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SOUTHERN CALIFORNIA EDISON®

An *EDISON INTERNATIONAL*® Company

(U 338-E)

PREPARED TESTIMONY IN SUPPORT OF SOUTHERN CALIFORNIA EDISON COMPANY'S CHARGE READY APPLICATION

VOLUME 01 – POLICY

Before the

Public Utilities Commission of the State of California

Rosemead, California
October 30, 2014

Prepared Testimony in Support of Southern California Edison Company's Charge Ready Application
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I.

EXECUTIVE SUMMARY

Accelerating transportation electrification is essential to achieving California's bold climate goals and air quality requirements. These goals and requirements can only be achieved with mass adoption of transportation electrification (TE) as well as very substantial pollutant emission reductions in the other sectors of the economy. Meeting these goals and requirements requires immediate acceleration in electric vehicle (EV) penetration – both plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). The scope and magnitude of this challenge, especially during the critical period over the next 10 to 15 years, is daunting, and requires prompt action to enable substantial market acceleration.

The California Public Utilities Commission (CPUC or Commission) and the investor-owned electric utilities have often played a critical role in facilitating new markets in California's electricity sector. For example, Commission-authorized utility participation in energy efficiency, demand response, and solar programs created demand for new greenhouse gas (GHG)-reducing resources and technologies and helped enable market participants to raise capital, innovate, and reach a sustainable scale. Now, the Commission and the electric utilities can and should play a similar but temporary "early market catalyst" role to help facilitate the acceleration of transportation electrification.

Therefore, Southern California Edison Company (SCE) proposes to launch the Charge Ready program and a complementary EV Market Education effort to address key barriers to accelerating TE adoption by targeting two specific, near-term goals of market advancement:

- SCE's Charge Ready program will seek to significantly increase the availability of long dwell-time EV charging infrastructure.
- SCE's Market Education effort and TE Advisory Services will seek to increase overall customer awareness of EVs and the benefits of fueling from the grid. These efforts will also educate customers on the critical importance of achieving the state's carbon reduction goals through TE while addressing the local air quality needs of the communities we serve.

SCE expects its Charge Ready program and Market Education efforts to deliver valuable ratepayer benefits and help California meet its ambitious climate and air quality goals. Because of the urgency required to achieve California's goals, SCE proposes to implement the program in two phases. As described in Section V of this volume, Phase 1, which is a one-year pilot, is intended to inform and refine the design and cost estimates and develop success measures for Phase 2 of the Charge Ready and Market Education programs.

A. Charge Ready Program Overview

SCE's Charge Ready program targets key infrastructure market segments that need a temporary boost by deploying charging infrastructure at long dwell-time locations, including: workplaces, multi-unit dwellings (MUDs), fleet parking, and destination locations where vehicles are usually parked for at least four hours. Through both its Charge Ready program and Market Education efforts, SCE plans to target disadvantaged communities, which are disproportionately affected by EV adoption barriers and negative environmental impacts of gasoline- and diesel-powered vehicles. Long dwell-time charging infrastructure is not developing fast enough to meet California's 2020 goals for EVs and supporting infrastructure. Increasing the availability of long dwell-time charging infrastructure would help reduce range anxiety, increase electric vehicle miles driven, increase access to charging in MUDs, reduce air pollution, and may, in the future, provide a way to utilize excess renewable energy generation during the day.

Over five years and in two phases of deployment, SCE's limited-duration Charge Ready program will provide supporting infrastructure for up to 30,000 charging stations in SCE's service area, estimated to be approximately one-third of the charging stations necessary in SCE's service area to support projected EV penetration by 2020.[1] To validate assumptions supporting SCE's proposal and recognizing the length of time required to assess the overall Charge Ready program, SCE is proposing to deploy the program, and complementary expanded market education and outreach in support of electric

[1] See Appendix B of this volume for detailed calculations.

transportation (described in Section I.B. below), in two phases. The first phase involves a 12-month pilot (Phase 1) of approximately $22 million and up to 1,500 charging stations including a complementary Market Education effort – comprised of an estimated $0.5 million for Charge Ready program-specific outreach and $3 million for broad EV market education and outreach. In Phase 1, SCE expects to test and validate key assumptions underlying its approach prior to implementing a full program in Phase 2. The Phase 1 Pilot is summarized in Section V of this volume, and described in detail in Volume 2 of SCE's supporting testimony. Phase 2 of SCE's Charge Ready program entails the full implementation of the remaining additional EV charging stations (up to a total of 30,000 across both phases) as well as the expanded EV market education and outreach at an estimated combined total cost of $333 million – $326.7 million for Charge Ready and $6.5 million for the expanded education and outreach. Phase 2 is described in detail in Volumes 3, 4, and 5 of SCE's supporting testimony. Thus, the total costs requested by this Application for both phases is $355 million. The program is expected to deliver valuable ratepayer benefits, summarized in Section I.D. below, and discussed in more detail in Section IV of this volume.

Table I-1
Summary of Total Program Costs Phase 1 "Pilot" and Phase 2
(Constant 2014 $, Excludes Escalation and Loaders)

(in $Million)		Total
Phase 1 Pilot Total	**$**	**22**
Phase 1 Charge Ready	*$*	*18.4*
Phase 1 Broad ME&O/Advisory	*$*	*3.1*
Phase 2 Total	**$**	**333**
Phase 2 Charge Ready	*$*	*326.7*
Phase 2 Broad ME&O/Advisory	*$*	*6.5*
Total Costs	**$**	**355**

The Charge Ready program is designed to offer a full-service, turn-key solution for SCE's customers that participate in the program. Targeting long dwell-time locations, SCE will deploy the supporting electric infrastructure needed to serve the charging stations at participating customer locations, up to and including the "make ready" stub, and also offer customers a rebate for the charging

stations. SCE will own and maintain the supporting electrical infrastructure; customers will choose, own, operate, and maintain the charging stations. Through a clear and established end-to-end process and proactive management of stakeholders, the Charge Ready program aims to support the deployment of charging installations efficiently while minimizing disruption for participating customers.

