEC, CARB and stakeholders

10.2.3 Providing Infrastructure for Investor Owned Utility Programs

Updated and improved CALGreen PEV Readiness codes would provide opportunities for other new construction incentive programs (Section 5.4) that could build upon electrical infrastructure required by CALGreen's minimum standards. Updates to the codes could also encourage builders to build out this electrical infrastructure into EVSE assets. These sites with electrical infrastructure could reduce cost and non-cost barriers for both IOU and non-IOU EVSE installations.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1) Identify, in one lead IOU's Transportation Electrification Plan (TEP), opportunities to support the California Green Building Standards Code (CALGreen) and further code updates to scale up levels of lower-cost transportation electrification (TE) infrastructure installed when buildings are originally constructed.
   a) These opportunities should include residential and non-residential new construction and medium and heavy-duty vehicles and should address both 2030 and 2050 electric vehicle (EV) adoption goals.
   b) TEPs should address whether additional resources are needed beyond resources currently provided by energy efficiency business plans to support these CALGreen revisions.

[350] "Plug-In Electric Vehicle Infrastructure Cost Analysis Report for CALGreen Nonresidential Update." Pike et. al,, 2019. See page 15.
[351] "Driving EV Adoption with Green Building Codes." 2018. Ed Pike et. al.
[352] "Driving EV Adoption with Green Building Codes." 2018. Ed Pike et. al. and "leed-v4-building-design-and-construction." U.S. Green Building Council. 2019. Page 29 provides LEED points for warehouses with ports for electric stand-by transportation refrigeration units.

10.3 Regional Coordination

Summary

As local governments continue to develop their own TE plans, the IOUs will need to coordinate increasingly with municipalities to develop holistic strategies that address unique regional barriers.[353] The IOUs TEPs should provide a level of flexibility to meet discrete regional needs. TEPs should evaluate regional coordination opportunities related to PEV Readiness, geographical infrastructure distribution, and grant coordination funding.

Questions for Stakeholders
1. Should the investor-owned utilities (IOU) prioritize sites that will achieve the greatest ambient air quality improvements and greenhouse gas (GHG) emission reductions that help regions in their service territories meet the state implementation plan and GHG emission targets, or should they prioritize sites that can achieve the installations of transportation electrification (TE) infrastructure at the lowest cost? a. How should the IOUs balance these two efforts? 2. Should the IOUs make additional efforts to prioritize sites based on the budget limitations of the local/regional municipalities? If so, how should this be done? 3. What IOU resources would help local agencies implement Plug-In Electric Vehicle Readiness activities and/or adopt stricter requirements for local building codes?

Background: Air Districts and Metropolitan Planning Organizations (MPOs)

California's 35 Air Districts are tasked with adopting and enforcing regulations for stationary and mobile air emission, monitoring regional air emissions, and preparing sections of the California State Implementation Plans (SIP) that identify steps to bring the region into attainment with federal National Ambient Air Quality Standards (NAAQS). CARB's 2016 MSS highlighted the importance of TE in meeting federal and state air quality goals and provides an essential resource for the Air Districts' EV readiness plans.[354]

[353] For example, Chapters 6 and 7 of the City of Los Angeles's *Green New Deal* identifies targets and goals that are specific to the city's own unique transportation challenges, such as increasing the electrification of all taxis, school buses, and delivery trucks within the city limits, increasing transit options within a 10-minute walk from all residents homes, and the development of a zero emission roadmap for travel to and from LAX. http://plan.lamayor.org/sites/default/files/pLAn_2019_final.pdf (Accessed on January 15, 2020)

[354] The EV readiness plans are regional guides to implement programs that lead to the adoption of EVs that will help the region come into compliance with the air quality and GHG emission reduction goals. For example, see the San Joaquin Valley Air Pollution Control District's Plug-in Electric Vehicle readiness Plan, which highlights the current EV adoption rates within the Districts region, available incentives to lower the costs of EV adoption, training and outreach opportunities for residents and business owners, and the permitting and building inspection requirements needed to install EV charging infrastructure. https://valleyair.org/grants/documents/pev/San_Joaquin_Valley_PEV_Readiness_Planning_Guide.pdf (Accessed on January 15, 2020)

California has both individual municipalities pushing ahead with TE goals and regional agencies that focus on improving the region's air quality and ensuring the region complies with the SIPs.[355] Most relevant are the 35 Air Pollution Control Districts (APCD) and Air Quality Management Districts (AQMD), (collectively referred to Air Districts) [356] and the 18 regional Metropolitan Planning Organizations (MPO),[357] which are organizations responsible for including a GHG reduction target in their transportation planning strategies, models, plans, and reviews pursuant to SB 375 (Steinberg, 2008).[358] The Air Districts and MPOs have released a number of reports that demonstrate the regional interests and expertise in promoting TE throughout their jurisdictions, which have recently included identification of region-specific barriers to widespread TE adoption.

Regional air quality issues, such as GHG emissions and other environmental hazards, are not limited to intangible municipal borders. Accordingly, local governments benefit from jointly working to rectify these issues. Regional agreements through MPOs have, in some cases, led to the development of a long-term strategy for metropolitan transportation planning (MTP), providing resources to support the strategy's implementation.[359] In addition to the MTP, each MPO is required to draft, and receive federal approval, of a near-term Transportation Improvement Plan (TIP).[360] Together, the MTP and TIPs identify areas that are suitable for immediate transportation upgrades, including EV charging infrastructure. This also provides a holistic vision for how these individual projects will contribute to a region-wide attainment of ambient air quality emissions and GHG emission reductions in order to comply with the SIPs.

10.3.1 Regional "Plug-in Electric Vehicle Readiness" Plan Implementation

The CEC has funded "PEV Readiness Plans" for most regions, but lack of local funding and limited staff availability have limited implementation by the local governments that are responsible for on

[355] Federal law requires all areas that are not in attainment with criteria air pollutant levels to develop a SIP. The SIP is a composite of plans, programs, district rules, state regulations, and federal oversight and control, that demonstrate how the state will attain national ambient air quality standards (NAAQS). Most California SIPs rely on a reduction of transportation emissions. CARB is the lead agency responsible for preliminary approval for federal EPA review, and ensuring compliance with the approved SIP. The local air districts, in addition to other agencies, design and enforce the approved SIP. Failure to meet NAAQS can result in a federal takeover of air emission regulations, and the implementation of a Federal Implementation Plan (FIP).

[356] See map of Air Pollution Control Districts and Air Quality Management Districts. https://ww3.arb.ca.gov/capcoa/dismap.htm (Accessed on January 15, 2020)

[357] See list of members to California's Council of Governments (CALCOG) https://calcog.org/index.php?submenu=MemberProfiles&src=directory&view=members&srctype=members_lister (Accessed on January 15, 2020)

[358] SB 375 requires the MTO in collaboration with CARB, to adopt a sustainable communities strategy that will reduce transportation GHG and air emissions within their regional transportation plan.

[359] Each MTP is required to identify how the region will achieve it's a multi-modal transportation system that meets the region's economic, transportation, development, and sustainability goals in a fiscally restrain way over a time period of at least 20 years. https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/metropolitan-planning-organization-mpo (Accessed on January 15, 2020)

[360] Each MPO is required to file a TIP with the Federal Transit Administration at a minimum of every four years. The TIP is required to cover a broad range of transportation enhancement projects, including TE infrastructure requirements, and electric transit corridor developments. https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/transportation-improvement-program-tip (Accessed on January 15, 2020)

the ground implementation.[361] As more EVs are deployed in communities throughout California, [362] local governments will face pressure to improve "PEV Readiness" implementation,[363] and the utilities can partner with local governments to provide assistance.

For instance, utilities can help local governments adopt PEV Readiness Reach Codes (as discussed in Section 10.2). CARB estimates that the 23 local Reach Codes currently in effect will result in 1) about 11,500 MUD parking spaces with EV electrical charging infrastructure installed from 2018-2025; and 20,800 nonresidential parking spaces with EV electrical charging infrastructure between 2021 and 2025 (including more than 4,400 with an EVSE installed).[364] Thus, expanding local Reach Code adoption would significantly increase EV infrastructure. Utility support for local building code adoption including EV charging infrastructure is a well-established model that offers technical assistance, model codes, and other resources.[365]

In addition, training resources may fill gaps in local expertise and improve implementation of CALGreen state codes at the municipal level. PG&E's experience providing related types of training could serve as a potential model.[366] Utilities could potentially also provide training to support other types of PEV Readiness activities beyond building code adoption and implementation, such as permit streamlining.[367]

CCAs typically have close relationships with local governments that position them to provide support for local government implementation of PEV Readiness activities if they choose to do so. (Please see section 10.4 for further discussions regarding CCAs role in IOU TE efforts). IOUs should evaluate the potential to provide support for activities that would not duplicate efforts implemented by CCAs.

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[361] The Energy Commission has previously funded a PEV readiness activities at a number of municipalities but has now scaled-down implementation funding to just a few. PEVs and EVs both refer to electrical vehicles powered by electricity that is generated off-board.

[362] "The surge of electric vehicles in United States cities", ICCT, June 2019. Available at https://theicct.org/sites/default/files/publications/ICCT_EV_surge_US_cities_20190610.pdf. Accessed on January 15, 2020.

[363] For instance, the Governor's Office of Business Development has released a scorecard and rankings of local government implementation of AB 1236 permit streamlining requirements. http://www.business.ca.gov/ZEVReadiness

[364] (California Air Resources Board, 2019) (California Air Resources Board, 2018). A total of 23 agencies have adopted local codes for non-residential and/or MUD housing

[365] According to SCE, "The IOUs are collaboratively offering technical assistance statewide to local governments that wish to develop and implement local ordinances designed to reduce energy use, energy costs, and GHG emissions." (Southern California Edison, 2017) p.206 See https://peninsulareachcodes.org/ (Accessed on January 15, 2020) for more information regarding activities by two Community Choice Aggregators.

[366] Utilities have demonstrated capacity to play a constructive role educating local building officials. For instance, PG&E has implemented training for local building officials around EV infrastructure accessibility requirements. Pacific Gas and Electric Company EV Charge Network Quarterly Report, Report Period: January 1, 2019 – March 31, 2019 p4; https://www.pge.com/pge_global/common/pdfs/business/services/training/training-centers/energy-centers-fall-2019-preview.pdf (Accessed on January 15, 2020) and provides training for PV solar code compliance.

[367] Any IOU training should leverage existing resources such as the July 2019 Electric Vehicle Charging Station Permitting Guidebook provided by the Governor's Office of Business Development. Available at http://www.business.ca.gov/ZEVReadiness, (Accessed on January 3, 2020).

10.3.2 Geographical Distribution of Transportation Electrification Infrastructure

Early evaluation of IOU TE programs show that ratepayer funded TE infrastructure is concentrated in the IOUs large, urban population centers because programs are implemented at self-electing sites.[368] To encourage more widespread geographical distribution of ratepayer investments, the utilities should target identified infrastructure gaps using the results of the IDS, the Air District's Mobile Strategy Solutions and SIP compliance programs, and the MPOs TIPs.[369]

Each IOU's TEP should demonstrate coordination with the Air Districts and MPOs to design TE program strategies that address the regional air quality issues. TEPs should describe collaborative partnerships with Air Districts. The IOUs' should devise metrics to show how a program will provide incremental air quality improvements that contribute to achieving attainment goals of the SIP and other local/regional TE infrastructure needs.

10.3.3 Grant and Funding Coordination

Air Districts and MPOs are eligible to become administrators for federal, state, and non-profit grants that, if awarded, could reduce the upfront costs of purchasing and installing EVSEs or purchasing EVs.[370],[371] These grant funds can be leveraged to lower the IOUs overall TE program costs if coordination is pursued between the parties. The IOUs can use this information to reflect how ratepayer funding was able to leverage third party funds to achieve a larger, more effective program.

When harmonizing TE planning efforts, the IOUs' should request information from the Air Districts and MPOs to illustrate the total value of the grants it has received or expects to receive. This information should be used by the IOUs to direct resources towards sites that will have the greatest impact to help the IOU meet the specific targets and metrics used to evaluate the progress the program had on meeting our State TE goals.

One pathway that can streamline the coordination process between the IOUs, the Air Districts, and MPOs is to have the IOUs participate in the reoccurring EV coordinating councils that are formed by the individual Air Districts. These meetings are attended by a diverse group of stakeholders to discuss issues that are affecting the regions ability to meet the regional and statewide TE goals, such as building codes, permitting, and zoning. These meetings also provide peers time to discuss available funding opportunities, specifically available or expected grants, third-party investments plans, and local tax incentives.

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[368] For example, in their Q3 2019 PAC report, PG&E presented data on the location of customer applications to participate in EVCN. 77 percent of the 820 submitted applications were from a customer located in the San Francisco Bay Area. Consistent with this, the location data for the activated and under construction EVSE's in the EVCN program are concentrated in the Bay Area. A map of the EVCN sites, and their current status can be found here. https://www.arcgis.com/home/webmap/viewer.html?webmap=7f4188377e7547a4b791b5becb1a8c2d&extent=-125.7923,32.3734,-111.9055,40.5997m (Accessed on January 15, 2020)

[369] For more information on the Infrastructure Deployment Strategy, and AB 2127, see Section *IOU Role in Accelerating Transportation Electrification Deployment*

[370] http://www.aqmd.gov/nav/grants-bids (Accessed on January 15, 2020)

[371] https://mtc.ca.gov/about-mtc/what-mtc/what-we-do (Accessed on January 15, 2020)

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1) Demonstrate efforts taken to coordinate with the Air Districts and Metropolitan Planning Organizations (MPO) when developing their Transportation Electrification Plans (TEP) and transportation electrification (TE) pilots, programs and rates, where appropriate.
    a) The IOUs' TEPs should include a section that will convey how the IOU will seek the Air Districts' support and how the IOUs will inform the Air District(s) and other local coordinating council(s) on individual TE program(s).
2) Include metrics to show how their TEPs and TE program(s) will provide incremental air quality improvements that contribute to helping the region achieve the attainment goals of California's State Implementation Plan (SIP).
3) Refer to the California Energy Commission's Infrastructure Deployment Strategy, the SIP, local air district SIP compliance programs, and MPO transportation implementation plans in their program applications to identify and design programs that address electric vehicle (EV) charging infrastructure gaps throughout their service territories.
4) Align with and support other available Air District and MPO grant funding opportunities to design TE programs that can help the state come meet ambient air quality standard attainment.
5) Designate staff time to participate in the regional EV Coordinating Councils within their service territories.
6) Evaluate opportunities to provide information and training to local officials to support implementation of "Plug-In Electric Vehicle Readiness" plans, including adoption of local "Reach Codes" to provide increased TE infrastructure.

10.4 Coordination with Community Choice Aggregators

Summary

Given the increasing growth of CCAs and the amount of customer load they serve, the CPUC should consider the appropriate role of CCAs as TE program administrators, including funded sources. The IOUs should proactively collaborate with the CCAs to ensure TE programs are complementary, and not redundant – as well as to leverage the CCAs' expert and trusted relationship with its constituents.

Questions for Stakeholders

1. Should the California Public Utilities Commission (CPUC) consider applications from community choice aggregators (CCA) for approval to develop their own programs, or administer a portion of the investor-owned utilities' (IOU) authorized transportation electrification (TE) programs using budgets that are recovered through IOU customer rates?
    a. If yes, what is the appropriate role for the CCAs in accelerating TE (i.e. IOU TE program administrator, designer and administrator of their own programs etc.)?
    b. If no, please explain why not, and what role(s) the CCAs could play in accelerating TE if they are not authorized to use funds recovered through IOU customer rates?
2. If the CPUC allows a CCA to file applications to receive ratepayer funds to administer TE programs, what funds should be used (e.g. IOU distribution revenue, non-by passable charges, etc.)?

Background

AB 117 (Migden, 2002) provided the initial authority for local governments to form CCAs and procure electricity on behalf of their constituents.[372] Since the establishment of CCAs, the State has passed legislation to prevent unnecessary cost-shifts and unfair competitive practices between CCA and IOU customers. In part of providing legislative authority to establish CCAs, AB 117, required the CCAs to file an implementation plan with the CPUC to ensure the CCAs have developed a cost recovery plan that would not shift costs from unbundled to bundled customers.[373] [374] SB 790 (Leno, 2011) directed the CPUC to adopt additional rules and procedures to protect ratepayers against cross-subsidization, provide CCAs with the opportunity to compete fairly with other load-serving entities by preventing the IOUs from using their market power to undermine the development and operations of the CCAs.[375]

At the time of the CPUC's initial rulemaking[376] to advance clean transportation fuels in 2009, there were no operational CCAs in California. As of January 2020, 19 CCAs are operational throughout California, representing more than four million customers and supplying 44,400 GWh of electricity annually.[377] By the end of 2020, another seven CCAs are expected to be operational. Several other regions, including San Diego, have signaled a commitment to commence operation in 2021 through submission of Implementation Plans with the CPUC.

Some established CCAs have expanded their mission and operations beyond electricity procurement to community energy programs. For instance, six of the longest operating CCAs have developed innovative bill savings and clean energy programs, some of which include TE infrastructure and vehicle incentives, EV-specific rates, and ME&O materials.[378]

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[372] CCAs are governmental entities formed by cities and counties to procure the electricity for their local residents and businesses. See D.05-12-041

[373] Bundled customers receive generation, distribution, and transmission services from the IOU. Unbundled customers take only distribution and transmissions services from the IOU and generation services from a CCA.

[374] D.04-12-046 and D.05-12-041 formally established the process to establish a CCA

[375] D.12-12-036 formally established a Code of Conduct and Guiding Principles for CCA and IOU interaction

[376] R. 09-08-009

[377] CalCCA Advancing Local Energy Choice, The California Community Choice Association, 2019, It is available at https://cal-cca.org/cca-impact/ (Accessed on January 15, 2020)

[378] Marin Clean Energy, Monterey Bay Community Power, Peninsula Clean Energy, Silicon Valley Clean Energy, Sonoma Clean Power, and Valley Clean Energy all have at least one TE program.

Several CCAs offer incentives to their customers to promote the adoption of EVs.[379] Currently, five CCAs have established TE programs.[380] As seen in SCE's stocktake, some CCAs are currently offering programs that are similar to those that the local IOUs offer.

Consequently, the CCA and IOU TE programs have the potential to cause confusion for customers who are unaware of what programs for which they are eligible to participate. For California to meet its TE goals in a timely and efficient manner, CCAs and IOUs must collaborate to define each of their roles and minimize duplicative measures. In addition, the CCA's wide reach and relationship with their customers provide a potentially important avenue that can help accelerate TE adoption.

A significant difference between the CCA and IOU TE programs is the method for how the programs are funded. IOU program costs have largely been recovered through distribution rates[381]. CCAs TE programs, on the other hand, are typically funded through their generation revenue, with some additional funding from grants.

Joint Community Choice Aggregators (Joint CCA) have expressed interest in seeking CPUC approval to use distribution revenue to fund their TE programs.[382] However, the CPUC's 2016 ruling determined that only electrical corporations[383] can file TE applications with the CPUC.[384] While California statute authorizes a role for CCAs in the administration of energy efficiency[385] programs, it does not authorize a similar CCA administrator role for TE programs.[386] However, the Joint CCAs have expressed interest in filing applications for CPUC approval to use distribution revenue to fund their TE programs.[387] The CCAs argue that because customers that switch to their services still pay distribution charges to the IOUs, they should be able to utilize the funds to serve the best interests of their customers. The Joint CCAs point to previous CPUC decisions that have

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[379] For example, Marin Clean Energy's (MCE) MCEV Charging Program is similar to PG&E's Electric Vehicle Charge Network (EVCN) as they both target workplace and MUD properties and provide a rebate for the purchase and installation of an EVSE. Although minor differences are apparent,[379] both programs provide similar services and rebates, target similar demographics, and approved the same vendors.