SCE will determine the number of charging stations and required supporting infrastructure based on existing and anticipated EV adoption at each participating site. The participating customers, together with SCE, will approve the final site plan. As a general rule, to participate in SCE's program, each site must be able to support a minimum of ten (10) charging stations. The customer must procure qualifying charging stations and their installation directly from qualified suppliers for interconnection to SCE's supporting infrastructure. SCE will offer a rebate for qualified charging stations in an amount that reflects the base cost for functionalities established by SCE and connection of those charging stations to SCE's infrastructure. The participating customer will be responsible for charging station operation, maintenance, and any other costs above the rebate amount.

SCE seeks to include a broad range of qualifying charging station models from multiple suppliers as part of the program offering. SCE intends to issue a Request for Information (RFI) to third-party suppliers of charging stations, including diverse business enterprises, to (1) identify and qualify equipment meeting SCE's minimum functionality requirements; (2) inform SCE's determination of an appropriate charging station rebate amount; and (3) ensure that the suppliers are technically capable and financially viable to provide, install, and support the operation and maintenance of the charging stations.

SCE intends to qualify charging stations according to three minimum functionality profiles:

1. Level 1 charging station, without network capability;[2]
2. Level 2 charging station, with network capability integrated into the charging station; and
3. Level 2 charging station, with network capability provided by an external device (such as a kiosk or gateway) shared among multiple stations.

[2] "Network capability" is the hardware and software required to communicate with a wide access network.

All Level 2 charging stations must be demand response-capable (i.e., capable of receiving and executing real-time instructions to throttle, and/or modify the end-user pricing of EV charging load)[3] and are encouraged to include additional load management features (e.g., EV charging sequencing or sharing).

The best value offered for a charging station within each minimum functionality profile will inform the base cost of a charging unit. SCE will use this base cost to establish a per unit rebate for each of the three profiles.

SCE has designed the Charge Ready program to meet the draft guiding principles proposed in the Alternative-Fueled Vehicle (AFV) Order Instituting Rulemaking (OIR) Scoping Memo and Assigned Commissioner Ruling.[4] For example, the Charge Ready program is designed to minimize costs to ratepayers by:

- Working with participating customers to evaluate near-term demand for charging stations,
- Selecting the cost efficient charging locations at each participating site ,
- Achieving economies of scale by requiring a minimum of 10 charging stations at each participating site (with some exceptions in disadvantaged communities), and
- Terminating the program early if warranted by unanticipated circumstances, such as unusually low customer interest or program enrollment.

B. EV Market Education and TE Advisory Services Overview

Developing broad awareness about the benefits of fueling vehicles from the grid is another essential element of SCE's proposal. SCE is uniquely positioned to educate our customers on the benefits of fueling from the grid because our customers already view us as a trusted energy advisor and

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[3] As in other demand response programs, SCE may send demand-response signals using open, non-proprietary two-way communications. Level 2 charging stations must be capable of receiving these signals either directly or through an EV charging network service provider.

[4] *See* R.13-11-007, OIR to Consider AFV Programs, Tariffs, and Policies, Assigned Commissioner Scoping Memo and Ruling, dated July 21, 2014, p. 6. Examples include maximizing ratepayer benefits, minimizing costs to all utility customers, complementing the use of preferred resources, remaining technology neutral, and allowing for business model innovation.

look to us to answer infrastructure-related questions. Therefore, in addition to education and outreach activities specific to the Charge Ready program, SCE proposes a broader complementary Market Education effort that will target potential car buyers in SCE's service territory (including those that may not already be shopping for EVs). The effort will expand awareness about EVs and the benefits of fueling from the electric grid, including increased utilization of utility assets, reduced GHG emissions, and lower rates for off-peak charging, among others. The Market Education effort will include both broad efforts (e.g. digital media, radio ads) and targeted efforts (e.g. bill messaging, improved websites, test drive events), while avoiding cost-intensive efforts (e.g. billboards and television ads).

SCE also proposes a TE Advisory Services program to provide a "one-stop shop" for business customers to receive specialized education and support on a broad array of TE issues. For example, TE Advisory Services will help business customers address electrifying fleets, EV charging, reducing GHG footprints, identifying grants and tax credits to reduce the incremental purchase price of EVs and supporting infrastructure, and pairing EV charging with solar or energy storage.

C. Disadvantaged Communities and Other Key Stakeholders

SCE will target up to 10 percent of charging infrastructure deployment in the Charge Ready program to take place in disadvantaged communities, identified using the California Environmental Protection Agency's (CalEPA's) California Communities Environmental Health Screening Tool (CalEnviroScreen 2.0).[5] To account for the estimated initial lower level of EV adoption in these communities and accommodate smaller sites, SCE will reduce the minimum requirement to five charging stations per participating site in appropriate circumstances. SCE will collaborate with state and local agencies and beneficiaries of EV incentive programs authorized by statutes that heavily favor state

[5] CalEnviroScreen 2.0 is a screening methodology, developed by the CalEPA, which can be used to help identify California communities that are disproportionately burdened by pollution and other socioeconomic factors. *See* "Approaches to Identifying Disadvantaged Communities," California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, August 2014, p. 2, *available at* http://oehha.ca.gov/ej/pdf/ApproachesnIdentifyDisadvantagedCommunitiesAug2014.pdf [as of October 27, 2014].

investments in disadvantaged communities, to encourage more EV incentives and other investments for these communities.[6]

SCE will also include in its Market Education efforts education and outreach (E&O) specifically aimed at reaching disadvantaged communities. Targeted E&O programs will educate customers, residents, fleet operators, and workplaces located in disadvantaged communities about how they can lower their fuel costs by switching from gasoline to electricity; increase savings through off-peak charging; opportunities under the Charge Ready program; and any available EV incentives.

Given the nature of this program and the important investment being sought from ratepayers, SCE also intends to form an advisory board with industry and community stakeholders, including representatives from disadvantaged communities. The advisory board will review and provide input, guidance, and suggestions on the implementation of the Charge Ready program and Market Education efforts, including serving disadvantaged communities. SCE plans to meet regularly with the advisory board and use relevant findings from data generation and program reports to refine and improve the implementation of the Charge Ready program and Market Education efforts as appropriate.