[380]Summarized in SCE's revised stocktake which was entered into the record of R.18-12-006 on November 13, 2019 and is available here: http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=319341969 (Accessed on January 15, 2020)

[381]SDG&E's MD/HD infrastructure program authorized in D.19-08-026 authorizes the program costs to be recovered on an equal cents per kWh basis rather the utility's typical distribution allocator. This provision was part of a settlement in the proceeding.

[382]R.18-12-006 Opening Comments of Joint CCA's http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M265/K370/265370728.PDF (Accessed on January 15, 2020)

[383] Defined by Public Utilities Code 218

[384] The 2016 ACR states "CCAs are not electrical corporations because they do not own, control, operate, or manage real estate or personal property to facilitate the production, generation, transmission, delivery, or furnishing of electricity for light, heat, or power. In addition, CCAs are not subject to price regulation by the Commission, and there are various Pub. Util. Code sections that distinguish CCAs from an electrical corporation. (See Pub. Util. Code §§ 331.1, 366, 366.1(f), 366.2, 366.3, 366.5, 381.1, 394.25(e), 396.5, and 707.)" It is available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M167/K099/167099725.PDF (Accessed on January 15, 2020)

[385] Pub. Util. Code Section §381.1

[386] Public Utilities Code Section §740.12

[387] R.18-12-006 Opening Comments of Joint CCA's http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M265/K370/265370728.PDF (Accessed on January 15, 2020)

authorized the use of IOU energy efficiency funds for CCA use.[388] Neither example, however, allows CCAs to use IOU distribution revenues.

10.4.1 Community Choice Aggregator Administration of Distribution Revenue

As the current law and CPUC precedent rules dictate, the CCAs do not currently have the authority to administer portions of the IOUs' TE programs or to receive distribution funds for the administration of their own TE programs. However, the CCAs argue that because their customers pay distribution charges to the IOUs, they should be able to utilize distribution funds to serve the best interests of their customers.

Although there does not appear to be a clear legislative or procedural pathway for the CPUC to consider CCA TE program applications, there are policy reasons[389] to consider whether the CCAs should receive CPUC approval to access the IOU distribution revenue for their own TE programs. Energy Division staff seeks stakeholder feedback on the appropriateness of expanding the CCAs' role to administer TE investments using distribution revenue.

10.4.2 Investor Owned Utility-Community Choice Aggregator Program Coordination

As demonstrated in SCE's stocktake, the CCAs and IOUs have independently developed TE programs that seek to address common TE barriers. The effectiveness of these programs can be improved if the CCAs and IOUs establish clear roles and responsibilities between each organization for how they will address TE barriers.

To facilitate this, the IOUs should hold a roundtable discussion with the CCAs to define the respective roles for each entity in accelerating widespread TE throughout the state, particularly in the near-term. This roundtable should be developed and facilitated by IOU and CCA staff, with participation by Energy Division staff. Following the roundtable discussion, each IOU should work with the CCAs in its service territory to develop a chapter within its TEP that outlines collaboration to meet the State goals, including alignment on program administration, cost-sharing, and developing distinct, non-competitive TE programs.

The joint TEP chapter should, at a minimum:

1. Identify areas of similarities and differences between the CCAs' and IOUs' roles in advancing TE.
2. Demonstrate collaboration with CCAs in developing TEPs and future TE programs.
3. Explain how both IOUs and CCAs plan to design programs that enhance existing TE programs.

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[388] Joint CCAs point to both Resolution E-4917 and D.18-06-027 as justification. Resolution E-4917 authorized CCAs to access ratepayer funding for CCA-administered energy efficiency programs, where the CCAs would serve as energy-efficiency program administrators. This is consistent with Public Utilities Code 381.1, which explicitly states that CCAs are eligible to become program administrators for the IOUs' energy efficiency programs. D.18-06-027 allowed the CCAs access to portion of the proceeds from the sale of GHG allowances to fund their own DAC-Single-Family Home Solar (DAC-SASH) and DAC Green Tariff programs because the GHG auction proceeds were generated to benefit bundled and unbundled customers. Additionally, the decision stated that if the funds from the GHG auction proceeds were not sufficient, supplemental funds from the Public Purpose Program (PPP) were eligible for use by the CCAs.

[389] The growing list of wildfires impacting the IOUs and the ongoing proceedings and programs to mitigate their societal, environmental, and financial impacts. Available at https://www.cpuc.ca.gov/wildfiresinfo/ (Accessed on November 29, 2019).

4. Demonstrate improved communication measures between the CCAs, IOUs, and customers/ program participants to ensure they are being directed to the targeted program(s).
5. Ensure CCA and IOU collaboration adheres to §740.12 and ensures programs are in the interests of ratepayers.
6. Improve data sharing strategies between the IOUs and CCAs to share lessons learned from TE program designs.
7. Discuss how parties plan to fund the programs.
8. Demonstrate how the programs will limit cross-subsidization.
9. The CCAs could also collaborate with the IOUs to develop programs supported with EPIC funding.
10. The IOUs should work with CCAs to develop joint ME&O programs, with co-branded materials, that can maximize effectiveness and customer reach.

In the interim before the Roundtable outcomes, the Commission and Energy Division staff are still researching the legal basis for CCA's to receive funding from distribution rates for their own TE programs. CCA customers continue to be eligible to participate in IOU TE programs and CCAs are able to use their generation revenue to fund TE programs. Further, CCAs may be eligible for grants offered by CARB and the CEC including EPIC funding.

Building off of existing IOU TE programs, the CCAs can play a role to ensure their customers have access to opportunities, while not offering a duplicate program. To achieve this, the CCAs should serve as a liaison between customers interested in TE programs and the appropriate party (IOU, CA State Agency, Air District, etc.). This includes, but is not limited to, site planning for local municipality/transit agencies, rebate and incentive navigations, and general EV education for customers. CCA Boards of Directors are typically staffed with elected officials from the communities they serve. This gives the CCAs insight on how to navigate the EVSE installation permitting process, and can identify and empower the community organizations that can provide EV education.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission (CPUC) should:

- Direct the investor-owned utilities (IOU)s to hold a roundtable discussion with the appropriate community choice aggregator (CCA) staff to define the roles of each entity in meeting the state's transportation electrification (TE) goals.
- Consider the legal and policy issues with using distribution revenue for CCA-branded TE programs that may not be available to the IOUs' bundled customers.
- Consider whether IOUs should hire third party administrators through a competitive bid process for any TE programs, and whether CCAs could bid to be an administrator.
- Direct the IOUs to ensure their TE programs are complementary to, rather than redundant of, CCA TE programs that already exist in their service territories.
- Directs the IOUs to leverage the CCAs' customer relationships where feasible, to further the states TE goals.
- Directs the IOUs to explore developing or expanding existing cobranding and coordinating TE marketing, education, and outreach materials with the CCAs.

11. Additional Policy Guidance

11.1 Vehicle Grid Integration (VGI)

Summary

VGI is and will continue to be critical to ensure that incremental load from a growing fleet of EVs is integrated in a way that provides grid benefits. VGI services are necessary to meet the State's TE goals for many reasons including the potential of VGI use cases to:

- Ensure that utility distribution infrastructure can support widespread TE.
- Incentivize charging times when renewable resources are generating electricity.
- Incentivize TE infrastructure installation through payment for grid services.

IOUs' TEPs should identify programs or incentives to provide hardware, software, technical, and/or financial resources to overcome barriers to deployment of VGI solutions. SB 676 (Bradford, 2019) created Pub. Util. Code §740.16 directing the CPUC to identify strategies and metrics that ensure the IOUs' TE programs "maximize the use of feasible and cost-effective electric vehicle grid integration." While the CPUC has not yet formally issued guidance on SB 676 implementation, the IOUs should consider how their programs can provide or incent VGI services in a way that minimizes costs and maximizes benefits.

The IOUs' TEPs should also address any action items that stem from the DRIVE OIR VGI working group and the Rule 21/DRIVE OIR joint procedural V2G AC Working Group, as described in Section 8.2.

Questions for Stakeholders
1. How can Energy Division staff and the investor-owned utilities (IOU) align the implementation of Senate Bill 676 (Bradford, 2019) with the IOUs' Transportation Electrification Plan (TEP) development? 2. Will existing activities such as the interagency Vehicle Grid Integration (VGI) Working Group provide sufficient output and identifiable next steps to specifically target IOU VGI activities? 3. What is the appropriate role of community choice aggregators and other load-serving entities to advancing VGI? How should their participation in VGI services be addressed in the IOUs' TEPs?

Background

As defined in Pub. Util. Code §740.16, VGI is "any method of altering the time, charging level, or location at which grid-connected electric vehicles charge or discharge, in a manner that optimizes plug-in electric vehicle interaction with the electrical grid and provides net benefits to ratepayers by doing any of the following:

1. Increasing electrical grid asset utilization.
2. Avoiding otherwise necessary distribution infrastructure upgrades.
3. Integrating renewable energy resources.
4. Reducing the cost of electricity supply.

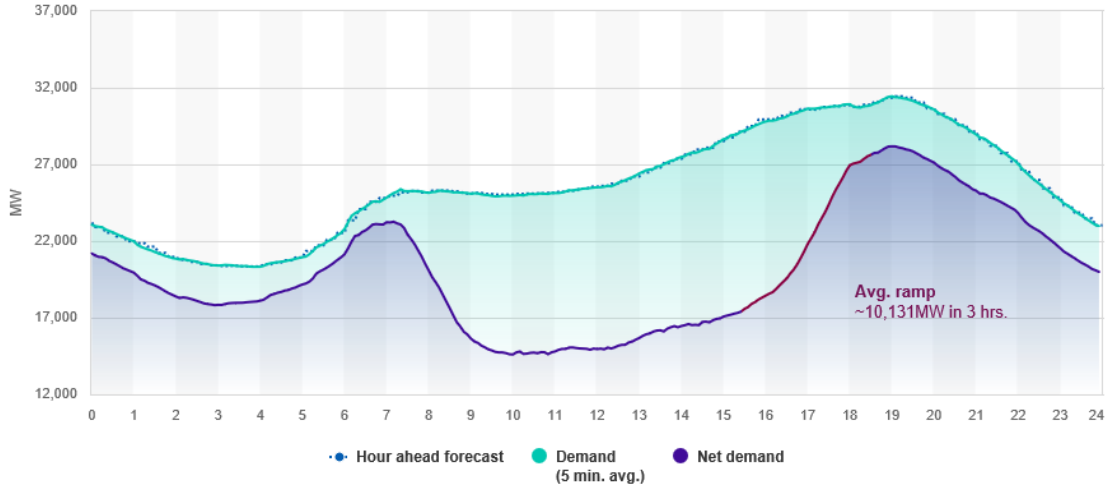
5. Offering reliability services consistent with Section 380 or the Independent System Operator tariff."

EV charging has the potential to serve as a grid asset by increasing the integration of midday solar generation or absorbing overnight wind generation. Vehicle batteries can also serve as backup power resources to customers' homes or facilities or send power back to the grid during times of peak demand.

At the same time, unmanaged EV charging load could adversely affect the grid. The CEC found that weekday EV load in 2025 could increase peak demand by roughly 500 MW between 4-7 p.m. and by nearly 1,000 MW around 8 p.m.[390]

Even at current levels of TE adoption, there is need to manage EV charging is shown in Figure 12.

Figure 12: CAISO Net Demand Curve for October 8, 2019[391]



The load anticipated from EVs could increase the evening ramp illustrated above if not properly managed. VGI services, however, could shift EV load to times of high renewable generation. The value of those VGI services could be captured by new business models offered by EVSPs, automakers, and other aggregators.[392] The cost savings or revenue from VGI services could help offset infrastructure costs or provide additional incentives for customers to adopt EVs. Unlocking additional VGI value will require technology, standards, and programs to dynamically control EV charging and enable bi-directional energy flow.

[390] California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025 (CEC, NREL), pages 3, 26. Available at https://www.nrel.gov/docs/fy18osti/70893.pdf (Accessed January 15, 2020)

[391] Current and historic CAISO reports are available at http://www.caiso.com/TodaysOutlook/Pages/default.aspx. A full set of graphs for the first weekday of each quarter is shown in the Appendix.

[392] CPUC/E3 Presentation on the value of Load Shift as determined in 2017 Integrated Resource Planning. Slides 5-19. Available at https://gridworks.org/wp-content/uploads/2018/04/04.18.18-Load-Shift-Working-Group-workshop-3_final.pdf (Accessed January 15, 2020).

The CPUC has worked with the CEC, CARB, CAISO and the Governor's Office of Business Development (GO Biz) to adopt and implement the ZEV Action Plan that identifies strategies each agency must implement to achieve the state's ZEV adoption goals.[393] CAISO and the CPUC in 2014 issued the first California Vehicle-Grid Integration Roadmap to define in more detail what steps are necessary to enable VGI at scale.[394] Both of these interagency action plans call for policies to facilitate VGI benefits.

In August 2019, the CPUC and other state agencies launched the DRIVE OIR VGI Working Group. The Working Group's scope was defined in the DRIVE OIR, and directed the CPUC, IOUs, participating state agencies, and stakeholders to answer three main questions:

1. What VGI use cases can provide value now, and how can that value be captured?
2. What policies need to be changed or adopted to allow additional use cases to be deployed in the future?
3. How does the value of VGI use cases compare to other storage or DERs?

The outcomes of this working group should inform the IOUs' TEP development. First, the IOUs should prioritize the scaled implementation of the use cases identified through Question 1 above and develop strategies that return the value back to the customer(s) providing those VGI services. Second, the IOUs should consider the output from the second and third questions above when developing their SB 676 implementation plans.

In October 2019, the Governor signed SB 676 establishing Pub. Util. Code §740.16 that defines new VGI requirements. The CPUC is directed to, by December 31, 2020, adopt strategies and quantifiable metrics to maximize the use of feasible and cost-effective electric vehicle grid integration by January 1, 2030. SB 676 established specific criteria for these strategies and metrics. While the code establishes a definition of "electric vehicle grid integration," the law also grants CPUC the authority to revise it if necessary.[395]

SB 676 states that VGI "shall not require the use of any specific technology" and "may be achieved using multiple strategies, including, but not limited to, the adoption of an electrical rate design, a technology, or a customer service, if that adoption helps provide net benefits to ratepayers."

SB 676 also sets specific requirements that apply to IOUs, independent of the issuance of strategies and metrics by the CPUC, for each future TE program application. For example, the IOUs are required to quantify how each proposed TE program will advance VGI, and to annually report their measurable progress in furthering VGI strategies, as defined in the legislation.

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[393] The ZEV Action Plan was initially adopted in 2013, and most recently updated in 2018. The current version is available at http://www.business.ca.gov/ZEV-Action-Plan (Accessed on January 15, 2020)

[394] The California VGI Roadmap was a collaboration between CPUC and CAISO staff released in 2014. The 2014 version is available at https://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf. (Accessed on January 15, 2020). The CEC is currently leading an effort to update the Roadmap to reflect the current state of technology. More information about the CEC's VGI Roadmap Update is available at https://www.energy.ca.gov/transportation/vehicle-grid-integration/ (Accessed on January 15, 2020). Examples of VGI services include but are not limited to demand response, dynamic time of use rates, and potentially a wide range of other grid services.

[395] See Pub. Util. Code §740.16 (b)(4).

11.1.1 Vehicle Grid Integration Implementation and Transportation Electrification Plans

The IOUs must ensure their TEPs reflect existing VGI activities, plans for additional VGI strategies and programs, and mechanisms to track progress toward SB 676 compliance metrics. VGI considerations should be applied to all utility functions including rates, standards development, technology assessment, education and outreach and other relevant IOU functions as discussed in these other TEF sections.

Energy Division staff wishes to emphasize that all VGI-related activities approved by the CPUC outside of the TEF should not be delayed, but rather reflected in the plan.[396] In particular, IOUs should continue to report on participation rates in demand response and any other VGI programs that are offered and load curves representing IOU TE program participant's electrical demand at different times of the day.

Each IOU's TEP should include specific action items to implement recommendations resulting from the current VGI and V2G AC working groups as well as consensus recommendations from the Rule 21 Working Group Issue 23 Report as explained in Section 8.1[397]

These two working groups may recommend the CPUC take steps to modify utility rules or processes or suggest utilities should support technical or cost-effectiveness research to help inform regulatory or standards development efforts by other agencies or organizations. IOU VGI programs may require tailoring to best fit specific TE market sectors, customer types, and load management opportunities. Some of the IOUs' VGI activities may already be underway or should be implemented ahead of the TEF deadlines in support of their existing TE programs or other demand response or load management programs. These existing VGI strategies should continue to move forward, and the TEPs should reflect and build upon activities already underway.

11.1.2 Pre-Transportation Electrification Plan Vehicle Grid Integration Guidance

IOUs should use the SB 676 definition of VGI and follow the principles of SB 676 in any program applications filed before their TEPs are approved if the filing occurs before the CPUC issues implementing guidance for the new code.

The IOUs should collaborate with Energy Division staff and other stakeholders to develop the SB 676 implementation guidance, and their TEPs should include strategies to reach the quantifiable metrics that are defined through that process.

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[396] Energy Division staff notes that SB 676 creates requirements for IOU Integrated Resources Planning (IRP) development activities in addition to requirements that are more directly related to the TE programs. While the TEF is not intended to provide guidance for IOU IRP development, including addressing SB676 requirements, Energy Division staff recognizes that there will likely be overlap between topics addressed in TE programs and the IRP (since VGI implementation will affect the resources that IOUs will need to procure through the IRP). We recommend that the IOUs identify in the TEF how to best coordinate the VGI Implementation Plan development and implementation and implementation of IRP- specific requirements of SB676.

[397] The Rule 21 Working Group 3 Final Report was issued on June 14, 2019 and submitted under CPUC Proceeding R.17-07-007. The final report is available at https://gridworks.org/wp-content/uploads/2019/06/R1707007-Working-Group-Three-Final-Report.pdf and all of the working documents from the Rule 21 Working Group 3 process are available at https://gridworks.org/initiatives/rule-21-working-group-3/. (both links accessed January 15, 2020)

Recommendations

Energy Division staff recommends that the California Public Utilities Commission (CPUC) should direct the investor-owned utilities (IOU) to:

1. Ensure their Transportation Electrification Plans (TEP) include strategies to meet the requirements of Senate Bill 676 (Bradford, 2019).
    a. Reflect current or planned activities across all utility functions without delaying activities that are already approved.
    b. Address recommendations from the Vehicle Grid Integration (VGI) and Vehicle-to-Grid (V2G) alternating current interconnection working groups and consensus recommendations from the final Rule 21 Working Group Issue 23 Report.
2. Integrate VGI considerations across all relevant business activities.
3. Address SB 676 definitions and guidance in any applications
    a. The CPUC should evaluate applications against SB 676's VGI definitions and objectives and the draft Transportation Electrification Framework guidance prior to issuance of formal CPUC implementation guidance.
    b. Applications will be evaluated against CPUC strategies and metrics for SB 676 implementation once guidance is formally issued.
4. Provide consistent reporting on time-of-use rate and VGI use case implementation among utility program participants including to help track progress toward meeting SB 676 requirements.
5. Collaborate with Energy Division staff to hold a workshop(s) aligning VGI strategies within the IOUs' TEPs with SB 676 implementation guidance.