D. Summary of Benefits to Ratepayers and Communities in SCE's Service Area

SCE's Charge Ready and Market Education programs are designed to realize a number of benefits for both ratepayers and the communities we serve. These include:

- *Improving and optimizing utility asset utilization* – EV charging at long-dwell locations is uniquely flexible load that can address existing grid challenges by avoiding charging on-peak[7] and expected future challenges related to integrating increasing amounts of intermittent renewable energy into the grid by managed EV charging.
- *Demand Response* – SCE proposes to require demand response capability for Level 2 EV charging stations to qualify under the Charge Ready program, so the incremental EV load

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[6] *See* Cal. Senate Bill (SB) 535 (2012 Cal. Stats. Ch. 830 § 2); Cal. Assembly Bill (AB) 8 (2013 Cal. Stats. ch. 401 § 2); Cal. SB 1204 (2014 Cal. Stats. ch. 524); and Cal. SB 1275 (2014 Cal. Stats. ch. 530).

[7] On-peak times are typically weekday afternoons, when demand is highest.

may be leveraged for new or existing utility or third party demand response programs. Demand response is a preferred resource for meeting new generation capacity demand in California under the state's Energy Action Plans.[8]

- *Environmental and other benefits* – Increased EV adoption and fueling from the grid will provide additional benefits to the entire Southern California region by reducing GHGs, improving air quality, increasing energy security, and creating local jobs.
- *Incremental Load* – SCE's Charge Ready and Market Education programs are expected to attract new load to SCE's system, which is beneficial for all ratepayers because it spreads the utility's fixed costs over more kilowatt-hour sales.
- *Benefits for disadvantaged communities* – SCE's programs will emphasize expanding charging infrastructure and education and outreach in disadvantaged communities, which are disproportionately affected by EV adoption barriers and negative environmental impacts of gasoline- and diesel-powered vehicles.
- *Innovation* – SCE's proposed approach of enabling numerous third-party charging station suppliers to qualify to provide eligible charging equipment and services in the Charge Ready program will stimulate innovation and possibly new business models in the charging market.

The benefits of SCE's Charge Ready and Market Education programs are discussed in more detail in Sections II and III of this volume.

[8] *See* "Implementing California's Loading Order for Electricity Resources," California Energy Commission Staff Report, July 2005, *available at* http://www.energy.ca.gov/2005publications/CEC-400-2005-043/CEC-400-2005-043.PDF [as of October 27, 2014]. *See also* "State of California, Energy Action Plan," May 8, 2003, *available at* http://www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF [as of October 27, 2014].

II.
ACCELERATING TRANSPORTATION ELECTRIFICATION IS ESSENTIAL TO REALIZING CALIFORNIA'S BOLD CLIMATE AND AIR QUALITY GOALS

"We face an existential challenge with the changes in our climate. The time to act is now. The place to look is California. We're not finished, but we sure are setting the pace."

Governor Edmund G. Brown Jr. made these remarks shortly before attending the September 23, 2014 United Nations (UN) Climate Summit in New York City, where he pledged to set an aggressive 2030 GHG-reduction target within six months. The 2030 target will be the next milestone on the path to deep de-carbonization of California's economy. Governor Brown also embraced the goal originally set by Governor Schwarzenegger of reducing California's GHG emissions to 80 percent below 1990 levels by 2050.[9]

Governor Brown recognizes the essential role that electrifying transportation must play in meeting California's long-term GHG reduction goals. Before leaving for the UN Summit, he signed six bills to "strengthen California's best-in-the-nation electric vehicle market." The new laws will help realize near-term goals he established in Executive Order B-16-2012, which calls for an 80 percent reduction in GHG emissions from the transportation sector by 2050 and sets several near- and mid-term milestones, including the following:

- By 2015, all California cities will have adequate infrastructure and be "zero-emissions vehicle (ZEV) ready."
- By 2020, California will have infrastructure in place to support 1 million ZEVs.
- By 2025, there will be over 1.5 million ZEVs on California roads.

Executive Order B-16-2012 also created the Governor's Interagency ZEV Action Plan for agencies such as the CPUC, California Air Resources Board (CARB), and the California Energy Commission (CEC). The Executive Order's 2025 goal is generally consistent with CARB's ZEV

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[9] *See* Exec. Order No. S-03-05 (June 1, 2005), *available at* http://gov.ca.gov/news.php?id=1861 [as of October 27, 2014]. *See also* Exec. Order No. B-16-2012 (March 23, 2012), *available at* http://gov.ca.gov/news.php?id=17472 [as of October 27, 2014].

regulation, which requires large- and intermediate-volume automobile manufacturers to offer specific numbers of light duty ZEVs for sale in California.

Studies indicate that California's GHG-reduction goals, air-quality requirements[10] and petroleum reduction goals[11] can only be achieved with replacing 70 to 90 percent of internal combustion engine vehicles with ZEVs.[12] Meeting the 2023 and 2032 air-quality attainment deadlines are the most difficult and require the fastest shift.[13] Figure II-1 below illustrates the magnitude of the need for ZEVs and contrasts different penetration trajectories to meet the 2050 GHG emissions target. All types of near-zero and zero-emission vehicles are necessary to meet this target, including PHEVs, BEVs, and fuel cell vehicles (FCVs). Several automakers are currently developing light-duty FCVs, but these are only likely to be available in limited quantities, at least through 2020.[14] On the other hand, Californians have

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[10] For example, in the South Coast Air Basin, nitrogen oxide (NOx) emissions must decline from 758 tons per day in 2008 to about 78 tons per day by 2032 in order to meet the federal standards. *See* "On the Move: Southern California Delivers the Goods; Comprehensive Regional Goods Movement Plan and Implementation Strategy; Summary Report," Southern California Association of Governments, December 2012, p. 27, *available at* http://www.freightworks.org/DocumentLibrary/CRGMPIS_Summary_Report_Final.pdf [as of October 27, 2014].

[11] The CEC and CARB, in response to AB 2076 and AB 1007, adopted the goal of increasing non-petroleum fuel to 20 percent of on-road demand by 2020 and 30 percent in 2030. *See* "State Alternative Fuels Plan, Commission Report," CARB and CEC, December 2007, *available at* http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF [as of October 27, 2014].

[12] Several studies that examine the 2050 climate goals show that almost all light-duty vehicles must be BEVs, fuel cell vehicles and/or PHEVs, and 70 percent or more of the medium- and heavy-duty vehicles must be as well. *See* Figure II-1 below. *See also* James H. Williams, et al. "The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity," Science Magazine, Vol. 335, January 2012, p. 53, *available at* http://www.sciencemagazinedigital.org/sciencemagazine/20120106?pg=54#pg52 [as of October 27, 2014].

[13] *See* "Vision for Clean Air: A Framework for Air Quality and Climate Planning," CARB, the South Coast Air Quality Management District (SCAQMD), and the San Joaquin Valley Unified Air Pollution Control District (APCD), Public Review Draft, June 27, 2012, pp. 16-19, *available at* http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf [as of October 27, 2014].

[14] This is primarily due to the initial technology cost and the need for California to build out a robust hydrogen fueling infrastructure from scratch.

already purchased over 100,000 EVs.[15] Over 20 models are currently available, with more choices expected over the next several years from the 16 automakers subject to CARB's ZEV regulation.[16] Part of the popularity of EVs today can be attributed to the ease of fueling at home from a ubiquitous infrastructure that has significant excess capacity. EVs will almost certainly continue to lead the initial phase of the transition to ZEVs (present to 2030).

[15] *See* S. Blanco, "California has sold 102,440 EVs since Volt, Leaf went on sale in 2010," AutoblogGreen, September 9, 2014, *available at* http://green.autoblog.com/2014/09/09/california-has-sold-102440-evs-since-volt-leaf-went-on-sale/ [as of October 27, 2014].

[16] *See* CARB, "Staff Report: Initial Statement of Reasons for Rulemaking; Proposed 2014 Amendments to the Zero Emission Vehicle Regulation," CARB, September 2, 2014, p. 3, *available at* http://www.arb.ca.gov/regact/2014/zev2014/zev14isor.pdf [as of October 27, 2014]. *See also* Electric Drive Transportation Association, Electric Drive Sales Dashboard, *available at* http://electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952 [as of October 27, 2014]. *See also* S. Blanco, "California has sold 102,440 EVs since Volt, Leaf went on sale in 2010," *supra*.

Figure II-1
Light-Duty ZEV Adoption Necessary from 2010 to 2050 to Achieve California's 2050 Climate Goals[17]

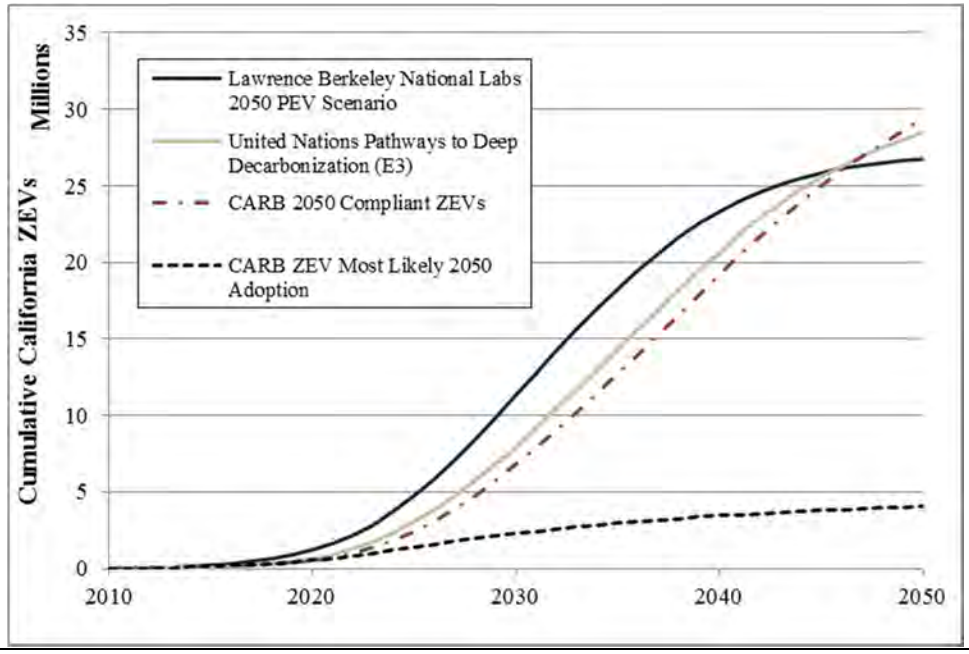
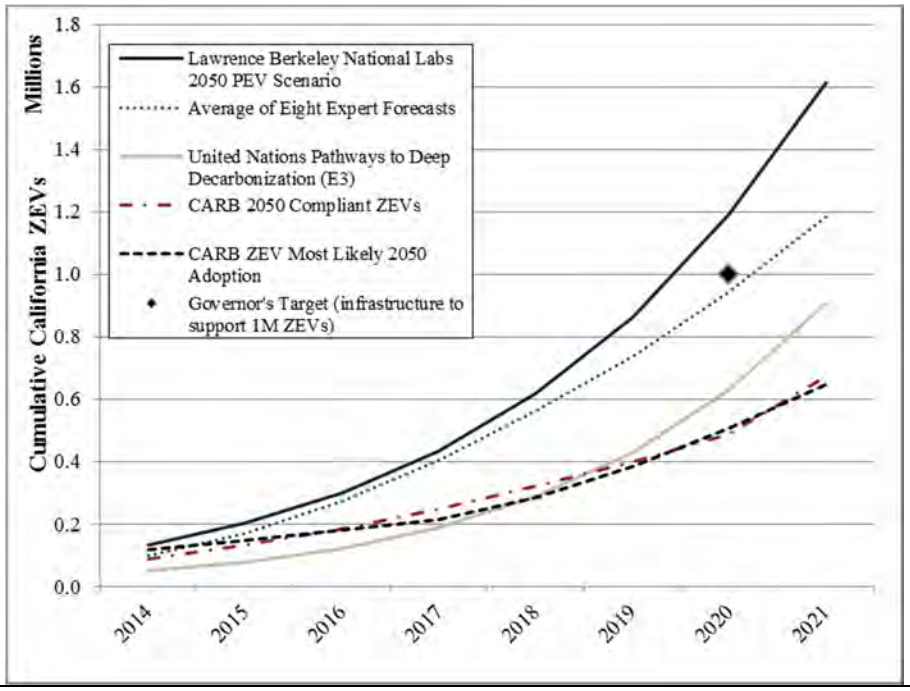