11.2 Marketing, Education, & Outreach Issues

Summary

Marketing, Education, and Outreach (ME&O) for TE programs has to this point been a collection of one-off efforts across the IOUs and across the individual TE programs, similar to the application process described above. Given the nascence of the TE market, and the early stages of IOU investment, the CPUC has not yet established clear requirements for the IOUs' TE ME&O campaigns. Energy Division staff recommends providing guidance to the IOUs on where they should focus their ME&O efforts based on their role within the TE industry and propose budgets that ensure their outreach programs are using ratepayer dollars effectively and efficiently.

The CPUC has authorized ME&O budgets for many customer-facing programs in which customer interest drives program participation, like for Solar on Multifamily Affordable Housing (SOMAH), California Solar Initiative (CSI), and residential TOU implementation. These marketing budgets largely support the goal of marketing IOU ratepayer-funded programs to potential program participants. In some cases, the TE ME&O programs have gone beyond encouraging program participation, to include outreach to support EV awareness more generally. However, broad EV awareness has a loose connection to utility operations and the grid. IOU programs are largely focused on increasing EV charging infrastructure and offering EV-specific rates, not encouraging vehicle adoption.

While there is a role for the IOUs to play in educating the public about TE, this lofty task is not theirs alone. There are already others outside of the IOUs who are providing broad EV awareness education, including Electrify America, Veloz, Plug-In America and the National Drive Electric effort. There are also others who have yet to fully engage in broad EV awareness but who have a critical role to play, like the dealerships and auto manufacturers.

To ensure the IOUs' ME&O efforts are complementary to these external EV awareness education efforts, and to ensure the IOUs are playing to their strengths and building off lessons learned, Energy Division staff recommends clearly defining the IOUs' role in TE ME&O. Within this section, staff recommends guidance to minimize ratepayer impact, maximize the efficacy of the investment, and coordinate with other TE ME&O efforts.

Questions:

Questions for Stakeholders
1. Should the investor-owned utilities' funds for transportation electrification (TE) marketing, education, and outreach efforts be capped at a specific percentage for each TE program or as a single budget across all their programs? If yes, please justify why and propose a methodology.

Background

The CPUC to date has authorized more than $34 million in TE ME&O spending. However, we have not required the IOUs to report many metrics on how well the programs perform in reaching their intended audiences, increasing program awareness, driving participation, and how efficiently the IOUs spent ME&O program funds. This makes it difficult to gauge the efficacy of these programs and how the CPUC should direct the use of ME&O funds in the future.

Table 12 outlines the CPUC authorized ME&O budgets for each of the programs.

Table 12: IOU TE ME&O Budgets

IOU Program	Authorized ME&O Program Budget	Total Program Budget	ME&O Budget as Percent of Total Budget
SCE Charge Ready[398]	$3M originally, $6M total[399]	$22M originally, $44M total	13.6%

[398] D.16-01-023. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M157/K835/157835660.PDF (Accessed on January 16, 2020).

[399] As a result of a Petition for Modification, SCE was authorized to spend an additional $22M in bridge funding, on top of the original $22M pilot budget.

SDG&E Power Your Drive[400]	Decision does not specify,[401] but PYD has spent $540,000 of its program budget on ME&O[402]	$65M (~$73M actually spent)	0.7%[403]
PG&E EV Charge Network[404]	$10M	$130M	7.7%
SB 350 PRPs[405]	not specified	$42.76M	n/a
PG&E MD/HD[406]	$10.76M	$269.07M	4%
SCE MD/HD[407]	not specified	$356.36M	n/a
SDG&E MD/HD[408]	$2.85M[409]	$115.04M	2.5%
CASMUs SB 350 programs[410]	not specified	$7.85M	n/a
PG&E EV Empower[411]	$311,240	$4.13M	7.5%
PG&E LCFS	~$836,778[412]	*confidential*	*confidential*
SCE LCFS	~$252,480[413]	*confidential*	*confidential*

[400] D.16-01-045. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M158/K241/158241020.PDF (Accessed on January 16, 2020).
[401] D.16-01-045 states in Findings of Fact #87: "There is no need to require that a certain percentage of the approved VGI program budget be used for education and outreach efforts."
[402] This number is as of August 2019.
[403] In addition to the ME&O costs directly associated with the Power Your Drive program budget, SDG&E spent approximately $300,000 from its GRC funds on marketing efforts where Power Your Drive was highlighted in the message. These costs include EV campaigns meant to promote and educate drivers on the benefits of EVs. Additionally, the SDG&E Clean Transportation group dedicates funds every year for ME&O efforts in order to increase EV awareness.
[404] D.16-12-063. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K539/171539218.PDF (Accessed on January 16, 2020).
[405] D.18-01-024. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M204/K670/204670548.PDF (Accessed on January 16, 2020).
[406] D.18-05-040. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M215/K783/215783846.PDF (Accessed on January 16, 2020).
[407] D.18-05-040. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M215/K783/215783846.PDF (Accessed on January 16, 2020).
[408] D.19-08-026. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K550/311550050.PDF (Accessed on January 16, 2020).
[409] The settlement, which D.19-08-026 approved with modifications, agreed that "15% of the approved education budget will be dedicated to educating small businesses on the benefits of transportation electrification…" Settlement page 13
[410] D.18-09-034. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M231/K030/231030113.PDF (Accessed on January 16, 2020).
[411] D.19-09-006. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M314/K145/314145047.PDF (Accessed on January 16, 2020).
[412] These numbers are taken from 2017, 2018, and 2019 projected costs for marketing and customer outreach spending.
[413] These numbers are taken from the 2017, 2018, and 2019 projected costs for admin and marketing and customer outreach spending, as well as the actual reported costs for marketing spending in 2017 since the projected administrative costs were not broken down into categories of spending.

SDG&E LCFS	~$2.69M[414]	*confidential*	*confidential*
PG&E AB 1082/1083	$1.7M	$11.30M	15.1%
SCE AB 1082/1083	$3.2M	$19.78M	16.2%
SDG&E AB 1082/1083	$500,000	$18.73M	3.0%
Liberty Utility AB 1082/1083	$84,000	$4.69M	1.8%

Beyond the authorized TE ME&O funds, the IOUs have requested over $50 million in additional ME&O budget for SCE's Charge Ready 2[415] and SDG&E's Power Your Drive Extension programs.[416] SCE's Charge Ready 2 proposal for ME&O focuses largely on EV awareness.

Many of the programs identified above include some overlap of efforts either with other IOU programs or external efforts, since several of the programs include a goal of increasing broad awareness of EVs to customers. For example, through PG&E's EV Charge Network program it has developed a cost of ownership tool for customers,[417] however this is similar to the shopping assistant tool that Plug In America offers.[418] Further, SCE's Charge Ready 2 proposal includes the development of "self-service tools" to provide education on EVs. While these are helpful tools, and do have some differences, this is one example of duplicative awareness efforts.
Several efforts are also underway to support broad EV awareness with other public and private funding resources. These include the following.

- Veloz is a nonprofit organization focused on accelerating the shift to EVs through public-private collaboration, public engagement, and policy education.[419] Each of the large IOUs contributes to Veloz—PG&E and SDG&E with ratepayer funds and SCE through a shareholder funds grant.[420]
- Electrify America, in addition to infrastructure deployment, has a ZEV education and awareness program involving outreach, ride-and-drive events, and other marketing.[421]
- Plug-in America also works to promote EV awareness across the country by providing information to consumers, policymakers, auto manufacturers, and others.[422]

[414] These numbers are taken from 2017, 2018, and 2019 projected costs for administrative spending for SDG&E's LCFS program. SDG&E does not differentiate between administrative and ME&O costs within its filings.
[415] A.18-06-015
[416] A.19-10-012
[417] D.16-12-065 authorized PG&E to create a total cost of ownership tool, which is named the EV Savings Calculator: https://ev.pge.com/?_ga=2.218610074.2096531506.1579143230-1582193621.1571169888 (Accessed on January 15, 2020)
[418] https://plugstar.com/ (Accessed on January 15, 2020)
[419] https://www.veloz.org/ (Accessed on January 15, 2020)
[420] Commissioner Rechtschaffen sits on the board of Veloz, and former-Commissioner Peterman did so before him. In response to a data request from Energy Division Staff, the IOUs stated that, for PG&E and SDG&E, the cost of Veloz membership comes from general ME&O funding authorized through their GRCs, while SCE has Veloz apply for a grant through their philanthropic arm to pay for its membership dues.
[421] https://www.electrifyamerica.com/(Accessed on January 15, 2020)
[422] According to the Electrify America investment plan approx. $20 million was earmarked for "public education and awareness" in Cycle 1 in California. It is unclear how much will be allocated within Cycle 2.

To date, it is not clear how IOU program-specific ME&O efforts are coordinated with these similar programs. Energy Division staff recommends that the IOUs include description of any existing and potential alignment and/or contribution to broader EV awareness within their TEPs.

Discussion

The IOUs do have a role to play in TE ME&O, but Energy Division staff recommends their efforts should minimize ratepayer impact, maximize the efficacy of the investment, and coordinate with other TE ME&O efforts. Given the significant public and private EV education and awareness efforts already underway, the IOUs should develop ME&O strategies that complement these efforts, employ their unique core competencies, and optimize ratepayer investments. This means allowing entities—like Veloz, Electrify America, Plug-In America, and others—to take the lead on certain aspects of EV education, like broad EV awareness. In turn, the IOUs should develop strategic ME&O plans as part of their TEPs that focus on the following core ME&O efforts and goals.

Individual program ME&O campaigns: The IOUs' TE ME&O efforts should largely focus on building awareness and participation interest for individual IOU TE programs. ME&O is a necessary component for successful customer facing programs to inform potential customers and vendors.

This individual program marketing should have a focused effort on reaching ESJ communities. As mentioned in Chapter 6, "Equity," barriers in awareness disproportionately affect ESJ communities. The IOUs should develop plans for focused outreach to ESJ communities, as well as better collaboration with CBOs, EJ groups, and local governments. Staff recommends the CPUC require this at the onset of the development of a marketing campaign, with the IOUs including within their applications for ratepayer funding the specific organizations that they will be collaborating with and how they will engage with the community or communities they are seeking to reach.

Communication about rates, charging, and using electricity as a transportation fuel: The IOUs should utilize outreach to address barriers of customer awareness and understanding related to their core competencies as utilities. The interaction between electric rates, EV charging behavior, and the electric grid should be the focus of the IOUs' only broad awareness campaign. This should focus on improving customer awareness and understanding of how different electric rates can change the price of charging an EV, and how charging at different times of the day impacts the electrical grid. The IOUs have a responsibility to manage the grid and deliver electricity affordably and reliably while reducing GHG emissions, thus they have a critical role to play in communicating about how customers' EVs can best interact with the grid.

Where feasible, the IOUs should coordinate their outreach about grid management and EV charging behavior across the IOU territories, particularly for customers that may need to charge their vehicles in multiple service territories. The IOUs should consider budgeting for a third-party to implement this educational effort to increase awareness of EV rates and the grid impacts of EV charging. The IOUs should consider using a single ME&O administrator to avoid duplicative efforts and ensure message coordination across the IOUs' programs as well as with the other external entities described above.

Like the individual ME&O program guidance, there should also be a clear focus to engage ESJ communities with this ME&O program. The IOUs should work with CBOs, EJ groups, and local

governments to develop discrete ESJ outreach plans. The CPUC should require this equity component of the ME&O prior to approving ME&O funding. This proposal should include specific detail on:

- The specific organizations with which the IOUs have and will continue to collaborate,
- Community segments targeted, and
- How IOUs will engage with the community.

There are also other pivotal stakeholders who have yet to fully engage in promoting EV awareness but who have a critical frontline role to play in interacting with customers, including EV dealerships and auto manufacturers. While the CPUC can only adopt requirements for the IOUs' ME&O programs, staff recommends other market actors engage in the development of outreach materials and encourages automakers and EVSPs to take a more active role in EV awareness. Auto manufacturers and EVSPs are often better equipped to educate the public about the benefits of their products.

Accountability: Quantifiable metrics are necessary to measure ME&O program effectiveness, progress, ensure accountability of ratepayers' investment, and provide lessons learned to inform future program improvements. Such evaluation will also serve as lessons learned to inform future program improvements.

The authorized TE ME&O programs to date have not included any performance accountability metrics or reporting requirements. This makes it difficult to gauge the efficacy of ME&O programs and inform how the CPUC should direct the use of ME&O funds in the future. Going forward, the IOUs' TEPs should clearly establish ME&O baselines, define ME&O program goals with associated metrics, and align with the broader IOU TEP and TE program evaluation plans described in Section 3.4, "Targets, Metrics, and Reporting."

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct investor-owned utilities (IOU) to:

1. Focus transportation electrification (TE) related marketing, education, and outreach (ME&O) efforts on building awareness and participation interest for individual IOU programs.
2. Develop ME&O plans within their Transportation Electrification Plans (TEP), including focused outreach to effectively target environmental and social justice (ESJ) communities, including collaboration with community-based organizations, environmental justice groups, and local governments.
    a. These outreach plans should include the specific organizations that the IOUs will be collaborating with and how they will engage with the community or communities they are seeking to reach.
3. Propose a single budget and overarching ME&O plans within their TEPs focused on electric vehicle (EV) rates, EV charging behavior, and the electric grid.
    a. Where feasible, the IOUs should coordinate their outreach about EV charging behavior and its interaction with grid reliability across the IOU territories.
    b. The IOUs should consider budgeting for a third-party program administrator to implement this effort.

c. There should be a clear focus on reaching ESJ communities with this program.

4. Work with Energy Division staff and stakeholders to develop portfolio-wide and program-specific ME&O targets and metrics
   a. These goals should include:
      i. Increase interest in program participation
      ii. Educate EV drivers about any new rate that could reduce their cost of fueling
      iii. Encourage more EV charging during periods of high renewable energy generation
   b. These targets and metrics should be clearly each time the IOUs request a TE ME&O budget for a new program.

11.3 Investor Owned Utilities' Low Carbon Fuel Standard (LCFS) Programs

Summary

The IOUs' role within CARB's Low Carbon Fuel Standard (LCFS) program has grown and shifted since the regulation's establishment in 2009. Several changes within the CARB regulation since 2018, in particular the directive for the utilities to establish the Clean Fuel Reward, have prompted changes within the IOUs' LCFS programs.

These current changes offer an opportunity for the CPUC to provide guidance on the IOUs' future LCFS programs in light of direction from CARB, and more broadly, assess how the IOUs' participation in the LCFS fits within their TEPs and their broader TE strategy.

Question for Stakeholders
1. Do Energy Division staff's proposed Low Carbon Fuel Standard holdback program options benefit existing and/or future electric vehicle drivers? Why or why not?

Background

The LCFS is one of the critical GHG reduction measures established to implement AB 32, the California Global Warming Solutions Act of 2006.[423] CARB adopted the LCFS regulation in 2009 and has amended it a few times, notably in 2018.[424] The purpose of the regulation is to transform and diversify the transportation fuel pool, reduce petroleum dependency, and reduce emissions of air pollutants and GHGs in California. As providers of clean transportation fuel—electricity—the IOUs generate LCFS credits, which CARB directs them to utilize to benefit existing or future EV drivers in California.

CARB's LCFS regulation establishes declining annual carbon intensity (CI) standards from 2011 through 2030, measured as the CI of fuels. The LCFS applies to fuel that is sold, supplied, or offered for sale in California, and to any person responsible for that transportation fuel as per the LCFS regulation. Providers of clean fuels (like electric utilities) that are below CI levels for any given year, may voluntarily opt-in to the LCFS program to generate credits. The large IOUs have all opted

[423] Information on the implementation of Assembly Bill 32 - https://www.arb.ca.gov/cc/ab32/ab32.htm
[424] https://ww3.arb.ca.gov/fuels/lcfs/rulemakingdocs.htm (Accessed on January 15, 2020)

into LCFS to earn residential EV charging base credits for supplying electricity for residential charging of EVs.[425] They also receive some other categories of LCFS credits.[426]

The scope of the CPUC's role within the LCFS is limited to oversight of the IOUs' LCFS credits, the revenue from the sale of those credits, and the distribution of that revenue back to IOU customers. The CPUC is involved in the LCFS because the selling of credits and allocation of revenue affect IOU customers, rates, and IOU programs related to TE.[427] There are several programs and activities that fall within this role.

1) **Clean Fuel Reward (CFR)**: In 2018, CARB approved amendments to its LCFS regulation, which directed the POUs and IOUs to establish a statewide upfront rebate (at the point-of-vehicle-purchase) for EVs and PHEVs funded entirely with the utilities' LCFS credit revenue from base credits.[428] From 2019 through 2022, the large IOUs must contribute at least 67 percent of their LCFS credit revenue to the program.[429]

   Over the last year and a half, CPUC staff has worked with CARB, IOUs, POUs, car dealerships, and other stakeholders to establish the CFR program. SCE will administer the program for the first three years, beginning in 2020 when the statewide program will likely launch.[430]

   For the IOUs, the CFR program will take the place of their existing rebate and bill credit programs that have been operational since 2017. These IOU programs[431] all return LCFS EV credit revenue to EV and PHEV drivers. SCE offers a one-time rebate for up to three owners of the same vehicle, PG&E offers a one-time rebate, and SDG&E offers an annual bill credit. Each of these programs has associated administrative and ME&O budgets.

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[425] The LCFS regulation requires utilities, as opt-in regulated credit generators for residential EV charging, to (1) use all credit proceeds from residential EV charging to benefit current or future EV customers in California; (2) educate the public and customers on the benefits of EV transportation (including the environmental costs and benefits of EV charging or total cost of ownership as compared to gasoline); and (3) provide rate options that encourage off-peak charging and minimize adverse impacts to the electric grid.

[426] Electric Distribution Utilities (including the IOUs) are the default generators of base credits for residential EV charging and for estimated forklift charging not claimed by other entities. IOUs are also eligible to generate credits for providing electricity and natural gas as a transportation fuel for other categories in the LCFS.

[427] D.14-05-021 (as corrected by D.14-07-003) authorized the IOUs to sell LCFS credits and established criteria and reporting requirements for the sale of the LCFS credits, pursuant to California Public Utilities Code (PUC) Section 853(b). The CPUC used its authority under PUC Section 701 to authorize the IOUs to sell LCFS credits on behalf of their customers. D.14-12-083 directed the IOUs to educate the public on the benefits of TE, and to provide rate options that encourage off-peak charging and minimize adverse impacts to the electric grid. D.14-12-083 directed the electric IOUs to return the value of the LCFS credit revenue either by (1) reducing the purchase costs of PEVs through rebates or other incentives, or (2) providing an annual credit on electric bills of customers with PEVs.

[428] "Base Credit" refers to the credit generated by an Electric Distribution Utility (including the IOUs) for residential EV charging using carbon intensity values provided in the Lookup Table pathway for California Average Grid Electricity and the credit calculation in 95486.1(a) of the CARB LCFS regulation. https://ww3.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf (Accessed on January 15, 2020)

[429] For large POUs it is 35 percent, for medium POUs it is 20 percent, and small POUs are not required to contribute.