Figure II-1 compares the CARB's "most likely" reference case to adoption trajectories needed to meet California's 2050 GHG goals. To achieve this long-term EV growth potential, the next 10 to15 years represent a critical period in which EV adoption must accelerate, and the market must expand to include mainstream consumers. Figure II-2 below shows the same data as Figure II-1, but focuses on the years 2014 to 2021 and includes the goal for infrastructure to support one million ZEVs by 2020. As shown in Figure II-1 above, California ZEV adoption rates must accelerate to achieve the steep adoption

[17] US Pathways vehicle numbers from E3 methodology in "UN Pathways to Deep Decarbonization: 2014 Interim Report" (July 2014), prepared by Sustainable Development Solutions Network (SDSN), the Institute for Sustainable Development and International Relations (IDDRI), and national teams (US analysis provided solely by E3), *available at* http://unsdsn.org/wp-content/uploads/2014/07/DDPP_interim_2014_report.pdf [as of October 27, 2014]. CARB 2050 vehicle numbers from "Vision for Clean Air: A Framework for Air Quality and Climate Planning," Prepared by CARB, SCAQMD, and San Joaquin Valley Unified APCD, June 27, 2012, *available at* http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf [as of October 27, 2014]. *See also* Max Wei, et al., "California's Carbon Challenge: Scenarios for Achieving 80% Emissions Reduction in 2050," Lawrence Berkeley National Laboratory, October 31, 2012, p. 44, *available at* http://eaei.lbl.gov/sites/all/files/california_carbon_challenge_feb20_20131_0.pdf [as of October 27, 2014].

trajectory necessary to meet the state's 2050 GHG-reduction goal. The scope and magnitude of this adoption challenge is daunting. Even the CARB's "most likely" reference case, which is significantly off from meeting the 2050 target, requires a 20-fold increase in ZEV sales in California between now and 2030 to reach 2 million vehicles.

Figure II-2
Light-Duty ZEV Adoption Necessary from 2014 to 2021 to Support California's 2050 Climate Goals[18]



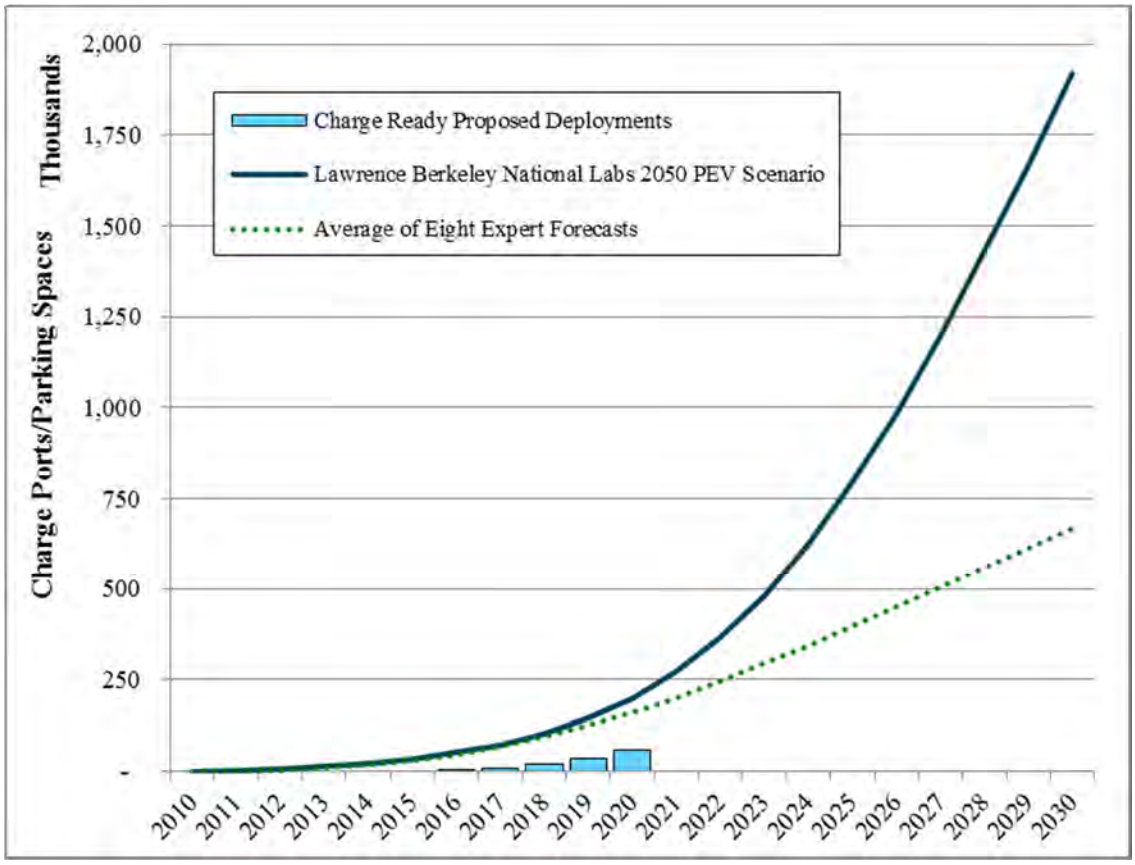
For EV adoption to support state goals, sufficient charging infrastructure is necessary – both at homes and other locations. Figure II-3 below shows the expected need for EV charge ports[19] outside of single-family residences in the SCE service territory. Also shown is SCE's proposed Charge Ready

[18] *Ibid*. For explanation of the eight expert forecasts, *see* SCE's Plug-In Electric Vehicle (PEV) Forecast Methodology Overview, August 2013, pp. 2-4, *available at* http://www.energy.ca.gov/2013_energypolicy/documents/2013-08-21_workshop/presentations/04_Taylor_SCE_presentation.pdf [as of October 27, 2014].