[430] Authorized through Resolution E-5015 - http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K266/311266079.PDF (Accessed on January 15, 2020)

[431] SDG&E's Electric Vehicle Climate Credit; SCE's Clean Fuel Reward Program; and PG&E's Clean Fuel Rebate

2) **Holdback Credit Funds**: The LCFS base credit revenue that remains after the IOUs direct 67 percent of it to the statewide CFR program is defined as their holdback funds. On November 21, 2019, CARB adopted proposed changes to its LCFS regulation,[432] which included requirements for the utilities to use their holdback credit funds. Under the amendments, the utilities must use at least 50 percent of the proceeds from the sale of their holdback credits to benefit DACs and/or low-income communities by 2024. CARB staff provides several options for the utilities to use the proceeds, including but not limited to:
    a. Electrification of transit or school buses, including battery swap programs to support consistent service
    b. Electrification of drayage trucks
    c. Rebates to low-income individuals for used EVs or utility bill rebates for low-income EV owners
    d. Collaboration with local municipalities and environmental justice advocates to develop pilot programs or EV plans to support further deployment of EVs

3) **Forklift and Other Credits**: The IOUs are eligible to receive (and have already received) LCFS credits for other electric transportation categories besides those discussed above. To date, the IOUs have received LCFS credits for the use of electric forklifts within their territories and for non-residential EV charging including public and workplace EV charging. They are also eligible to receive other credits as per CARB's LCFS regulation. The IOUs have not yet returned any of the revenue to customers from the forklift credits they have received. In order to do so, the IOUs would need to request a revenue return pathway via a Tier 2 Advice Letter.

11.3.1 Coordination Across Transportation Electrification Programs

Historically, the CPUC has addressed the IOUs' LCFS programs independently from other TE activities. While several POUs utilize LCFS credit revenue to fund TE infrastructure programs, the IOUs fund their infrastructure programs with ratepayer funds and use LCFS credit revenue for separate vehicle or fuel incentives. Energy Division staff sees opportunity for improved coordination across LCFS-funded and ratepayer-funded TE programs. Specifically, the CPUC should require that the IOUs include descriptions of their LCFS efforts within their TEPs to identify how the programs funded with LCFS credit revenue will contribute to the IOU's overall TE strategy and contribute to their TE targets and goals.

The IOUs should also coordinate ME&O efforts associated with LCFS with their other TE ME&O efforts to ensure they are not duplicative.

11.3.2 Use of Holdback Credit Funds and Forklift Credit Revenue

The IOUs have yet to determine pathways to return the revenue from the holdback funds and forklift credits to customers. In addition to meeting the CARB requirements for directing 50 percent of the holdback credit funds towards DAC/low-income customers, Energy Division staff recommends that the IOUs choose from the following holdback program options:

1. Develop a used EV rebate program, as included in CARB's list of pre-approved holdback equity projects. However, since one of the goals of the CFR program was to create consistency across the state, the IOUs should also coordinate any second-hand EV rebate

[432] https://ww3.arb.ca.gov/regact/2019/lcfs2019/isor.pdf (Accessed on January 15, 2020)

program across the three IOU territories. The past LCFS programs differed by territory, which has added to the confusion of navigating incentives within California. We should continue to seek ways to support consistency across IOU territories.

2. Reduce the cost to ratepayers of existing school bus or transit charging infrastructure programs. These are target areas for electrification from CARB, and they are areas that the IOUs are already beginning to electrify. Staff sees an opportunity to reduce the cost of these programs to ratepayers by supplementing the budgets with LCFS credit revenue.
3. Support EV resiliency efforts, like those discussed within Section 5.2 of the TEF, covering Near-Term IOU TE investment Priorities on investments for EVs and System Resiliency. As discussed within that section, addressing climate and wildfire resiliency is a priority for the CPUC and the state. Examples of these investments include installation of EV charging, placed in strategic locations like IOU Community Resource Centers, including those serving low-income or DAC customers, and V2B demonstrations focused on resiliency. Much work is still necessary to improve resiliency within TE and to utilize EVs to improve grid resiliency. As resiliency bleeds into equity issues and the larger issues of increased EVs on the road, staff finds this to be a good subject area for LCFS-funded programs.

The IOUs should also contribute the revenue from their forklift and other LCFS credits to any holdback funded program as it can have a more meaningful impact if combined with the other remaining LCFS credit revenue.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission should direct the investor-owned utilities (IOU) to:

1. Include descriptions of their Low Carbon Fuel Standard (LCFS) programs within their Transportation Electrification Plans (TEP) and identify how the programs funded with LCFS credit revenue will contribute to the IOU's overall transportation electrification (TE) strategy and contribute to its TE targets and goals.
2. Coordinate LCFS related marketing, education, and outreach (ME&O) with other TE ME&O efforts.
3. Propose a revenue return implementation plan for the holdback credits using the following holdback credit program options:
    a. Program supporting electric vehicle (EV) climate and wildfire resiliency efforts;
    b. Develop a second-hand EV rebate program, coordinated across the three large IOU territories;
    c. Reduce the cost to ratepayers of existing school bus or transit charging infrastructure programs.
4. Contribute the revenue from LCFS forklift and other credits to any holdback funded program(s).

12. Emerging Transportation Trends

Summary

Emerging mobility trends—like Transportation Network Companies (TNCs), electric bikes and scooters, and autonomous electric vehicles (AEVs)—have already impacted the TE landscape. This trend will likely continue, with future emerging models and potentially larger disruption looming on the horizon. As the TEF focuses on developing the IOUs' long-term planning for TE, it is prudent to look at the emerging trends within transportation that have the potential to impact TE over time.

This section provides some guidance for how the IOUs should approach three specific emerging transportation sectors—TNCs, micromobility, and AEVs. Energy Division staff includes some recommendations for paths forward to improve the interaction of these industries with the electrical grid and to ensure the maximization of ratepayer benefits. In other cases, the recommendations within this section do not specifically call for near-term action but discuss guidance to the IOUs in the event that they choose to address that industry.

While the trends discussed within this section represent some of the key emerging transportation developments that Energy Division staff has identified, there are no doubt others to come. IOUs should consider all emerging transportation trends as they develop their TEPs, and as market realities for these industries become clearer.

Questions for Stakeholders
1. Should the California Public Utilities Commission (CPUC) establish a requirement for a minimum transportation network company (TNC) contribution to any investor-owned utility (IOU) transportation electrification program designed to directly benefit their drivers? a) If yes, what methodology would you propose and why? b) If no, please discuss whether you believe another approach to using ratepayer funds to support TE to benefit TNCs would be reasonable. 2. Should the CPUC direct the IOUs to guarantee micromobility equipment is charged under the correct tariff? a) If so, are Energy Division staff's recommendations sufficient to achieve this or should more guidance be provided? b) Should there be enforcement penalties developed to ensure electric micromobility equipment charges using the correct tariff? If so, what types of enforcement actions are appropriate? 3. With the understanding that the micromobility companies typically rely on residential customers to charge their equipment, is there an appropriate commercial-scale tariff for charging micromobility equipment? If so, should there be a separate metering requirement for customer charging micromobility equipment? 4. Should the IOUs be held accountable for educating the micromobility companies' charging providers, or should that be the responsibility of the micromobility companies?

12.1 Transportation Network Companies

Background

Since the launch of Uber in 2009 and Lyft in 2012, TNCs have changed California's transportation ecosystem and have impacted how Californians think about personal vehicles, shared mobility, and public transit. TNC operations have added to higher vehicle miles traveled (VMT), contributing to an increase in GHG emissions and congestion.[433] This TEF section provides guidance to the IOUs on the role of ratepayer funding for TNC dedicated, or primary usage, TE infrastructure.

The CPUC regulates the operations of for-hire passenger carriers, including TNCs, and is currently coordinating with CARB to implement the California Clean Miles Standard.[434] Governor Brown signed SB 1014 (Skinner, 2018) in 2018 to establish the California Clean Miles Standard, which requires TNCs to meet annual GHG emission targets and goals, starting in 2023.

TNCs are also parties to some TE proceedings at the CPUC—including the DRIVE OIR and SCE's Charge Ready 2.[435] As parties, TNC have requested that ratepayer funded TE programs support dedicated charging stations for the EV drivers that operate on their platforms.[436] The CPUC has historically denied programs that would specifically target TNC drivers because the IOUs' proposals did not include any guaranteed data sharing or cost sharing agreements with the TNC companies.[437] This section provides guidance to the IOUs if they choose to develop any proposals that use ratepayer funding for TE infrastructure that is designed primarily or partially for TNC drivers' use.

Discussion

TNCs' role within TE and in meeting the State's GHG goals is still uncertain. Further, the relationship between TNCs, IOUs, and ratepayer funding is also not yet defined. There must be a balance between ratepayer benefits and electrification of TNCs.[438] Programs that seek to provide charging infrastructure that supports TNC electrification, or infrastructure designed primarily or partially for TNC drivers' use can and should be carefully considered through this lens.

While Energy Division staff recognizes the critical role that electrifying TNCs may play in achieving the State's transportation electrification goals and emissions reduction targets, ratepayers should not have the responsibility to fully subsidize the electrification of TNC fleets. Energy Division staff does however see opportunity for the IOUs and TNCs to collaborate to achieve compliance with the California Clean Miles Standard.

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[433] https://archive.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Congestion_Report_181015_Final.pdf (Accessed on January 15, 2020)

[434] The Clean Miles Standard was codified as Chapter 369, Statues of 2018. Available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1014 (Accessed on January 16, 2020).

[435] See A.18-06-015 and R.18-12-006

[436] A.18-06-015, Lyft Opening Testimony: "Lyft recommends that SCE expands its programs to include working with major TNCs to help educate Southern California TNC drivers about EV benefits, provide charging infrastructure in places where TNC drivers need it, expand charging infrastructure in MUDs and DACs, ensure that its marketing and education efforts include the TNC driver population, and collaborate with TNCs on its programs."

[437] D.18-01-024 denied SCE's proposal to provide cash incentives to TNC drivers for meeting EV-miles-traveled goals and SDG&E's proposal to install and own EVSE at TNC drivers' homes.

[438] D.18-01-024, in reference to SCE's proposal for a TNC driver incentive pilot, states: "As stated in a previous section, while we believe that electrifying the TNC sector is an important endeavor, the SCE proposal as presented does not clearly identify the barriers and opportunities that balance accelerating widespread TE with benefits to ratepayers…Finally, SCE does not propose to leverage any external funding or partnerships to support its incentive program. Providing cash incentives to TNC drivers is not a sustainable use of ratepayer funds, so the program as proposed could not provide a basis for any larger-scale effort."

Given that TNCs are required to comply with CARB's California Clean Miles Standard, Energy Division staff expects that TNCs will be meaningfully working towards this compliance, showing both strategic and financial commitment to reducing emissions and electrifying their operations. Staff does not view the reduction of TNC emissions and compliance with the California Clean Miles Standard as the sole or primary responsibility of ratepayers.

It may be appropriate to support the necessary charging infrastructure to a degree determined by the ability of such infrastructure to contribute to broader CPUC and IOU TE goals and targets. As TNC drivers are responsible for approximately one-third of non-Tesla DC fast charging,[439] TNCs are already benefiting from the availability of partially (or wholly) publicly funded charging infrastructure.

Energy Division staff recommends that any IOU proposals for ratepayer investment in TNC electrification should comprise strong partnerships between the IOUs and TNCs, with TNCs providing substantial matching or co-funding. At this time, staff does not endorse a specific methodology to determine the appropriate extent of ratepayer and TNC contributions to any TNC electrification. This topic would benefit from further research on the broader societal costs and benefits of TNC electrification, as well as stakeholder input.

City and regional governments have a vested interest in how TNC operations evolve and how those changes may affect their community or region. Before, during, and after any collaboration between the IOUs and TNCs, the IOUs should ensure that in addition to securing financial contribution from the TNCs, they have also consulted with city and regional governments. Energy Division staff wants to ensure that IOUs and TNCs consider city and regional governments' goals and planning efforts prior to any investment.

Further, TNCs should negotiate data sharing agreements with planning entities when public money is funding TNC-specific infrastructure.

12.2 Micromobility

Holding all else equal, electrifying transportation alone will not achieve the State's transportation sector GHG emissions reduction goals. California must also reduce vehicle miles traveled (VMT) by 25 percent by 2030.[440] Micromobility[441] options – such as shared electric bicycles and scooters - have proliferated throughout California cities while being touted as a potential strategy for reducing

[439] Jenn, A. (2019). Emissions Benefits of Electric Vehicles in Uber and Lyft Services. UC Davis: National Center for Sustainable Transportation. http://dx.doi.org/10.7922/G23R0R38 Retrieved from https://escholarship.org/uc/item/15s1h1kn (Accessed on January 15, 2020)

[440] CARB's *2017 Climate Change Scoping Plan Update* states "…California cannot meet its climate goals without curbing growth in single-occupancy vehicle activity. Even if the share of new car sales that are ZEV grows nearly 10-fold from today, California would still need to reduce VMT per capita 25 percent to achieve the necessary reductions for 2030 [goals]"

[441] According to Horace Dediu, a micromobility industry analyst, micromobility can be defined as any form of light-weight (<500 kg), lower speed transportation options, powered by either human or electric efforts, and can share infrastructure created for bicycles, such as bike lanes. https://micromobility.io/blog/2019/2/23/the-micromobility-definition (Accessed on January 17, 2020)

VMT[442] and electrifying transport. However, micromobility is still a nascent industry with limited data on GHG and grid impacts from charging the equipment.

In order to encourage the efficient deployment and use of micromobility options to maximize reductions in VMT and GHG emissions, the IOUs and micromobility companies must coordinate to determine the grid impact of charging the equipment and charge the equipment on the correct electric tariff.

Background

In 2013, Motivate launched California's first bikeshare program,[443] with other California cities such as Los Angeles, Sacramento, and San Diego, following suit with their own bikeshare program. In 2018, Motivate introduced electric bicycles (e-bikes) in California.[444]

In January 2018, Jump launched the first California dockless bikeshare program in the San Francisco Bay Area.[445] These e-bikes contain a 250w motor and can travel up to 30 miles per charge.[446] Each bikeshare program offers its own equipment models, with different battery sizes. This makes it difficult to determine the potential impact of charging.[447]

Dockless scooters are a relatively new micromobility option. The first electric scooter (e-scooter) program launched in San Francisco and Los Angeles in 2017. Since then, five companies[448] have expanded to over 20 cities in California, with more cities planned in the future. Bird and Lime operate their e-scooter between 5:30am and 9:00pm and can achieve roughly 20 miles of transport per charge with a 100-240 Volt battery.[449, 450]

Although not as widespread as e-bikes and e-scooters, electric moped (e-moped) deployment has steady grown since Scoot's initial pilot phase in 2012. Although the information regarding the total number of e-mopeds in San Francisco is not available, Scoot claim at least 6,862,613 electric miles

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[442] 'Shared Scooters Can Be Good for the Environment… If you remove the Automobile', C. Oster, ENO Center for Transportation, August 15, 2019 https://www.enotrans.org/article/shared-scooters-can-be-good-for-the-environment-if-you-remove-the-automobile/ (Accessed on January 17, 2020)

[443] "History of Bikeshare" City Lab. 2015. https://www.citylab.com/city-makers-connections/bike-share/#slide-2013 (Accessed on January 17, 2020)

[444] The launch of the e-bike was intended to encourage riders to increase their average ride from 2 miles to 3-5 miles. "GoBike adds e-bikes to SF's shared alternative transportation fleet". San Francisco Chronicle. April 2018. https://www.sfchronicle.com/bayarea/article/E-bikes-SF-s-latest-alternative-transportation-12861602.php (Accessed on January 17, 2020)

[445] Jump is an Uber owned e-bike and e-scooter company. They currently operate in five California cities, including Los Angeles, Sacramento, San Francisco, Santa Cruz, and Santa Monica. Up until September 19, 2019, the company also operated in San Diego. https://www.kqed.org/news/11774389/uber-to-pull-jump-bikes-from-san-diego-and-atlanta (Accessed on January 17, 2020)

[446] "How Jump Designed a Global Electric Bike" Wired. October 8, 2018. https://www.wired.com/story/how-jump-designed-a-global-electric-bike/ (Accessed on January 17, 2020)

[447] For example, Jump bikes are expected to travel a range of 25-45 miles per charge at a max speed of 19 mph. Each charge takes 6-hours to fully charge the 250-watt electric battery. "Electric ride: New powered-up bike share system coming to DC" Washington Top New. September 2017. https://wtop.com/dc/2017/09/electric-ride-new-powered-up-bike-share-system-coming-to-dc/ (Accessed on January 17, 2020)

[448] Bird, Lime, Scoot, Skip, and Spin

[449] Mi Electric Scooter Specs. https://www.mi.com/us/mi-electric-scooter/ (Accessed on January 17, 2020)

[450] Lime Scooter FAQs https://www.li.me/electric-scooter#faqs (Access on January 17, 2020)

have been ridden on their e-moped's since 2012.[451] In January 2020, Revel, a Scoot competitor, announced plans to roll out 1,000 e-mopeds in Oakland.[452] If expansion continues, e-mopeds could pose a more significant impact than e-bikes and e-scooters. Scoot's 2.0 kWh e-moped battery can travel up to 35 miles per charge. A complete battery charge can take up to 3.5 hours using a 110V AC power input.[453]

The method that the companies use to charge the e-scooters is problematic. Currently, each company hires "Chargers," which are individuals that sign up to collect, charge, and redistribute the e-scooters throughout a city. Micromobility apps inform the Chargers of e-scooters location, charge level, and how much compensation each charge will earn the Charger. A Charger is then required to collect the e-scooter (usually using a pickup truck, van, or SUV) and bring them into their homes to charge the vehicles using their residential tariff.

It is not an option for customers to reserve the e-scooters, which leads to a common occurrence of Chargers driving to pick up a e-scooter that another Charger has already retrieved.[454] Lime indicates, however, that it plans to enable reservations for equipment.[455]

Micromobility companies are regulated at the local government level and are granted permits to operate.[456] A key condition to receive the permit is to share select data with the relevant city agency.[457] This data sharing requirement is not extended to State agencies. The information shared with the cities is limited to basic data, such as number of bikes or scooters, locations of the equipment, and how long the equipment is in use.

Discussion

Without data, Energy Division staff is unable to determine how many e-bikes and e-scooters micromobility companies are charging, or plan to charge, and if they are charged under preferred conditions.

The method that the micromobility companies use to charge the e-scooters is problematic for several reasons.

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[451] Scoot San Francisco Tab https://scoot.co/san-francisco/ (Accessed on January 17, 2020)
[452] "Electric Moped Rentals Now Available in Oakland" East Bay Times. https://www.eastbaytimes.com/2020/01/11/electric-moped-rentals-now-available-in-oakland/ (Accessed on January 17, 2020)
[453] genZe Electric Moped Specifications https://www.mi.com/us/mi-electric-scooter (Accessed on January 17, 2020)
[454] "Charging Electric Scooters is a Cutthroat Business" The Atlantic. May 2018 https://www.theatlantic.com/technology/archive/2018/05/charging-electric-scooters-is-a-cutthroat-business/560747/ (Accessed on January 17, 2020)
[455] "Electric scooter charging is a cutthroat business, and Lime wants to fix that". The Verge. March 2019. https://www.theverge.com/2019/3/15/18267128/lime-electric-scooter-charging-juicers-harvesting-business (Accessed on January 17, 2020)
[456] Proposed bill, AB 1286 (Muratsuchi) would codify the requirement for micromobility companies to obtain a permit from a municipality prior to offering services within its jurisdiction. According to a spokesperson for Assembly member Laura Friedman, the legislation has been held, and will be taken back up in January 2020.
[457] If passed AB 1112 (Friedman), would clarify what regulations a city could impose on a micromobility company when granting an operating permit, and would place some restrictions on the regulations a city can enact on micromobility companies, specifically, the requirement to provide the city with individual trip data. According to a spokesperson for Assembly member Laura Friedman, the legislation has been held, and will be taken back up in January 2020.