[19] Charging stations can have multiple charge ports allowing more than one parking space to be served at the same time.

program goal of deploying up to 30,000 charging stations (about 60,000 charge ports[20]) in long dwell-time charging locations. SCE's Charge Ready program plans to provide approximately one-third of the estimated 2020 infrastructure requirements in SCE's service territory. The details supporting Figure II-3 are shown in Appendix B to this volume.

Figure II-3
Estimated Charging Infrastructure Required to Support ZEV Adoption in SCE's Service Territory and proposed Charge Ready Deployment



A. Barriers to EV Market Acceleration

To attain the very challenging near- and long-term state goals, several barriers to EV adoption must be addressed.

[20] *See* Appendix B.

- *Insufficient EV infrastructure to support state goals, especially in certain market segments:* Lack of charging infrastructure is a major barrier to accelerating EV adoption.[21] This is a fundamental problem, because availability of charging infrastructure stimulates demand for EVs.[22] This correlation is especially true for workplace charging.[23] Because there are only about 5,800 public charge ports,[24] the number of charge ports in workplaces and public settings must grow as fast as or faster than EVs themselves. SCE's programs can help to accelerate this growth by meeting a significant portion of the need in long dwell-time locations.
- *Cost and complexity:* The cost and complexity of charging infrastructure deployment outside of single-family homes are significant barriers to EV adoption.[25] For example, even though

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[21] *See* "Overcoming Barriers to Electric-Vehicle Deployment: Interim Report," (2013) National Academy of Sciences, pp. 35-36, *available at* http://www.nap.edu/openbook.php?record_id=18320 [as of October 27, 2014]. *See also* "Bay Area Plug-In Electric Vehicle Readiness Plan," prepared by ICF International for the Bay Area Air Quality Management District (AQMD), September 2013, pp. 330, 332, *available at* http://www.bayareapevready.org/assets/Background-Analysis-PEV-Readiness-Plan-Draft-Final-v2.pdf [as of October 27, 2014].

[22] A recent global study that examined the relationship between key variables (financial incentives, charging infrastructure, and presence of production facilities) and 30 national electric vehicle markets concluded that, of those variables, charging infrastructure was the best predictor of a country's EV market penetration. *See* William Sierzchula, et al., "The influence of financial incentives and other socio-economic factors on electric vehicle adoption," *Energy Policy*, vol. 68, May 2014, pp. 183-194 ("For charging infrastructure, holding all other factors constant, each additional station per 100,000 residents that a country added would increase its EV market share by 0.12 percent. This suggests that each charging station (per 100,000 residents) could have twice the impact on a country's EV market share than $1,000 in consumer financial incentives, albeit with different bearings on a nation's budget."). Abstract *available at* http://www.sciencedirect.com/science/article/pii/S0301421514000822 [as of October 27, 2014].

[23] *See* ChargePoint, "The Ratepayer Benefits of Electric Vehicle Charging," *available at* http://www.chargepoint.com/pdf/ratepayer_benefits [as of October 28, 2014].

[24] *See* U.S. Department of Energy, Alternative Fuels Data Center, Electric Vehicle Charging Station Locations, *available at* http://www.afdc.energy.gov/fuels/stations_counts.html [as of October 27, 2014].

[25] *See* "California Transportation Electrification Assessment; Phase 1: Final Report," prepared by ICG International and E3, September 2014, Section 5.2, pp. 46-50, *available at* http://www.caletc.com/wp-content/uploads/2014/09/CalETC_TEA_Phase_1-FINAL_Updated_092014.pdf [as of October 27, 2014]. Installing charging stations at businesses involves many more factors than home charging, and also includes a more expensive setup. Commercial Level 2 charging station installation costs are an average of $2,500, compared with residential Level 2 costs of $1,300 and residential Level 1 costs of only $200. *See* "Electric Vehicle Supply Equipment Installed Cost Analysis: 2013 Technical Report," Electric Power Research

(*Continued*)

customers with parking facilities may recognize the benefits of offering EV charging, charging stations do not fit the classic return-on-investment paradigm.[26] Owners or managers of properties with long dwell-time parking may be reluctant to navigate a complex and possibly confusing market.

- *Not enough market awareness*: Developing broad awareness about EVs and the benefits to drivers and the environment of fueling from the grid is one of the most important drivers to increasing EV adoption and growing the EV market significantly.[27] Currently, low awareness about EV benefits (individual, societal, and environmental) and differences between BEVs and PHEVs is one of the most significant impediments to acceleration of EV adoption.[28] Expanding consumer awareness and demand for ZEVs is one of the four broad

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Continued from the previous page

Institute (EPRI), December 6, 2013, pp. 18, 33, abstract *available at* http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002000577 [as of October 27, 2014]. As with businesses, charging station installation cost at multi-unit dwellings far exceeds that of single-family residences. *Id.*, pp. 3-5, 3-6.

[26] *See* J. Rhow, "Public Private Partnerships for California EVSE Market," Kleiner Perkins Caufield & Byers, April 2014, *available at* http://www.energy.ca.gov/2014_energypolicy/documents/2014-04-23_workshop/presentations/07_CEC_Panel_John_Rhow_Kleiner_Advisor.pdf [as of October 27, 2014]. *See also* "California Transportation Electrification Assessment; Phase 1: Final Report," *supra*, Section 5.2.1., pp. 46-48.

[27] *See* J. Rhow, "Public Private Partnerships for California EVSE Market," *supra*, pp. 15-20.