1. **Use of Residential Rates:**

   Chargers use their home residential electricity rate to support the operation of a commercial customer's equipment. These residential tariffs are not intended to facilitate commercial activities but do provide a favorable rate to these micromobility companies. For example, a PG&E customer, who is also a Charger using a home outlet to charge an e-scooter will pay an average daily rate of $0.22/kWh.[458] The same Charger, if using a commercial rate, would be $0.25/kWh.[459] The micromobility companies avoid payments by charging on the wrong tariff . Inappropriate charging tariffs is expected to proliferate as micromobility companies continue to deploy more equipment and expand to more cities. As battery charging is a core component of the micromobility business model, the IOUs should work directly with the micromobility companies to ensure equipment charging practices are not circumventing commercial charging rates. The CPUC should direct the IOUs to design an education campaign as part of their broader ME&O efforts to inform micromobility companies and their contracted chargers about the importance of charging off-peak and the appropriate tariff for Chargers to utilize. (See ME&O, Chapter 12)

2. **Timing of a Charging Session:**

   The micromobility companies do not currently require or encourage chargers to charge their equipment to correspond with TOU price signals. The chargers are typically minors, who tend to search for available eScooters as soon as school is out and plug them in for charging during peak-hours.[460] If scaled, this could put strain on the grid. A data-sharing agreement between the IOUs, and/or the CPUC, and micromobility companies could provide transparency on the impacts charging the micromobility equipment will have on the local distribution network. The agreement should at a minimum request information on the number of electric micromobility options deployed, the battery capacity of the equipment, the frequency of charging events, when charging occurs, and what steps the micromobility companies have taken to encourage efficient charging practices.

3. **Use of ICE Vehicles to Collect Micromobility Equipment:**

   The method of collecting the electric mobility equipment could lead to an increase in congestion, VMT, and GHG emissions from using ICE vehicles to collecting the equipment. Depending on the final outcome of CARB's design of the California Clean Miles Standard, the TNCs' total VMT can be significantly impacted if the inclusion of micromobility equipment collection and distribution is included. However, resolution of this issue should not be an IOU responsibility. It is essential for policymakers and stakeholder to be aware of this issue, as it could impact the potential environmental benefits of micromobility transportation options.

Though still a burgeoning industry with a de minimis impact on the distribution system, it is imperative for the IOUs to plan for a future that includes tens of thousands of e-bikes and e-

[458] Based on the July 17, 2019 average for the Residential TOU Schedule E-6 tariff
[459] Based on the July 17, 2019 average for Commercial TOU A-1 tariff
[460] "Charging Electric Scooters is a Cutthroat Business" The Atlantic. May 2018 https://www.theatlantic.com/technology/archive/2018/05/charging-electric-scooters-is-a-cutthroat-business/560747/ (Accessed on January 17, 2020)

scooters charging.[461] The IOUs have a key role in ensuring the incremental load associated with new technology does not adversely impact the grid. Accordingly, the CPUC should direct the IOUs to provide guidance and support to micromobility companies. However, micromobility companies will be fully responsible for relaying the information to their staff, Chargers, and users.

12.3 Autonomous Electric Vehicles

Background

AEVs are an emerging technology with the potential to change the amount of energy required to charge the vehicle throughout the day due to different driving patterns such as higher utilization rates. The location of charging could also change if AEVs are deployed in fleets and/or concentrated at new types of chargers designed for autonomous vehicles (i.e. wireless charging). If scaled over the long term, these changes could impact how the IOUs plan for distribution service upgrades and how they design TE programs.

Discussion

AEVs have been deployed in small numbers and the timelines and scale for deployment of AEVs are uncertain. In addition, limited information is available regarding how these vehicles will operate. If the IOUs include consideration of AEVs in their TEPs, they should forecast:

- How AEVs may change the general requirements for TE infrastructure investments.
- What data AEV companies that participate in IOU TE programs should report.
- Other AEV centric topic that can impact their TEP development and implementation.

Given the potential for AEVs to alter the transportation landscape, the IOUs should track whether this technology could change what TE infrastructure investments are necessary in the future. The IOUs should coordinate with relevant CPUC staff –both Energy Division and Transportation Division—to track the advancement of AEV technology and how it could impact the EV marketplace and the grid.[462] The IOUs should provide descriptions of how the development and growth of AEVs s could impact future TE infrastructure needs in their TEP updates.

Recommendations

Energy Division staff recommends that the California Public Utilities Commission (CPUC) should direct the investor-owned utilities (IOU) to:

1. If proposing a program involving transportation network companies (TNC)s, ensure that substantial TNC matching or co-funding is secured.

[461] The City of San Francisco recently issued permits for up to 10,000 e-scooters according to the San Francisco Examiner. https://www.sfexaminer.com/the-city/e-scooters-are-here-to-stay-sf-announces-long-term-permits-for-two-wheelers/ (Accessed on January 17, 2020)

[462] Information about CPUC pilot programs is available at https://www.cpuc.ca.gov/avcpilotinfo/ Data from the pilot programs, including which pilots are using electric vehicles and the number of miles traveled, is also posted on the CPUC website: https://www.cpuc.ca.gov/avcpilotdata/

2. If proposing a program involving TNCs, demonstrate how investments that support TNC-dedicated or primary usage infrastructure will efficiently achieve state greenhouse gas reduction and transportation electrification (TE) goals and IOU TE targets.
3. If proposing a program involving TNCs, require transparent TNC data sharing with IOUs and their research partners to help inform IOU program design and strategic planning.
4. Align any ratepayer funded efforts involving TNC electrification with local, regional, and State transportation planning efforts.
5. Encourage and provide information that ensures micromobility equipment is charged on the proper electric tariff(s)
    a. The IOUs could facilitate a roundtable discussion with the micromobility companies to talk through the proper tariff, best practices for collecting the equipment, and environmentally responsible charging habits. This discussion could inform the IOUs' targeted marketing, education, and outreach plan for micromobility technology, which should be included in their Transportation Electrification Plans (TEP).
6. For any IOU TE program that installs charging infrastructure that could directly support micromobility equipment, the IOUs should establish data sharing requirements to gather more information about charging behavior
    a. Similar data sharing agreements could be pursued beyond any IOU-funded programs if micromobility companies are willing to engage more directly with the utilities
7. Develop and provide educational material about managed charging opportunities to the micromobility companies, to be distributed to their chargers.
    a. The material should provide information on how off-peak TOU periods can minimize electric costs, reduce environmental impact, and ensure efficient use of the grid resources.
8. Coordinate with the appropriate CPUC staff to track autonomous electric vehicle (AEV) deployments and trends and describe how the development and growth of AEVs could impact the future TE infrastructure needs in the IOU TEP updates.

Appendix A – Additional Legislative Background

Transportation Electrification Legislation Adopted Since SB 350

In October 2017, §740.13 and §740.14 were added to the Public Utilities Code pursuant to Assembly Bills (AB) 1082 and 1083 (Burke),[463] which authorize the utilities to propose pilot programs to install TE infrastructure at school facilities and at state parks and state beaches.

In 2018, the California legislature passed three bills, SB 1000 (Lara)[464], SB 1014 (Skinner)[465], and AB 2127 (Ting)[466].

- SB 1000 requires the CPUC to address "in an existing proceeding" rate design issues, such as EV-specific tariffs, submetering, and other grid integration technologies.

- SB 1014 requires the CPUC to implement by 2023, the CARB developed California Clean Miles Standard for all online-enabled applications or platforms by transportation network companies (TNC) on a per-passenger-mile basis. SB 1014 requires CARB to establish a GHG emission baseline for TNCs on a per-passenger-mile basis by January 1, 2020. This bill also requires CARB to adopt and set annual GHG reduction requirements for TNC companies by January 1, 2021

- AB 2127 requires the CPUC to support the CEC's development of a statewide assessment of the ZEV charging infrastructure needed to support the state's vehicle adoption and greenhouse gas (GHG) emission reduction goals.

In 2019, California legislature passed six bills related to transportation electrification, one of which requires new efforts from the CPUC, SB 676 (Bradford) as noted above.[467]

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[463] AB 1082 and 1083 (Burke) were enrolled as Chapters 637 and 638 of the Statutes of 2017. They authorize the utilities to propose, no later than July 30, 2018, pilot programs to install electric vehicle charging infrastructure at school facilities and at state parks and beaches.

[464] SB 1000 was codified as Chapter 368, Statutes of 2018, on September 14, 2018. It directs the CPUC to, within an existing proceeding, consider policies to encourage the development and deployment of grid-integration technologies, including submetering; develop new EV-specific tariffs for medium- and heavy-duty fleets, including transit fleets; and encourage charging to occur at times and locations where there is excess grid capacity.

[465] SB 1014 was codified as Chapter 369, Statutes of 2018, on September 13, 2018. It establishes the California Clean Miles Standard and Incentive Program, which among other things, will create a baseline for vehicle emissions of GHG for vehicles used by Transportation Network Companies, such as Uber and Lyft. The CPUC will implement annual GHG emission reduction targets starting in 2023.

[466] AB 2127 was enrolled as Chapter 365 of the Statutes of 2018 and added Section 25229 to the Public Resources Code and requires the CEC to prepare and biannually update, in collaboration with CARB and the CPUC, a statewide assessment of the EV charging infrastructure currently installed and the amount still necessary to support the adoption of at least 5 million EVs by 2030.
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2127

[467] addition to establish strategies to maximize the use of feasible and cost effective EV-grid integration,

Transportation Electrification Legislation Passed During 2019 Legislative Session

Bill	Sponsor	Description	Responsible Agency(s)
AB 684	Levine	Requires a review of building standards to determine if updates are needed to allow for the future installation of EVSEs at MUDs and other nonresidential developments.	California Building Standards Commission; Department of General Services; Department of Housing and Community Development
AB 784	Mullin	Exempts eligible hybrid and zero-emission buses and trucks from state sales taxes through January 1, 2024.	California Department of Tax and Fee Administration
SB 44	Skinner	Requires CARB to recommend goals to reduce GHG emissions from MD/HD vehicles from 2030 to 2050.	California Air Resources Board; California Department of Transportation; California Energy Commission; Governor's Office of Business and Economic Development
SB 676	Bradford	Requires the CPUC to establish a pathway and metrics to enable vehicle-to-grid integration by January 1, 2030.	California Public Utilities Commission; California Energy Commission; California Air Resources Board
AB 285	Friedman	Requires the Department of Transportation to identify how the state will achieve a 40% below 1990 levels GHG emission reduction by the end of 2030.	California Department of Transportation
AB 970	Salas	Provide grants, funded through the Greenhouse Gas Reduction Fund, for elderly and disabled residents of DAC and low-income communities, for the purchase of non-emergency zero-emission transportation vehicles with a capacity of 7-15 passengers.	California Air Resources Board; California Department of Aging

Appendix B – Investor Owned Utilities' Program Summary

PG&E Existing/Pending Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (million)	Markets	Disadvantaged Communities	Charger Ownership	Cost to Host	Rates	Regulatory Status
EV Charge Network	1,458 ports activated (10/19)	7,500 charging stations	$130.0	MUD, Workplaces	15% of installed charging stations	Site host or utility	Participation Payment, or balance of EVSE after rebate	Commercial TOU	Approved (12/2016) CPUC Decision 16-12-065
Medium/Heavy Duty Fleet Customer Demonstration	5 60 kW chargers activated (10/19)	One customer who operates Medium or Heavy-Duty fleets	$3.34	Commercial/Industrial	1 or more Medium and Heavy Duty demonstrations need to be in DACs	Utility	Balance of EVSE after rebate	Commercial TOU	Approved (01/2018) CPUC Desicsion 18-01-024
Electric School Bus Renewables Integration	9 L2 chargers activated (10/19)	Make-ready infrastructure for 2-5 EV school buses	$2.21	Schools	100% of infrastructure must serve one or more DACs	Site host	Portion of make-ready infrastructure investment.	Commercial TOU	Approved (01/2018) CPUC Desicsion 18-01-024
Idle Reduction Technology	25 ports under construction (10/19)	At least 15 electrified parking spaces	$1.72	Commercial/Indutrual Medium & Heavy-Duty Vehicles	Pilot must be sited in a DAC	Site host	Portion of make-ready infrastructure investment.	Commercial TOU	Approved (01/2018) CPUC Desicsion 18-01-024
Home EV Charger Information Resource Program	Project scope in progress (10/19)	Update webpage to provide information about safe EVSE installation	$0.50	Residential	Information must include materials targeting low- and moderate income customers and be available in multiple languages	N/A	N/A	N/A	Approved (01/2018) CPUC Desicsion 18-01-024
FleetReady	13 contracts signed (10/19)	Install make-ready infrastructure at 700 sites, support electrification of at least 6,500 MD/HD fleet vehicles	$236.30	Commercial/Industrial Medium & Heavy-Duty Vehicles	At least 25% of program budget must be spent in DACs	Site host	Balance of EVSE after rebate	Commercial TOU	Approved (05/18) CPUC Decision 18-05-040
Fast Charge	4 applications received (10/19)	Approximately 234 DCFC stations across 52 sites	$22.30	Light-duty vehicles	At least 25% of program budget must be spent in DACs	Site host	Balance of EVSE after rebate.	Commercial TOU	Approved (05/18) CPUC Decision 18-05-040
Empower EV Charge Network	Approved in D.19-09-006	Approximately 1,000 L2 chargers and electric panel upgrades	$4.13	Low / Moderate Income Residential	No DAC target - targets low / moderate income customers	Site host	Balance of EVSE and electric panel upgrade after rebate.	Residential TOU or EV-TOU rates	Approved (09-19) CPUC Decision 19-09-006
EV Charge Schools	Approved in D.19-11-017	88-132 L2 ports	$5.76	Schools/Educational Institutions	At least 40% of the sites must be located in a DAC	Site host or utility	Participation payment or balance of EVSE after rebate.	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017
EV Charge Parks	Approved in D.19-11-017	40 L2 ports and 3 DCFC	$5.54	State Parks and Beaches	At least 25% of the sites must be located in a DAC	Utility	Participation payment	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017

SCE Existing/Pending Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (millions)	Markets	Disadvantaged Communiti	Charger Ownership	Cost to Host	Rates	Regulatory Status
Charge Ready	2,739 ports committed (12/19)	2,500 charging stations	$44.0	Multifamily, Workplace, Public	At least 10% of ports to be installed in DACs	Site Host	Balance of EVSE after rebate	Residential TOU	Approved (01/16); $22M bridge funding authorized 12/18 (D.18-12-006) CPUC Decision 16-01-023
Residential Make Ready Rebate	4,128 rebate checks issued, $1.4M rebate dollars distibuted (12/19)	Up to 5,000 customer rebates	$4.0	Residental EVSE installation	At least 50% of funds for customers living in DACs	Site Host	Balance of EVSE after rebate	Residential TOU	Approved (01/18) CPUC Decission 18-01-024
Urban DCFC Clusters	Construction complete at 5 sites (12/19)	Up to 50 DCFC ports	$3.98	Multifamily, Workplace, Public	100% of ports in DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (01/18) CPUC Decission 18-01-024
Electric Transit Bus Make-Ready	3 participants approved (12/19)	Up to 20 charge ports	$3.98	Municipal bus fleets	Must maximize sites in DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (01/18) CPUC Decission 18-01-024
Port of Long Beach Gantry Crane	4 crane transformers energized (12/19)	Enough EVSE to serve 9 cranes	$3.04	Industrial Crane equipment	Port is surrounded by DACs	Utility	EV crane equipment; balance of EVSE after rebate	Commercial TO	Approved (01/18) CPUC Decission 18-01-024
Port of Long Beach ITS Terminal Yard Tractor	Construction complete and energized (12/19)	24 EVSEs	$0.45	Industrial Crane equipment	Port is surrounded by DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (01/18) CPUC Decission 18-01-024
MD/HD Infrastructure	8 signed agreements (12/19)	840 sites to support electrification of at least 8,490 MD/HD Evs	$356.0	MD/HD fleets	At lesat 40% of budget spent in DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (05/18) CPUC Decision 18-05-040
AB 1082	Approved in D.19-11-017	Up to 250 L1/L2 ports	$9.89	Schools/Educational Institutions	At least 40% of the sites must be located in a DAC	Site host or utility	Participation payment or balance of EVSE after rebate.	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017
AB 1083	Approved in D.19-11-017	120 L2 ports and 15 DCFC	$9.88	State Parks and Beaches	At least 25% of the sites must be located in a DAC	Utility	Participation payment	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017
Charge Ready 2	Under CPUC Review	48,000 L1, L2, DCFC ports	$760.10	MUD, Workplace, Destination Centers, MD/HD	At least 30% of ports install	Site host or utility		Commercial TO	A.18-06-015 pending CPUC approval

SDG&E Existing/Pending Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (million)	Markets	Disadvantaged Communities	Charger Ownership	Cost to Host	Rates	Regulatory Status
Power Your Drive (Infrastructure Pilot Project)	3,015 ports energized (10/19)	3,500 Charging Stations	$45.0	MUD, Workplace	10% of installed chargers located in DACs	Utility	Participant Payment	VGI rate to driver or site host	Approved (01/2016) CPUC Decision 16-01-045
Airport Ground Support Equipment	Phase 1 installations complete (12/19)	45 new charge ports, 15 retrofit charge ports, 90 new ground support equipment	$2.8	Offroad Infrastructure	Adjecent to DAC	Site host or utility owned	Balance of EVSE after rebate	Commercial TOU	Approved (01/2018); CPUC Decision 18-01-024
Car Dealer Incentives	321 incentive claims made by 65 sales persons across 15	1,500 Evs	$1.7	Education/Outreach	N/A	N/A	N/A	N/A	Approved (01/2018); CPUC Decision 18-01-024
Electrify Local Highways	Construction started at 4 locations (12/19)	80 L2, 8 DCFC	$4.0	Public DCFC	N/A	Utility	Participant Payment	Commercial TOU	Approved (01/2018); CPUC Decision 18-01-024
Fleet Delivery Services	79 L2 ports installed (12/19)	120 L2 Chargers, 6 DCFC	$3.7	Medium/Heavy Duty Infrastructure	N/A	Utility	No participant payment	Commercial Grid Intergration Rate	Approved (01/2018); CPUC Decision 18-01-024
Port Electrification	Construction complete at 2 locations (12/19)	30 EVSE	$2.4	Offroad Infrastructure	N/A	Utility	Participant Payment	Commercial TOU	Approved (01/2018); CPUC Decision 18-01-024
Green Shuttle	Construction started at 3 locations (12/19)	60 L2, 5 DCFC	$3.5	Taxi/Shuttle/Rideshare	N/A	Utility	Participant Payment	Commercial or Residential Grid Intergration Rate	Approved (01/2018); CPUC Decision 18-01-020
MD/HD Infrastructure	Approved in D.19-08-026	3,000-6,000 charge ports	$107.0	Medium/Heavy Duty Infrastructure	At least 30% of selected sites must be located in a DAC	Utility	Balance of EVSE after rebate	Commercial TOU	Approved (08/19) CPUC Decision 19-08-026
AB 1082	Approved in D.19-11-017	Up to 250 L1/L2 ports	$9.9	Schools/Educational Institutions	At least 40% of the sites must be located in a DAC	Site host or utility	Participation payment or remaining EVSE balance after rebate.	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017
AB 1083	Approved in D.19-11-017	120 L2 ports and 15 DCFC	$8.8	State Parks and Beaches	At least 25% of the state park sites and 100% of local parks must be located in a DAC	Utility	Participation payment	Commercial TOU	Approved (11/19) CPUC Decision 19-11-017
Power Your Drive Extension	(A.19-10-012)	2,000 L2 ports	$43.5	MUD, Workplace	10% of chargers located in DACs	Utility (MUD), site host (Workplace)	Participation payment (MUD) , balance of EVSE after rebate (Workplace.	VGI rate to driver or site host	A.19-10-012 pending CPUC approval

Bear Valley Electric Service Existing Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (million)	Markets	Disadvantaged Communities	Charger Ownership	Cost to Host	Rates	Regulatory Status
EV TOU Pilot rate	N/A	As many research-only sub-meters as allowed with budget	$0.14	Residential	BVES service territory does not contain any DACs	Site Host	EVSE equipment	3 EV TOU	Approved (10/18) CPUC Decission 18-09-034
Destination Make-Ready Rebate	N/A	up to 50 L2 chargers	$0.61	Customer Serving Commercial Property Owner	BVES service territory does not contain any DACs	Site Host	Cost of EV charger	EV TOU	Approved (10/18) CPUC Decission 18-09-034

Liberty Utilities Existing Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (million)	Markets	Disadvantaged Communities	Charger Ownership	Cost to Host	Rates	Regulatory Status
DC Fast Charger Project	N/A	5-9 DCFC sites (up to 8 ports per location)	$4.00	Light-Duty Consumer vehicles	Liberty service territory does not include any DACs	Site Host	Site hosts pays a participation payment or remaining EVSE balance after rebate.	Commercial TOU	Approved (10/18) CPUC Decission 18-09-034
Residential Make-Ready Rebate	N/A	1,000 residential customers ($1,500 per customer)	$1.60	Residential	Liberty service territory does not include any DACs Liberty will reserve 100 of the 1,000 rebates for existing California Alternative Rates for Energy customers	Site Host	Balance of EVSE after rebate	Residential TOU	Approved (10/18) CPUC Decission 18-09-034
Small Business Make-Ready Rebate	N/A	100 small-business customers ($2,500 per customer)	$0.30	Workplace	Liberty service territory does not include any DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (10/18) CPUC Decission 18-09-034
Bus Infrastructure Program	N/A	2 locations	$0.22	Bus Depots	Liberty service territory does not include any DACs	Site Host	Site hosts pays a participation payment or remaining EVSE balance after rebate.	Commercial TOU	Approved (10/18) CPUC Decission 18-09-034
AB 1082	N/A	28 L2 ports, 2 DCFC	$3.90	Schools/Educational Institutions	Liberty service territory does not include any DACs	Utility	Participation payment	Commercial TOU	Approved (11/19) CPUC Decission 19-11-017
AB 1083	N/A	5 L2 ports	0.783	State Parks and Beaches	Liberty service territory does not include any DACs	Utility	Participation payment	Commercial TOU	Approved (11/19) CPUC Decission 19-11-018

PacifiCorp Existing Transportation Electrification Program Summary

Program	Program Status	Scope	Budget (million)	Markets	Disadvantaged Communities	Charger Ownership	Cost to Host	Rates	Regulatory Status
Demonstration & Development Grant Program	N/A	No scope, will fund as many make-ready, hardware, installation and upfront software costs as the budget allows	$0.27	Non-residental markets	PacifiCorp CA service territory does not contain any DACs	Site Host	Balance of EVSE after rebate	Commercial TOU	Approved (10/18) CPUC Decission 18-09-034
Outreach & Education Program	N/A		$0.17	All markets		N/A	N/A/	N/A	Approved (10/18) CPUC Decission 18-09-034

Appendix C – Transportation Electrification Plan (TEP) Completeness Checklist

Energy Division staff recommends that the CPUC direct the IOUs to incorporate the following information in their TEPs. This checklist will be used evaluate whether the TEP is complete, and if the CPUC determines that a TEP is incomplete, it will be returned to the IOU with an itemized list of any missing items. If an initial TEP filing is rejected, the assigned commissioner and/or the assigned administrative law judge(s) would provide the IOU with a timeframe for remedying any issues that were not appropriately addressed and require a new filing by a specific date.

Energy Division staff recommends that the CPUC direct the IOUs' 10-year TEPs to address the following, at a minimum:

1. A forecast of EV adoption and estimates of TE infrastructure deployment needs within the utility service territory, by year. This forecast should include, at a minimum:
    a. Research on commercial and residential customer EV adoption rates within their service territory
        i. Identify any geographic regions and/or cities that have high expected EV adoption
    b. An itemized list and description of potential T&D upgrades necessary to accommodate projected EV load, particularly in already grid-constrained areas
    c. How much TE infrastructure the IOU anticipates building to enable the projected levels of EV adoption
        i. What portion of this projected infrastructure build out does the IOU propose to own and operate itself?
        ii. What portion could be addressed through Rule 15/16, potential tariff modifications and/or a more standardized make-ready budget approval process?
2. Projection of incremental TE load by customer class and site type
    a. Using the IOUs' ongoing Load Research Reports, [397] and other resources such as the CEC's IEPR, provide anticipated load shapes from residential EV charging on an hourly and seasonal basis
    b. Using data collected from the MD/HD SB 350 programs, the Load Research Reports and other resources such as the CEC's IEPR, provide anticipated load shapes from commercial customers' EV charging on an hourly and seasonal basis with specific load shapes estimated for:
        i. Transit agencies
        ii. Large commercial fleets
        iii. Ports, airports, and warehouses that may have multiple TE use cases
        iv. High-powered DCFC charging stations
    c. Project anticipated commercial TE load associated with meeting existing regulatory and legislative directives[398]
3. TE Strategies
    a. Identify which priority market segments the IOU's programs will focus on over the next five and ten years, with justification for the strategies
    b. Portfolio-wide targets that the strategies will be used to achieve

c. Expected pilot- and larger-scale program proposals that will be used to achieve the IOU's strategies over the next five and ten years
d. Estimated total cost of providing all the TE infrastructure needed to support the IOU's forecasted EV adoption
    i. Cost of infrastructure on the utility-side of the meter
    ii. Cost of customer-side infrastructure
    iii. Estimated infrastructure installation costs and O&M expenses
    iv. Expected total ratepayer cost, and how much participating customers would be expected to contribute
e. Projected distribution upgrade costs needed to support vehicle electrification
    i. Percentage of the overall costs needed to support the IOU's EV adoption forecast the 10-year plan would seek to recover from ratepayers
    ii. Budget estimates for each of the IOU's planned large-scale programs
    iii. Estimated cost savings that could be achieved if EV load is optimally managed, such as shifting EV charging to periods that provide grid benefits
    iv. Estimated distribution upgrade costs that could be incurred if EV charging is not managed in a manner that benefits the grid
f. Anticipated program requirements for each separate proposed program
    i. Participation criteria
    ii. Vendor specifications for each program's equipment needs, including strategies to harmonize procurement criteria across similar programs in various IOU service territories
    iii. Strategies to secure matching funding
        1. Partnerships with private entities
        2. Alignment with other regulatory efforts and incentive programs
    iv. Data collection, reporting, and evaluation plans
g. Include descriptions of any LCFS-funded programs and identify how the programs funded with LCFS credit revenue will contribute to the IOU's overall TE strategy and contribute to its TE targets and goals
h. Anticipated program goals, targets, and metrics

4. TE and Resiliency
    a. Address strategies to improve grid and community resiliency including:
        i. Mitigating any climate change or natural disaster-related impacts on TE infrastructure
        ii. Utilizing TE infrastructure to improve the resiliency of communities, including ESJ communities
            i. Identify infrastructure and IT system upgrades necessary to enable V2B functions
            ii. Ensure areas being rebuilt after natural disasters include sufficient infrastructure to meet the regions' current and future TE load
        iii. Demonstrating collaboration with emergency service organizations and local communities
        iv. Preparing for events that can impact the ability for the IOUs to supply customers with electricity as a transportation fuel.
    b. Coordination with other IOU resiliency efforts, including but not limited to, R.19-09-009 and R.18-12-005
5. Targets, Metrics, and Reporting

a. Identify which program-specific targets and metrics from the CPUC adopted final Scorecard the IOU is prioritizing in its initial TEP and describe the strategies the IOU will employ to achieve these.
b. Describe their portfolio-wide targets and metrics and strategies to achieve them
c. Propose an overarching evaluation budget within their TEP
d. Propose evaluation strategies in each program and pilot application to ensure every investment is designed to meet targets and track metrics from the CPUC adopted final Scorecard
e. Include cost comparison data from at least two third-party sources when submitting pilot and program applications

6. Equity Considerations
    a. Include strategies to ensure TE investments are distributed across Environmental and Social Justice (ESJ) communities as identified in Chapter 6 of the TEF
        i. Determine the appropriate equity designation(s) for each TE program depending on the focus of the TE investment, as outlined in Chapter 6
        ii. Include plans within TEPs and future program and pilot applications plans for distributing funds across ESJ communities and address the equity barriers outlined in Chapter 6, including:
            1. Providing higher program incentives to ESJ communities, where appropriate; and
            2. Designing programs to specifically address the needs of ESJ communities.
    b. Include within TEPs discussion of how the IOU will partner with planning agencies, local, governments, communities, and EJ groups to ensure equitable distribution of TE investments.
    c. Seek input from ESJ communities and clearly incorporate the feedback into TEPs, program applications, and advice letters
7. Safety Considerations
    a. Identify any existing workforce needs and/or training necessary to ensure IOU TE infrastructure is installed safely
    b. Propose strategies to partner with the California Workforce Development Board to ensure any additional training is available to all otherwise-eligible contractors and electricians
    c. Identify strategies to ensure that IOU-funded infrastructure is safely maintained or decommissioned after the program period ends or the conclusion of its useful life
8. Technology and Standards Requirements
    a. Ensure all publicly accessible TE infrastructure installed through IOU programs meet existing state regulations and are capable of high-level communication
    b. Propose strategies to ensure TE infrastructure projects being installed outside of IOU programs are not unduly delayed
    c. Discuss how existing national cybersecurity standards are integrated in the IOUs' TEPs
        i. Evaluate whether additional or updated standards are necessary for the security of IOU TE infrastructure deployment
        ii. Describe how IOUs intend to engage cybersecurity standards organizations to fill any existing gaps or address outstanding cybersecurity concerns

d. Describe the steps necessary to implement a streamlined process for load only EV charging installations
e. Propose processes to determine whether utility service upgrades are needed at potential EVSE sites
    i. Include strategies that reduce the time between application filing date and sit energization
    ii. Include strategies to ensure third-party EVSE installations and IOU owned EVSE are weighted equally on interconnection queues

9. EV Rate Evolution Plan (EVREV)
    a. Describe any new rates to be proposed over the next 10 years to follow the rate design principles described in Section 9.1
        i. Include an evaluation of current EV rates in California and elsewhere
        ii. Propose a schedule for periodically evaluating EV rates
    b. Identify rates that would apply to specific programs and explain any use case or sector-specific rates including in the EVREV
    c. Describe any programs aimed at creating value from EV-specific load management
        i. Explain who would be eligible to recover the value, and how that value would be passed to the eligible entity(ies)
        ii. Discuss how EV-specific rates will align with other load management and demand response programs
    d. Describe any rate design, load management, or EV charging educational programs designed to defer distribution upgrades
    e. Identify strategies to increase enrollment in EV rates
10. Rate Recovery and Allocation
    a. Describe how TE program costs are recovered through the distribution rate component of customers' bill
    b. Include how TE program costs will be recovered from the appropriate customer class(es)
    c. Describe the timeframe and process for the IOU reviewing the allocation factor for TE program costs within its General Rate Case 2 proceedings.
11. Public Private Partnerships
    a. Discuss potential partnership opportunities on a portfolio-wide and program-specific scale
    b. Include identified third-party financing that will be leveraged as part of the IOU TE portfolios and overall TE investment plans
12. Regional Coordination
    a. Convey how the IOU sought Air Districts' support and how the IOUs will inform the Air District and other local coordinating council(s) about the IOUs' TE program(s).
    b. Include metrics to show how their TEPs and program(s) will provide incremental air quality improvements that contribute to helping the region achieve the attainment goals of the SIP.
    c. Refer to the Infrastructure Deployment Strategy, Air District *State Implementation Plans* compliance programs, and Metropolitan Planning Organization's *Transportation Improvement Programs* in their program applications to identify and design programs that address EV charging infrastructure gaps throughout their service territories.

d. Align with and support other available Air District and MPO grant funding opportunities to design TE programs that can help the state come meet ambient air quality standard attainment.
e. Designate staff time to participate in the regional EV Coordinating Councils within their service territories.
f. Evaluate opportunities to provide information and training to local officials to support implementation of "PEV Readiness" plans, including adoption of local "Reach Codes" to provide increased TE infrastructure and training local code officials.

13. Evaluate each of the following priority segments and opportunities identified in the TEF:
    a. Strategies to support infrastructure necessary to help transit agencies, fleets, ports, and other medium- and heavy-duty and off-road vehicle operators shift to EVs to comply with CARB regulations
    b. Strategies to facilitate CALGreen implementation and incent building developers to exceed minimum EVSE code requirements
    c. Strategies to support implementation of local "PEV Readiness" plans, including adoption of local "Reach Codes"
    d. Strategies to advance vehicle-grid integration across all proposed TE programs and infrastructure investments
14. Marketing, Education, and Outreach efforts
    a. Propose a single budget and overarching ME&O plan within the TEP focused on EV rates, EV charging behavior, and the electric grid.
        i. Where feasible, the IOUs should coordinate their outreach about EV charging behavior and its interaction with grid reliability across IOU territories
        ii. The IOUs should consider budgeting for a third-party program administrator to implement this effort.
        iii. There should be a clear focus on reaching ESJ communities with this program.
        iv. Identify clear targets and metrics for this program.
    b. Develop broad ME&O plans that include collaboration plans with CBOs, EJ groups, and local governments
        i. These outreach plans should include the specific organizations that the IOUs will be collaborating with and how they will engage with the community or communities they are seeking to reach
        ii. The
    c. Include strategies to evaluate the IOU's ME&O efforts to measure progress toward the targets and metrics adopted in the final Scorecard
    d. Coordinate LCFS ME&O with other TE ME&O efforts

Appendix D – Pilot Project Advice Letter Template

I. **Subject:** [Utility Company Name, UXXXE] Proposal for TE Pilot Program(s) under the DRIVE OIR

II. **Purpose:** Identify the subject of the advice letter, including a summary of the pilot(s) as follows:
   A. Pilot cost
   B. Duration of pilot
   C. TE barrier(s) being addressed
   D. Research question(s) or strategy to address TE barrier(s) the pilot is targeting
   E. Metrics to measure pilot success
   F. Potential strategies for partnering and/or scaling up the program if pilot is successful

III. Background
   A. Identify the CPUC decision that approved the utility's TEP.
      i. Describe how the pilot proposed aligns with the CPUC guidelines adopted in that Decision.
      ii. Describe how, if at all, the program aligns with any other CPUC Decision(s).
   B. Describe how the proposed pilot aligns with the utility's approved TEP.
      i. What lessons learned from prior pilot(s) and/or program(s) are being utilized to inform this pilot program design?
      ii. Discuss how the project is consistent with the utility's other planning and infrastructure development strategies, including its Integrated Resource Planning, Distributed Energy Resources Planning, and any other planning processes identified as crucial to align TE with in the utility's TEP.

IV. Pilot Proposal: Describe how the proposed pilot program(s) will contribute to the utility's strategic transportation electrification plan (TEP) and the targets identified in the plan. Include clear, detailed answers to each of the following questions for each project:
   A. What specific barrier(s) to widespread TE does the proposed program aim to address?
      i. How does the pilot address the identified TE barrier(s)?
      ii. What prior pilot program result(s) were used to develop the proposal?
      iii. Which stakeholders were engaged in developing the program proposal?
      iv. What TEF Scorecard metrics will be tracked to measure the program's success toward addressing the identified barrier(s), and how will they be tracked?
   B. How will the proposed project(s) address local, regional and state policies, including the state's Zero-Emissions Vehicle Action Plan, and the Air Resources Board's Scoping Plan and Mobile Source Strategy?
   C. How will the project(s) increase access to, or provide benefits of, TE for disadvantaged communities (DAC), as defined by SB 350, and other priority populations?
      i. Will the vehicles supported by the program be driven by or accessible by low- or moderate-income customers?
      ii. Will the vehicles the program supports travel through DACs and/or other communities that are highly burdened by pollution from the transportation sector?
      iii. If the vehicles will not be driven by DAC residents or through DACs, what benefits to DACs could the program provide?

D. What TEF Scorecard metrics will be tracked to measure the program's impact on DACs and other priority populations?
    i. What partners will collaborate with the utility to complete the project(s)?
    ii. How much private investment will be leveraged:
        1. To support infrastructure installation?
        2. To support charging station deployment?
        3. To procure vehicles?
    iii. What other public funding resources will be leveraged to fund the project(s)?
    iv. Will any utility procurement associated with the program encourage the development of new business opportunities or third-part market participants?
        1. How does the program design enable consumer choice, in terms of offering multiple vendor and contractor options for program participants?
        2. How does the utility's program design ensure this proposal will avoid or mitigate any potential unfair competition with nonutility enterprises?

E. How will the utility seek cost recovery for the pilot project(s)?
    i. How was the budget for the program developed?
        1. Provide the estimated budget in nominal dollars and also for the full project with escalators and loaders over its expected term.
        2. Break the estimated budget line items into capital and expenses.
        3. What is the estimated rate increase an average customer will face, by class?

F. What program parameters are designed to avoid stranded costs that might result from the proposed project(s)?

G. What safety requirements are included in the proposed project(s)?
    i. Does the project(s) align with the Safety Requirements Checklist adopted in D.18-01-024, D.18-05-040, and D.18-09-034?
    ii. Are there additional safety requirements included in the proposal that should be noted? If so, explain the need for incremental safety requirements for the proposed project(s).

H. What data collection and reporting requirements are included in the proposed project(s)?
    i. How does the utility propose to evaluate the success of the project(s)?
    ii. What metrics will be tracked to develop future research questions? How do they align with the final Scorecard adopted within the TEF?
    iii. What criteria will the utility measure the project(s)'s success against to determining whether its results suggest the need for larger-scale program development?

I. How does the utility propose to evaluate the pilot once it is complete?
    i. What would indicate success in addressing the barrier(s) the pilot is targeting?
    ii. How could the pilot be scaled if it is successful?

Appendix E – Proposed Scorecard Targets and Metrics

Scorecard Targets

Energy Division staff's recommended Scorecard targets are listed below.