[28] Navigant Research reports that the awareness for EVs other than the LEAF and Volt among survey respondents is less than 25 percent. Even with the Volt and LEAF, only 44 percent and 31 percent were extremely familiar or somewhat familiar with these vehicles, respectively. *See* C. Vyas and D. Hurst, "Electric Vehicle Consumer Survey: Consumer Attitudes, Opinions, and Preferences for Electric Vehicles and EV Charging Stations" Navigant Research, 4Q 2013, p. 10, *available at* http://www.revi.net/docs/default-source/highlights/navigant-research---electric-vehicle-consumer-study-q4-2013.pdf?sfvrsn=6 [as of October 27, 2014].

In 2013, Ernst & Young found that 62 percent of respondents had never heard of PHEV technology or have heard of it but don't know what it is. Similarly, 40 percent of respondents have never heard of PEV technology or have heard of it but don't know what it is. *See* "Cleantech matters -- The electrification of transportation from vision to reality," (2010) Ernst & Young, p. 15, *available at* http://www.ey.com/Publication/vwLUAssets/Les_transports_deviennent_%E9l%E9ctriques/$FILE/The%20electrification%20of%20transportation.pdf [as of October 27, 2014]. The vast majority of commenters responding to the AFV OIR question number 3 regarding expanded utility role in EV market education and

(*Continued*)

goals highlighted in Governor Brown's ZEV Action Plan. Although federal, state, and local governments could undertake several activities to address this barrier, the reality is that little public funding goes to enhancing consumer awareness.[29] Utilities, in collaboration with other stakeholders, are well-positioned to fill the gap.[30]

- *Disadvantaged communities:* Disadvantaged communities, as defined by CalEnviroScreen 2.0, face additional socioeconomic barriers and a disproportionate amount of pollution, some of which is from gasoline-powered vehicles. Additional EV charging infrastructure and E&O in these communities will help accelerate EV adoption and related pollution reduction impacts for these communities and for all Californians. E&O will educate customers regarding available EV incentives and rebates that can help make EVs more affordable, including special state incentives available only for disadvantaged communities.

B. California's Goals Can Only Be Achieved with Dramatic Market Acceleration, Requiring IOU Participation

To meet its goals for transportation electrification and address the barriers discussed above, California must write the most dramatic chapter yet in its history of bold market acceleration initiatives. California's energy efficiency policies have helped transform construction practices and industrial equipment.[31] California's renewable energy policies have helped to mature the wind and solar power

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outreach agreed that utilities should have an expanded role in this area. *See* R.13-11-007, various parties' Opening Comments in Response to OIR, filed December 13, 2013.

29 CEC has funded less than $5 million in consumer education on EVs since 2009 with Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) funds, out of more than $400 million between 2009 and 2013. *See* California Energy Commission, DRIVE: California's Alternative & Renewable Fuel & Vehicle Technology Program, Reports, as of June 30, 2013, *available at* http://www.energy.ca.gov/drive/investing/reports.html [as of October 27, 2014].

30 *See* "Overcoming Barriers to Electric-Vehicle Deployment: Interim Report," *supra*, p. 20.

31 Numerous studies have found that utility-administered, ratepayer-funded energy efficiency programs have spurred commercialization and widespread national adoption of high efficiency household appliances, lighting technologies, motors and residential windows. *See* e.g., M. Rosenberg and L. Hoefgen, "Market Effects and Market Transformation: Their Role in Energy Efficiency Program Design and Evaluation,"
(*Continued*)

industries.[32] California's first-in-the-nation energy storage procurement mandate aims to commercialize energy storage technologies. Both the Commission and the regulated utilities have been instrumental in these efforts. Transportation electrification presents another opportunity for the Commission to take a leadership role in supporting the state's challenging and important goals of EV market acceleration to contribute to the state's GHG reduction goals.[33] SCE believes that regulated utilities can once again play a unique role in helping achieve the state's and Commission's goals by investing in charging infrastructure and improving consumer awareness regarding the benefits of EVs to accelerate the penetration of EVs toward a self-sustaining market.

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prepared for the California Institute for Energy and Environment, March 2009, pp.4-5, *available at* http://uc-ciee.org/downloads/mrkt_effts_wp.pdf [as of October 27, 2014].

[32] Since 2003, approximately 10,000 MW of renewable generating capacity has come on-line or has started construction in California, almost all of it underwritten by utility power purchase agreements. *See* California Public Utilities Commission, "Renewables Portfolio Standard Quarterly Report," 4th Quarter 2013, p. 3, *available at* http://www.cpuc.ca.gov/NR/rdonlyres/71A2A7F6-AA0E-44D7-95BF-2946E25FE4EE/0/2013Q4RPSReportFINAL.pdf [as of October 27, 2014]. To date, California has installed over 2,400 MW of solar capacity, through the California Solar Initiative and other utility procurement programs. Falling solar costs allow declining incentive levels, clear evidence of market transformation.

[33] Transitioning California's transportation to near-zero and zero-emission technologies will take market acceleration to a new scale: California's $50 billion in 2013 sales of new light duty vehicles exceeds national sales for lighting ($17 billion) and air conditioning ($24 billion) equipment. See "NADA Data: Annual Financial Profile of America's Franchised New-Car Dealerships, 2014," National Association of New Car Dealers, p. 6, available at http://www.nada.org/NR/rdonlyres/DF6547D8-C037-4D2E-BD77-A730EBC830EB/0/NADA_Data_2014_05282014.pdf [as of October 27, 2014]. Total sales for California dealerships ($86.985 billion) scaled by national share of total dealership sales from new vehicles (57.1 percent).

See also "North America Air Conditioning Systems Market Analysis By Product (Portable, Window, Split, Single Packaged, Chillers, Airside), By Application (Residential, Commercial, Industrial) And Segment Forecasts To 2020," Grand View Research, May 2014, *available at* http://www.grandviewresearch.com/industry-analysis/north-america-air-conditioning-systems-market [as of October 27, 2014]. Grand View Research estimates the North American market for air conditioning systems at $28.8055 billion in 2013. The U.S. accounts for 83 percent of that market, so the U.S. air conditioning market would be worth about $23.9086 billion.