Scorecard Target	Category of Target	Program vs. Portfolio	Description
Number of EV drivers without access to home charging that are provided access to EV charging through an IOU infrastructure program	Infrastructure Target	Program-Specific target	Within an infrastructure program, a target would be set for the number of residential customers without access to home charging served (either by on-site or public/shared off-site infrastructure)
Average number of days from customer application for EV service connection to utility approval (reduction in current average)	Process Improvement Target	Portfolio-Wide	Final Scorecard would set a max. number of days for service connections of different types and a deadline (e.g. 2022), to ensure reduced waiting time.
Percent of utility territory's EV driver customers enrolled on an EV rate	Load Management/VGI Target	Portfolio-Wide	Final Scorecard would set a target percent of drivers and a deadline (e.g. 2025) for each IOU's portfolio of EV rates
Percent of utility territory's EV drivers who have received education about EV rates	Load Management/VGI Target	Portfolio-Wide	Final Scorecard would set a target percent of drivers and a deadline (e.g. 2025) for each IOU's portfolio of EV rates
Total number of light-duty EV charging ports IOUs build within a program	Infrastructure Target	Program-Specific	Dependent on Infrastructure Deployment Strategy, so target(s) would be defined following the release of the CEC Assessment
Number of charging site locations (light-duty and	Infrastructure Target	Program-Specific	Dependent on Infrastructure

MD/HD) that the IOU electrifies within a program			Deployment Strategy, so target(s) would be defined following the release of the CEC Assessment
EV charging port distribution goals based on geography (port per census tract)	Infrastructure Target	Portfolio-Wide	Dependent on Infrastructure Deployment Strategy, so target(s) would be defined following the release of the CEC Assessment (target aims to ensure equitable distribution of charging infrastructure throughout rural and less populated areas)
Number of transit agencies electrified	Infrastructure Target	Program-Specific	Within an infrastructure program, a target would be set for the number of transit agencies an IOU would need to electrify.
Number of public fast-charging sites built along transit corridors	Infrastructure Target	Program-Specific	Dependent on Infrastructure Deployment Strategy, so target(s) would be defined following the release of the CEC Assessment
Number of heavy-duty port and off-road electrification projects completed	Infrastructure Target	Program-Specific	Dependent on Infrastructure Deployment Strategy, so target(s) would be defined following the release of the CEC Assessment
Number of ESJ community customers served by ratepayer funded charging infrastructure	Equity Target	Program-Specific	Within an infrastructure program, a target would be set for the number of either DAC, low-income, or tribal community customers served

			(either by light duty on-site or public/shared off-site infrastructure, or transit)
Date by which single family homeowners and those without access to home charging have the opportunity to pay the same amount per kWh to fuel an EV.	Equity Target	Portfolio-Wide	Final Scorecard would set a deadline (e.g. 2025)
Number of school buses electrified	Infrastructure Target	Program-Specific	Within an infrastructure program, a target would be set for the number of school buses electrified as a result of ratepayer funded infrastructure
Number of light-duty EV charging ports installed at new construction locations, beyond CALGreen or local EV readiness standards	Infrastructure Target	Program-Specific	Within an infrastructure program, a target would be set for the number of light-duty EV charging ports the IOU should install at new construction locations

Scorecard Metrics

Energy Division staff's recommended Scorecard metrics are listed below. This list does not include the data collection required for each individual TE program and pilot, like the SB 350 Data Collection Template.[468]

Scorecard Metric	Category of Metric	Program vs. Portfolio	Description/Notes
Number of all EV chargers deployed in service territory	Infrastructure Metric	Portfolio-Wide	The goal is to ensure the utilities can plan for EV deployment by knowing how many EV chargers are within their service territories (this should include all chargers Level 2 and above)

[468] The CPUC adopted requirements for the IOUs to file standardized data collection templates for the SB 350 programs authorized in D.18-01-024, D.18-05-040, and D.18-09-034. The data collection and reporting templates are available at https://www.cpuc.ca.gov/sb350te/ (Accessed on February 3, 2020)

Location of all EV chargers deployed in service territory	Infrastructure Metric	Portfolio-Wide	The goal is to ensure the utilities can plan for EV deployment by knowing where EVs are located within their service territories (data on location should include the circuit location for all chargers Level 2 and above)
Percent of IOU TE program participants that are small business customers	Infrastructure Metric	Program-Specific	Would need to define small businesses (should work with ED, PAC, and SBUA)
Percent of auto dealerships with publicly accessible charging on-site	Infrastructure Metric	Portfolio-Wide	Data gathering effort
Number of available ports per light-duty EV	Infrastructure Metric	Portfolio-Wide	Will support Infrastructure Deployment Strategy efforts
IOU funded charger utilization rate vs. expected utilization rate	Infrastructure Metric	Portfolio-Wide	Will need common definition for utilization rate
Percent of IOU ratepayers with access to chargers at home, work, and/or along daily routes	Infrastructure Metric	Portfolio-Wide	Will support Infrastructure Deployment Strategy efforts and future IOU investments
Number of EVSEs installed that are dedicated for MUD residents/renters	Infrastructure Metric; Equity Metric	Portfolio-Wide	Will measure equity efforts
Percent of publicly accessible parking spaces converted to EV parking	Infrastructure Metric	Portfolio-Wide	Data gathering effort
Ratepayer dollars spent per site electrified	Financial Metric	Program-Specific	Will support future IOU investments
Cost per port by major cost category—including site design, permitting, transformer, electrical panel, conduit, wiring, trenching, accessibility (if required), other demolition and reconstruction, EVSE	Financial Metric	Program-Specific	Will support future IOU investments

equipment and installation, and labor vs. equipment breakdown			
Cost per port for annual operating and networking costs	Financial Metric	Program-Specific	Data gathering effort
Percent of programs funded by non-ratepayer sources	Financial Metric	Program-Specific	Will support future IOU investments
Gallons of petroleum reduced as a result of IOU spending	Environmental Metric	Portfolio-Wide	IOUs must develop common methodology
Improved AQI on key transit corridors	Environmental Metric	Portfolio-Wide	Data gathering effort
Percent of Fortune 1,000 companies with electrified fleets	Financial Metric	Portfolio-Wide	Data gathering effort
kWhs charged with renewable energy load	Load Management/VGI Metric	Portfolio-Wide	Will help inform the efficacy of EV rates in shifting load
EVs adopted by sector (residential, fleets, etc.) as a result of IOU programs	Vehicle Metric	Portfolio-Wide	IOUs must develop common methodology
IOU dollars spent per GHG avoided	Environmental Metric	Portfolio-Wide	IOUs must develop common methodology
GHG reductions associated with IOU TE investments	Environmental Metric	Portfolio-Wide	IOUs must develop common methodology
Cumulative customer bill impacts resulting from TE programs	Financial Metric	Portfolio-Wide	IOUs must track the TE bill impacts by customer class

Appendix F – Data Sources for Medium and Heavy-Duty Sector Market Maturity Assessment

As noted in Chapters 4 and 5, IOU TEPs proposals should implement the four-step process of determining appropriate IOU roles with the following specific MD/HD considerations:

1. **The TEF Identifies TE Market Barriers:**
The potential market barriers listed in Chapter 4 are also relevant for MD/HD vehicles.

2. **State Agencies Prioritize TE Segments**:
CARB plans and regulations include timelines that can assist the IOUs in identifying which segments have the most time-sensitive needs for which to provide input to CARB as it adopts regulations and/or programs to advance the transition to electrification. For instance, the MSS completed by CARB in 2016 includes[469]

- Innovative Clean Transit (transit buses)
- Advanced Clean Trucks (Class 2B to Class 8 trucks)
- Zero-Emission Airport Shuttle Buses
- At-Berth Regulation Amendments
- Off-Road Equipment Sources Zero-Emission Off-Road Forklift Regulation Phase 1
- Zero-Emission Off-Road Worksite Emission Reduction Assessment
- Zero-Emission Airport Ground Support Equipment
- Transport Refrigeration Units Used for Cold Storage
- The MSS also identifies a process to develop additional technologies that could be added to this list.

CARB's MSS due January 1, 2021 and implementing regulations will be particularly helpful for MD/HD vehicles because they will:

- Inform strategies to fill TE infrastructure gaps for MD/HD segments that, unlike passenger vehicles, do not have specific vehicle deployment targets and timelines specified in legislation and Executive Orders.[470] The MSS will include timelines for adopting implementing regulations and the implementing regulations will contain specific vehicle deployment requirements. IOUs should also utilize data collected by CARB during the development of regulations identified in the MSS on when and where TE infrastructure will be needed.
- Identify specific air quality needs from the MD/HD diesel vehicle segments (in coordination with local air quality plans). [471]

3. **Assess Market Maturity in Priority TE Segments**
Many MD/HD segments are in the very early development and should be incorporated into the broader Market Maturity Assessment described above. The MD/HD Market Maturity Assessment should be based on resources such as:

[469] "Mobile Source Strategy", California Air Resources Board, 2016, p.52, Available at https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf , accessed on December 1, 2019:

- Lessons learned from CARB, CEC and IOU funded demonstration can help identify the extent to which various MD/HD segments face market barriers and thus inform the Market Maturity Assessment. While IOU pilots and initial MD/HD infrastructure programs are not yet complete, IOUs should review, share, and evaluate lessons learned that are available when they prepare TEFs. Future MD/HD applications should demonstrate how existing programs inform new program design.
- The CARB Heavy-Duty Investment Strategy included in the Fiscal Year 2019-20 Three-Year Recommendations for Low Carbon Transportation Investments contains detailed assessments of market maturity for a broad range of medium and heavy-duty vehicle segments.[472] The CARB MSS also includes data on the stage of commercialization for certain market segments.[473]
- The CEC infrastructure planning process often identifies the availability to TE technologies.[474]

4. **Develop IOU Programs to Overcome Market Barriers**:

IOU strategies for MD/HD segments should be structured based on the needs of individual MD/HD segments for several reasons. First, MD/HD infrastructure programs should consider the needs of individual market segments. In addition, many MD/HD technologies are in earlier stages of development and will likely require more intensive support. Furthermore, concentrated electric load as a result of EV fleets could create challenges for utility service, and can lead to significant demand charges, but also provide greater potential opportunities for VGI services.

Appendix G – Electric Vehicle Rates Background

Residential

As of 2019, most IOUs offer both whole-house and separately metered residential EV rates. These rates include a TOU component with a sharp peak/off-peak differential as the distinguishing feature of the rates from standard tiered rates. The IOUs also offer a dedicated rate for those who wish to cover the cost of installing a separate meter for EV charging[475]. SDG&E is the only IOU offering a super off-peak (SOP) period, but its SOP prices are still higher than SCE and PG&E's off-peak periods.

Commercial

SCE and Liberty Utilities[476] are the only IOUs currently offering[477] commercial EV rates. PG&E had commercial rates approved in October 2019 (D.19-10-055) and expects to offer them starting in May 2020, with full implementation planned for October 2020. SDG&E has proposed a new commercial EV rate that is currently under consideration (A.19-07-006). There has been no overarching guidance from the CPUC or legislature regarding preferred components of commercial EV rates, although SB 1000 encourages the CPUC to explore policies that "reduce the effects of demand charges." The Legislature's guidance aligns with a consensus among experts[478][479], non-profits[480], and industry groups[481] that demand charges, and non-coincident demand charges in particular, are a significant hinderance to early-stage deployment of transportation electrification where utilization is low, particularly for DCFCs. Within that context, the IOUs have all proposed varying strategies to address demand charges within their rates, as well as introduce time-varying elements.

SCE is launching new 10-year rate with 5-year demand-charge holiday. After 5 years, demand charges will be gradually reintroduced. Over the demand charge phase-in, energy rates will go down as demand charges go up. In addition to altering demand charges, it also applies a different cost

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[476] Liberty Utilities offers a basic TOU EV rate to small commercial customers https://california.libertyutilities.com/portola/residential/smart-energy-use/what-is-the-tou-ev-rate.html

[477] BVES's commercial EV rate was approved in D.18-09-034 https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442459116

[478] "Increasing Electric Vehicle Fast Charging Deployment: Electricity Rate Design and Site Host Options" Ryan Hledik, Jurgen Weiss, The Brattle Group, January 2019. https://www.brattle.com/news-and-knowledge/publications/increasing-electric-vehicle-fast-charging-deployment-electricity-rate-design-and-site-host-options

[479] "EVgo Fleet and Tariff Analysis" https://rmi.org/wp-content/uploads/.../eLab_EVgo_Fleet_and_Tariff_Analysis_2017.pdf and "Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand" Garret Fitzgerald and Chris Nelder, Rocky Mountain Institute, 2017 https://rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf

[480] "Reforming Rates for Electric Trucks, Buses & Fast Chargers" Miles Muller, NRDC, December 2018 https://www.nrdc.org/experts/miles-muller/reforming-rates-electric-trucks-buses-fast-chargers

[481] "Petition of the California Solar & Storage Association, California Energy Storage Association, Enel X, Engie Services, Engie Storage, OhmConnect, Inc., Solar Energy Industries Association, and Stem, Inc. to adopt, amend, or repeal a regulation pursuant to Pub. Util. Code § 1708.5" P.18-11-004 http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M237/K979/237979007.PDF

recovery principle than most commercial rates[482]. As part of D.18-05-040, SCE was also ordered to file a separate rate for DCFCs no later than its 2021 GRC proceeding, which will occur in early 2020.

PG&E's application A.18-11-003 was approved by the CPUC in D.19-10-055 to establish a new commercial EV rate that replaces traditional demand charges with a "subscription charge" allowing customers to select their level of demand, with an eye towards predictability and ease-of-understanding. PG&E claims this rate would provide greater consistency in monthly electricity costs, allowing commercial customers to make investment and business decisions with more confidence than existing commercial rates. This decision also establishes a separate rate class for EV customers to recover costs.

SDG&E filed A.19-07-006 with the CPUC to establish a "high-powered" commercial EV rate specifically for DCFC and MD/HD customers.

The following tables include specifics of each of the IOUs' existing EV rates in their California service territories:

[482] Generation capacity costs are typically collected through time-related demand (TRD) charges billed by maximum customer demand. However, this new rate collects TRD charges via time-differentiated volumetric charges. Facilities-related demand (FRD) (i.e., distribution capacity) charges are absent in year 1-5, then ramp up 10% each year until 60% of FRD costs are collected through a fixed monthly charge and the remaining 40% are collected through the TOU energy charge. Transmission charges will also be ramped up in a similar way.

Bear Valley Electric Service

BVES TOU-EV-1[483]

Residential

EV only

Summer: May 1 to October 31

On-Peak		Hour	Summer Prices ($/kWh)
	Start	4:00 PM	$0.18149
	End	9:59 PM	
Off-Peak		Hour	Summer Prices ($/kWh)
	Start	10:00 PM	$0.13612
	End	8:59 AM	
Super Off-Peak		Hour	Summer Prices ($/kWh)
	Start	9:00 AM	$0.09074
	End	3:59 PM	
Demand Charge: ($/kw)	N/A		
Customer Charge:(i.e. $/month or $/meter)	N/A		

Winter: November 1 to April 30

On-Peak		Hour	Winter Prices ($/kWh)
	Start	5:00 PM	$0.31446
	End	10:59 PM	
Off-Peak		Hour	Winter Prices ($/kWh)
	Start	11:00 PM	$0.12704
	End	8:59 AM	
Super Off-Peak		Hour	Winter Prices ($/kWh)
	Start	9:00 AM	$0.09074
	End	4:59 PM	
Demand Charge: ($/kw)	N/A		

[483] Tariff available at https://www.bves.com/media/managed/ratechange010119/Sch_TOU_EV_1_354_E_Revised.pdf (Accessed January 16, 2020)

Customer Charge:(i.e. $/month or $/meter)	N/A		

BVES TOU-EV-2[484]

Commercial

EV only

Summer: May 1 to October 31

On-Peak		Hour	Summer Prices ($/kWh)
	Start	4:00 PM	$0.18149
	End	9:59 PM	
Off-Peak		Hour	Summer Prices ($/kWh)
	Start	10:00 PM	$0.13612
	End	8:59 AM	
Super Off-Peak		Hour	Summer Prices ($/kWh)
	Start	9:00 AM	$0.09074
	End	3:59 PM	
Demand Charge: ($/kw)	N/A		
Customer Charge:(i.e. $/month or $/meter)	N/A		

Winter: November 1 to April 30

On-Peak		Hour	Winter Prices ($/kWh)
	Start	5:00 PM	$0.31446
	End	10:59 PM	
Off-Peak		Hour	Winter Prices ($/kWh)
	Start	11:00 PM	$0.12704
	End	8:59 AM	
Super Off-Peak		Hour	Winter Prices ($/kWh)

[484] Tariff available at https://www.bves.com/media/managed/ratechange010119/Sch_TOU_EV_2_354_E_Revised.pdf (Accessed on January 16, 2020)

	Start	9:00 AM	$0.09074
	End	4:59 PM	
Demand Charge: ($/kw)	N/A		
Customer Charge:(i.e. $/month or $/meter)	N/A		

BVES TOU-EV-3[485]

Commercial

EV only

Summer: May 1 to October 31

On-Peak		Hour	Summer Prices ($/kWh)
	Start	4:00 PM	$0.18149
	End	9:59 PM	
Off-Peak		Hour	Summer Prices ($/kWh)
	Start	10:00 PM	$0.13612
	End	8:59 AM	
Super Off-Peak		Hour	Summer Prices ($/kWh)
	Start	9:00 AM	$0.09074
	End	3:59 PM	
Demand Charge: ($/kw)	9.00		
Customer Charge:(i.e. $/month or $/meter)	N/A		

Winter: November 1 to April 30

On-Peak		Hour	Winter Prices ($/kWh)
	Start	5:00 PM	$0.31446
	End	10:59 PM	
Off-Peak		Hour	Winter Prices ($/kWh)

[485] Tariff available at https://www.bves.com/media/managed/ratechange010119/Sch_TOU_EV_3_354_E_Revised.pdf (Accessed on January 16, 2020)

	Start	11:00 PM	$0.12704
	End	8:59 AM	
Super Off-Peak		Hour	Winter Prices ($/kWh)
	Start	9:00 AM	$0.09074
	End	4:59 PM	
Demand Charge: ($/kw)	9.00		
Customer Charge:(i.e. $/month or $/meter)	N/A		

Liberty Utilities

Liberty Utility EV TOU Domestic Service (TOU D-1 EV)[486]

Residential

Whole House

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	10:01 a.m.	$0.13768	5:01 p.m.	$0.14111
	End	10:00 p.m.		10:00 p.m.	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	n/a	n/a	7:01 a.m.	$0.13735
	End	n/a		5:00 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	10:01 p.m.	$0.08042	10:01 p.m.	$0.08042
	End	10:00 a.m.		7:00 a.m.	
Demand Charge: none					
Customer Charge: $13.43 per month					

Note: Winter is October through May. Summer is June through September.

Liberty Utility EV TOU Small General Service (TOU A-1 EV)[487]

Small Commercial

Whole Facility

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	10:01 a.m.	$0.15633	5:01 p.m.	$0.17076
	End	10:00 p.m.		10:00 p.m.	
Mid-Peak		Hour	Summer Prices ($/kWh)		Winter Prices ($/kWh)
	Start	n/a	n/a	7:01 a.m.	$0.15633
	End	n/a		5:00 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)		Winter Prices ($/kWh)
	Start	10:01 p.m.		10:01 p.m.	

[486] Tariff available at https://california.libertyutilities.com/uploads/LU-CA%20March%201%20Revised%20Tariffs/D1%20TOU%20EV%20March%201.pdf (Accessed on January 16, 2020)

[487] Tariff available at https://california.libertyutilities.com/uploads/LU-CA%20March%201%20Revised%20Tariffs/A1%20TOU%20EV.pdf (Accessed January 16, 2020)

End	10:00 a.m.	$0.10524	7:00 a.m.	$0.10524
Demand Charge:	None			
Customer Charge: $20.21 per month				

Note: Winter is October through May. Summer is June through September.

Liberty Utility Small General Service (A-1)[488]

Small Commercial

Whole Facility

On-Peak	Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
Start		$0.15633	$0.15633
End			
Mid-Peak	Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
Start		$0.15633	$0.15633
End			
Off-Peak	Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
Start		$0.15633	$0.15633
End			
Demand Charge: none			
Customer Charge: $15.29			

Note: Interim rate for DCFCs. There is one rate for all usage.

[488] Liberty Utilities has proposed to apply its A-1 tariff to DCFC sites in its service territory until it implements a DCFC specific rate. Draft Resolution E-5042 was circulated to the service list of A.17-06-031 et al, and is on the CPUC February 6, 2020 voting agenda. Tariff available at https://california.libertyutilities.com/uploads/CPUC%20Sheet%20107-109%20-%20Schedule%20No.%20A-1.pdf (Accessed on January 16, 2020).

Pacific Gas and Electric

PG&E EV-A[489]

Residential

Whole House

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	2pm	$0.54121	$0.37957
	End	9pm		
Mid-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	7am and 9pm	$0.29567	$0.23289
	End	2pm and 11pm		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	11pm	$0.14232	$0.14567
	End	9am		
Demand Charge: none				
Customer Charge: none				

Note: Peak hours are 3pm to 7pm on weekends and holidays. Partial peak hours do not apply weekends and holidays. Rates effective 1/1/20.

Summer Season is May through October (6 months)

Winter Season is November through April (6 months)

EV-A is only available to solar customers eligible for legacy Time-of-Use treatment. Other customers moved to EV2-A.

PG&E EV-B[490]

Residential

EV only

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	2pm	$0.53525	$0.37322
	End	9pm		
Mid-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	7am and 9pm	$0.29269	$0.22971
	End	2pm and 11pm		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	11pm	$0.14189	$0.14521
	End	9am		

[489] EV-A has closed for new enrollments. Tariff available at https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_SCHEDS_EV%20(Sch).pdf (Accessed on January 16, 2020).

[490] Tariff available at https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_SCHEDS_EV%20(Sch).pdf (Accessed January 16, 2020).

Demand Charge: none	
Customer Charge: $1.50/month	

Note: Peak hours are 3pm to 7pm on weekends and holidays. Partial peak hours do not apply weekends and holidays. Rates effective 1/1/20.

Summer Season is May through October (6 months)

Winter Season is November through April (6 months)

EV-B is currently available but is expected to be displaced by Schedule EV2B, which is not currently available.

PG&E EV2-A[491]

Residential

Whole House

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	4pm	$0.48179	$0.35468
	End	9pm		
Mid-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	3pm and 9pm	$0.37130	$0.33798
	End	4pm and 12am		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	12am	$0.16928	$0.16928
	End	3pm		
Demand Charge: none				
Customer Charge: none				

Note: Time periods apply every day. Rates effective 1/1/20.

Summer Season is June through September (4 months)

Winter Season is October through May (8 months)

[491] Tariff available https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_SCHEDS_EV2%20(Sch).pdf (Accessed on January 16, 2020).

PG&E
BEV-1

Commercial < 100kW

EV only

On-Peak		Hour	Prices ($/kWh)
	Start	4pm	$0.32858
	End	9pm	
Off-Peak		Hour	Prices ($/kWh)
	Start	2pm and 9pm	$0.13657
	End	4pm and 9am	
Super Off-Peak		Hour	Prices ($/kWh)
	Start	9am	$0.10991
	End	2pm	
	Subscription Charge: $12.41 per 10kW. Overage charge of $2.48/kW		
Customer Charge: none			

Note: Tariff not expected to be available until 5/1/20. Rates set at values that would be applied under 1/1/20 revenue requirements.

Rates do not vary by season.

PG&E BEV-2 S

Commercial > 100kW, Secondary voltage

EV only

On-Peak		Hour	Prices ($/kWh)
	Start	4pm	$0.34490
	End	9pm	
Off-Peak		Hour	Prices ($/kWh)
	Start	2pm and 9pm	$0.13167
	End	4pm and 9am	
Super Off-Peak		Hour	Prices ($/kWh)
	Start	9am	$0.10840
	End	2pm	
Subscription Charge: $95.56 per 50kW. Overage charge of $3.82/kW			
Customer Charge: none			

Note: Tariff not expected to be available until 5/1/20. Rates set at values that would be applied under 1/1/20 revenue requirements.

Rates do not vary by season.

PG&E BEV-2 P

Commercial > 100kW, Primary voltage

EV only

On-Peak		Hour	Prices ($/kWh)
	Start	4pm	$0.33694
	End	9pm	
Off-Peak		Hour	Prices ($/kWh)
	Start	2pm and 9pm	$0.12806
	End	4pm and 9am	
Super Off-Peak		Hour	Prices ($/kWh)
	Start	9am	$0.10540
	End	2pm	
Subscription Charge: $85.98 per 50kW. Overage charge of $3.44/kW			
Customer Charge: none			

Note: Tariff not expected to be available until 5/1/20. Rates set at values that would be applied under 1/1/20 revenue requirements.

Rates do not vary by season.

Southern California Edison

TOU-D Option PRIME[492]

Residential

Whole-house

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.39314	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.27479	4 p.m.	$0.35943
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.13577	9 p.m.	$0.12932
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.12932
	End	N/A		4 p.m.	
Non-seasonal Components					
Customer Charge:($/day)			$0.39500		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates.

TOU-EV-7[493]

Commercial, mthly. max demand <= 20kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.41056	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.29776	4 p.m.	$0.31791
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.14839	9 p.m.	$0.14030
	End	4 p.m.		8 a.m.	

[492] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/residential-rates/ELECTRIC_SCHEDULES_TOU-D.pdf. (Accessed on January 16, 2020).

[493] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-7.pdf (Accessed on January 16, 2020).

Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$ 0.08496
	End	N/A		4 p.m.	
Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					
Customer Charge:($/day)			$0.34700		
Three-Phase Service ($/day)			$0.03100		
Voltage Discount - Energy ($/kWh)					
From 2 kV to 50 kV			$(0.00197)		
From 51 kV to 219 kV			$(0.02395)		
220 kV and above			$(0.04851)		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. This tariff has two options: Option E with no demand charge and Option D. The rates for both options are the same as demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

TOU-EV-8[494]

Commercial, mthly. max demand > 20 kW and <= 500 kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.49738	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.25694	4 p.m.	$0.29831
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.12710	9 p.m.	$0.13700
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.07865
	End	N/A		4 p.m.	

[494] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-8.pdf (Accessed on January 16, 2020).

Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					
Customer Charge:($/meter/month)			$117.96000		
Voltage Discount - Demand ($/kW)					
From 2 kV to 50 kV			$ -		
From 51 kV to 219 kV			$ -		
220 kV and above			$ -		
Voltage Discount - Energy ($/kWh)					
From 2 kV to 50 kV			$(0.00201)		
From 51 kV to 219 kV			$(0.02619)		
220 kV and above			$(0.04902)		
Power Factor Adjustment ($/kVAR)					
Greater than 50 kV			$0.54000		
50 kV or less			$0.60000		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. Demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

TOU-EV-9 (Below 2kV)[495]

Commercial, mthly. max demand > 500 kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.44227	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.22135	4 p.m.	$0.25703
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.10703	9 p.m.	$0.11285
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.06890
	End	N/A		4 p.m.	
Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					

[495] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-9.pdf (Accessed on January 16, 2020).

Customer Charge:($/meter/month)		$433.47000		
Power Factor Adjustment ($/kVAR)		$0.60000		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. Demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

TOU-EV-9 (Below 2kV)[496]

Commercial, mthly. max demand > 500 kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.44227	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.22135	4 p.m.	$0.25703
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.10703	9 p.m.	$0.11285
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.06890
	End	N/A		4 p.m.	
Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					
Customer Charge:($/meter/month)			$433.47000		
Power Factor Adjustment ($/kVAR)			$0.60000		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. Demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

TOU-EV-9 (From 2kV to 50kV)[497]

Commercial, mthly. max demand > 500 kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.40891	N/A	N/A
	End	9 p.m.		N/A	

[496] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-9.pdf (Accessed on January 16, 2020).

[497] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-9.pdf (Accessed on January 16, 2020).

Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.20129	4 p.m.	$0.23603
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.09854	9 p.m.	$0.10323
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.06493
	End	N/A		4 p.m.	
Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					
Customer Charge:($/meter/month)			$231.24000		
Power Factor Adjustment ($/kVAR)			$0.60000		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. Demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

TOU-EV-9 (Above 50kV)[498]

Commercial, mthly. max demand > 500 kW

EV only - Separately metered

On-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.30422	N/A	N/A
	End	9 p.m.		N/A	
Mid-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	4 p.m.	$0.11772	4 p.m.	$0.15389
	End	9 p.m.		9 p.m.	
Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	9 p.m.	$0.07972	9 p.m.	$0.08353
	End	4 p.m.		8 a.m.	
Super Off-Peak		Hour	Summer Prices ($/kWh)	Hour	Winter Prices ($/kWh)
	Start	N/A	N/A	8 a.m.	$0.05749
	End	N/A		4 p.m.	
Demand Charge: ($/kW)			$ -		$ -
Non-seasonal Components					

[498] Tariff available at https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-9.pdf (Accessed on January 16, 2020).

Customer Charge:($/meter/month)			$1,597.39000		
Voltage Discount - Demand ($/kW)					
220 kV and above			0		
Voltage Discount - Energy ($/kWh)					
220kV and above			$(0.00693)		
Power Factor Adjustment ($/kVAR)			$0.54000		

Note: Summer season is June through September. Mid-peak rates in summer only apply on weekends in lieu of On-peak rates. Demand charges are set to zero until March 1, 2024 and will phase-in thereafter.

San Diego Gas & Electric

SDG&E Schedule EV-TOU[499]

Residential

EV-only

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	4:00pm (Everyday)	$0.55279	$0.30540
	End	9:00pm (Everyday)		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April	$0.33796	$0.29767
	End	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April		
Super Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	Midnight 10:00 am in March and April (Weekdays)	$0.19319	$0.19392
	End	6:00 am 2:00 pm in March and April (Weekdays) 2:00 pm (Weekends & Holidays)		

Notes:

Rate levels as of Jan. 1, 2020

Minimum bill: $0.338/day

SDG&E Schedule EV-TOU-2[500]

Residential

Whole-house

[499] Tariff available at https://www.sdge.com/sites/default/files/regulatory/1-1-20%20Schedule%20EV-TOU%20%26%20EV-TOU-2%20Total%20Rates%20Tables.pdf (Accessed on January 16, 2020).

[500] Tariff available at https://www.sdge.com/sites/default/files/regulatory/1-1-20%20Schedule%20EV-TOU%20%26%20EV-TOU-2%20Total%20Rates%20Tables.pdf (Accessed on January 16, 2020).

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	4:00pm (Everyday)	$0.55279	$0.30540
	End	9:00pm (Everyday)		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April	$0.33795	$0.29766
	End	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April		
Super Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	Midnight 10:00 am in March and April (Weekdays)	$0.19319	$0.19392
	End	6:00 am 2:00 pm in March and April (Weekdays) 2:00 pm (Weekends & Holidays)		

Notes:
Rate levels as of Jan. 1, 2020
Minimum bill: $0.338/day

SDG&E Schedule EV-TOU-5[501]

Residential

Whole-house

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	4:00pm (Everyday)	$0.50411	$0.25672
	End	9:00pm (Everyday)		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April	$0.28927	$0.24898
	End	All other hours excluding 10:00 am to 2:00 pm on weekdays in March and April		
Super Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	Midnight 10:00 am in March and April (Weekdays)	$0.08558	$0.08631
	End	6:00 am 2:00 pm in March and April (Weekdays) 2:00 pm (Weekends & Holidays)		
Customer Charge:		$16/month		

Note:

Rate levels as of Jan. 1, 2020

[501] Tariff available at https://www.sdge.com/sites/default/files/regulatory/1-1-20%20Schedule%20EV-TOU-5%20Total%20Rates%20Table.pdf (Accessed on January 16, 2020).

SDG&E Schedule VGI[502]

Medium/Large Commercial & Industrial (> 20 kW)

EV-Only

On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		
Super Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		

Demand Charge: ($/kw)	N/A
Customer Charge:	N/A
Total Base Rate: ($/kWh)	$ 0.14
CAISO day-ahead hourly price ($/kWh)	updated daily, day-ahead
CAISO day-of hourly adjustment for surplus energy ($/kWh)	updated daily, same day
VGI day-ahead C-CPP Hourly Adder (if applicable) ($/kWh)	$ 0.49
VGI day-ahead D-CPP Hourly Adder (if applicable) ($/kWh)	$ 0.60

Notes:

Applicable for participants in Power Your Drive Program only

[502] Tariff available at http://www.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_VGI_2018.pdf (Accessed on January 16, 2020).

SDG&E Schedule Public
GIR[503]

Medium/Large Commercial & Industrial (> 20 kW)
EV-Only

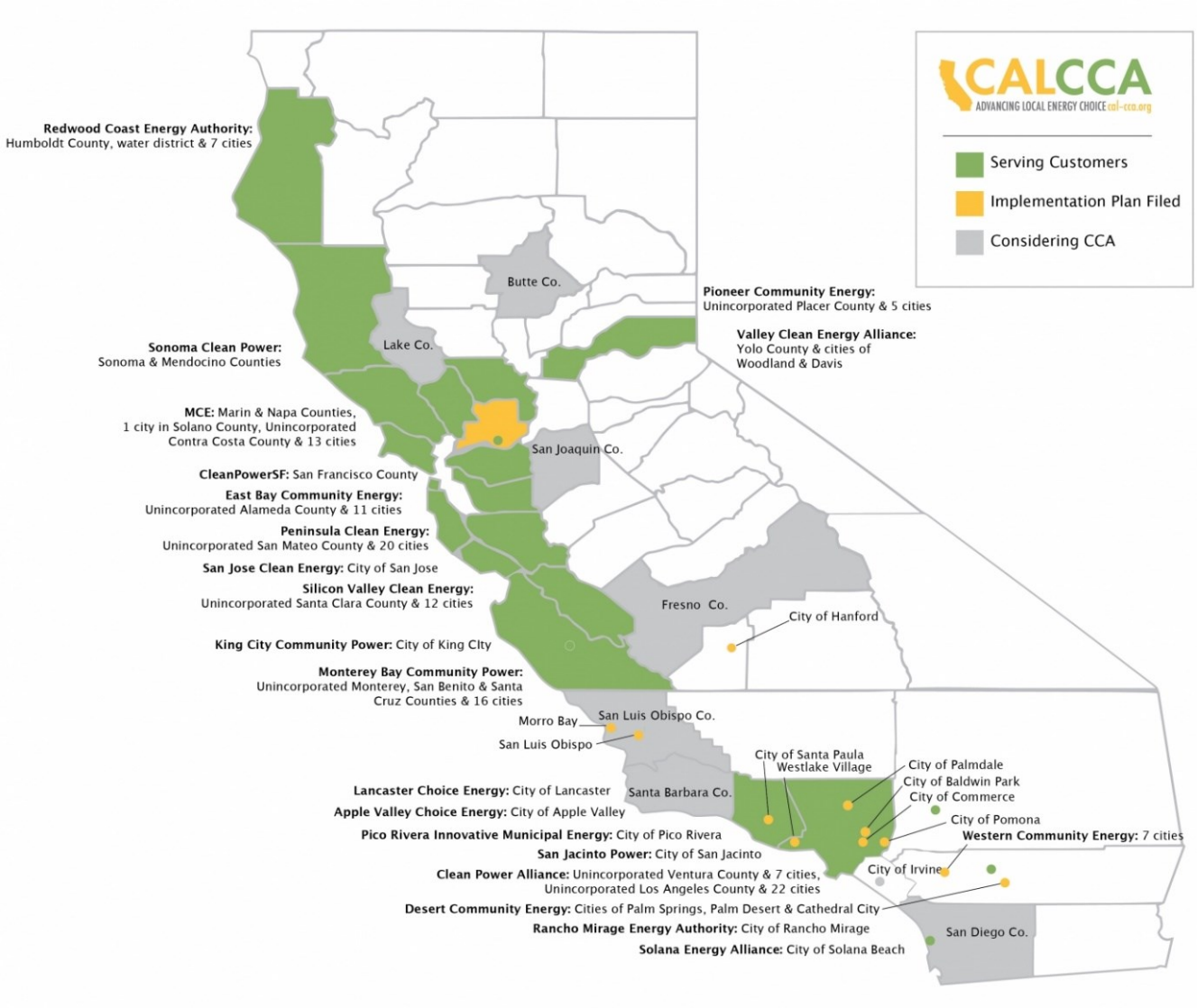
On-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		
Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		
Super Off-Peak		Hour	Summer Prices ($/kWh)	Winter Prices ($/kWh)
	Start	N/A	N/A	N/A
	End	N/A		

Demand Charge: ($/kw)	N/A
Customer Charge:	N/A
Total Base Rate: ($/kWh)	$0.16
CAISO day-ahead hourly price ($/kWh)	Updated daily, day-ahead
CAISO day-of hourly adjustment for surplus energy ($/kWh)	$0.49
VGI day-ahead C-CPP Hourly Adder (if applicable) ($/kWh)	$0.24

Note: Applicable for participants in Green Shuttles Priority Review Project only

[503] Tariff available at http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_PUBLIC_GIR.pdf (Accessed on January 16, 2020).

Appendix H – California Community Choice Aggregators Map



Source: https://cal-cca.org/cca-impact/

Appendix I – Acronym List

Acronym	Meaning
AC	Alternating Current
AEV	Autonomous Electric Vehicle
APCD	Air Pollution Control District
AQMD	Air Quality Management District
AV	Autonomous Vehicle
BSC	California Building Standards Commission
CARB	California Air Resources Board
CAISO	California Independent System Operator
CalETC	California Electric Transportation Coalition
CALeVIP	California Electric Vehicle Infrastructure Project
CALGreen	California Green Building Code Standards
Caltrans	California Department of Transportation
CASMU	California Association of Small or Multi-Jurisdictional Utilities
CBO	Community-based organization
CEC	California Energy Commission
CBIA	California Building Industry Association
CFR	Clean Fuel Reward program
D.	Commission Decision
DAC	Disadvantaged Communities
DC	Direct Current
DCFC	DC Fast Charger
EJ	Environmental Justice
EMFAC	CARB Emission Factors model
ESJ	Environmental Social Justice
ESJ Communities	Environmental Social Justice Communities
EPIC	Electric Program Investment Charge
EVITP	Electric Vehicle Infrastructure Training Program
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EVSP	Electric Vehicle Service Provider
EVREV	Electric Vehicle Rate Evolution
GHG	Greenhouse Gas
GIR	Grid Integrated Rate
GRC	General Rate Case
HCD	California Department of Housing and Community Development

HD	Heavy Duty
ICE	Internal Combustion Engine
IDS	CEC Infrastructure Deployment Strategy
kW	Kilowatt
kWh	Kilowatt Hour
L1	Level 1
L2	Level 2
LCFS	Low Carbon Fuel Standard
MBE/WBE	Minority-Owned Business Enterprise/Woman-Owned Business Enterprise
ME&O	Marketing, Education, and Outreach
MD	Medium Duty
MDMA	Meter Data Management Agent
MPO	Metropolitan Planning Organization
MSS	CARB Mobile Source Strategy
MTP	Metropolitan Transportation Planning
MUD	Multi-Unit Dwelling
NOx	Nitrous Oxide
NRTL	Nationally Recognized Testing Laboratory
O&M	Operation and Maintenance
OBF	On-Bill Financing
ORA	Office of Ratepayer Advocates
P3	Public-Private Partnership
PAC	Program Advisory Council
PEV	Plug-In Electric Vehicle
PG&E	Pacific Gas and Electric Company
PM	Particulate Matter
PPP	Public Purpose Program
PRP	Priority Review Project
Pub. Util. Code	Public Utilities Code
PV	Photovoltaic
R.	Rulemaking
RFP	Request for Proposals
SB	Senate Bill
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
SED	Safety and Enforcement Division
SIP	State Implementation Plan
TBR	Tariff Based Recovery

TE	Transportation Electrification
TEF	Transportation Electrification Framework
TEP	Transportation Electrification Plan
TIP	Transportation Improvement Program
TNC	Transportation Network Company
TOU	Time of Use
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
ZEV	Zero Emission Vehicle