See also "The Lighting Fixtures Markets in the United States," Centre for Industrial Studies, July 2014, *available at* http://www.worldfurnitureonline.com/research-market/the-lighting-fixtures-market-united-states-0058484.html [as of October 27, 2014]. The Centre for Industrial Studies estimates the U.S. market for lighting fixtures at $17.1 billion in 2013. "Light fixture" includes both the bulbs and mounting equipment.

III.
SCE'S CHARGE READY PROGRAM AND EV MARKET EDUCATION AND OUTREACH PROGRAMS ADDRESS KEY MARKET SEGMENTS AND MARKET BARRIERS

SCE's proposed programs are designed to help address key barriers to accelerating TE adoption by targeting two specific, short-term goals:

- SCE's Charge Ready program seeks to increase long dwell-time EV charging infrastructure in the near term.
- SCE's Market Education and Outreach seeks to increase overall customer interest in EVs and fueling from the grid, as well as educate customers on the importance of achieving state carbon goals with TE while addressing the local air quality needs of the communities we serve.

SCE is seeking Commission approval to implement the five-year Charge Ready program and Market Education effort in two phases. The smaller scope and 12-month duration of the Phase 1 Pilot described in Volume 2 would allow SCE to test and validate key assumptions underlying its proposed program. SCE plans to collaborate with the Commission and stakeholders throughout the Pilot to refine the Charge Ready program and Market Education effort as necessary prior to the full implementation proposed for Phase 2. SCE expects this collaboration to continue throughout both phases. The reporting during the Pilot is anticipated to inform SCE and the Commission and allow SCE to supplement its showing as appropriate prior to a Commission decision on Phase 2. SCE is presenting both phases in this Application to give an overall perspective of our plans for helping to accelerate EV penetration in our service area and to provide context for the desired near-term approval of the Phase 1 pilot.

SCE's proposals seek to consider the unique needs of the region (e.g., high levels of solar, poor air quality, the large proportion of plug-in hybrid EVs compared to battery EVs). The Charge Ready program focuses on long dwell-time locations for the reasons explained below. SCE solicited feedback from a wide variety of stakeholders, including customers, industry experts, EV charging station and service providers, and representatives of disadvantaged communities, and used their feedback to improve the program design.

A. Charge Ready Program Addresses Key Market Segments

The Charge Ready program addresses market barriers and provides important benefits in five market segments in need of acceleration, including:

- *Workplace charging*: Workplace charging creates a "showroom effect," where the employee parking lot and employees themselves help "sell" more EVs.[34] Workplace charging enables employees to drive EVs, even if they don't have a place to charge at home or their commutes are too long to get to work and back home on a single charge. In addition, EV owners who can charge both at home and at work can increase their total daily electric vehicle miles traveled (EVMT),[35] especially for PHEVs with smaller batteries that limit electric range per charge. Finally, workplace charging is also a potentially significant solution to the emerging problem of solar over-generation since it provides flexible, daytime load.[36]

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[34] ChargePoint's recent case study shows that, as workplace charging is built, both EV adoption as well as charging station use increases at the site. *See* ChargePoint, "The Ratepayer Benefits of Electric Vehicle Charging," *supra*. *See also* U.S. Department of Energy, "EV Everywhere Grand Challenge: Road to Success," January 2014, at p. 11, *available at* http://energy.gov/sites/prod/files/2014/02/f8/eveverywhere_road_to_success.pdf [as of October 29, 2014] ("Charging stations at the workplace can serve as a 'second showroom' in which employees can learn about PEVs informally from their colleagues"). Automakers like Nissan are trying to capitalize on the connection between adoption and public charging infrastructure, premising that customers need to have reliable and convenient charging at two of three locations (home, work, public) to increase EV adoption. *See* Brandon White for Nissan, presentation for Breakout Session A2: *Taking the "Work" Out of Workplace Charging*, Plug-in 2014, San Jose, CA, July 29, 2014. *See also* "Best Practices for Workplace Charging: Employer EV Initiative, Supporting Solutions for Workplace Charging," CALSTART, September 2013, p. 2, *available at* http://www.calstart.org/Libraries/Publications/Best_Practices_for_Workplace_Charging.sflb.ashx [as of October 27, 2014]. *See also* footnote 22, *supra*, which shows the linkage of infrastructure and EV adoption.

[35] The average driver makes three trips, totaling 29.1 miles, each day. Many PHEV drivers, then, whose vehicles have electric ranges between ten and forty miles, could increase their daily electric miles by up to 100 percent by charging at both home and work. For example, a PHEV with a 15-mile range and 15-mile work commute, which currently must use gasoline for the return trip home, could instead charge overnight at home, travel 15 electric miles to work, charge during the workday, and drive an additional 15 electric miles home. *See* "California Transportation Electrification Assessment; Phase 1: Final Report," *supra*, p. 5. *See also* "Best Practices for Workplace Charging: Employer EV Initiative, Supporting Solutions for Workplace Charging," *supra*, p. 1.

[36] A recent study by E3 identified flexible loads as an effective measure to help reliably integrate an increased share of renewable energy in California. *See* "Investigating a Higher Renewables Portfolio Standard in California," E3, January 2014, *available at*

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- *Multi-unit dwellings*: MUDs are an essential charging market segment that needs to accelerate. By increasing the availability of charging infrastructure at MUDs where there is demonstrated interest, the Charge Ready program will help expand the pool of potential EV adopters. MUDs represent about 28 percent of SCE's service accounts, and 34 percent of MUDs have over 20 units.[37]
- *Other long dwell-time charging locations*: Increasing charging infrastructure at "destination locations" (e.g., hotels, theme parks, recreational parks, beaches), and other locations where vehicles typically park for more than four hours (e.g., park-and-ride lots, college campuses), would help increase range confidence and electric miles driven. Enabling charging at these venues will benefit both BEVs and PHEVs, because people typically travel a long distance to visit them.
- *Fleets*: By providing charging infrastructure to enable electric fleets, the Charge Ready program helps to address the significant air-quality challenges of the eight non-attainment air districts in SCE's service territory.[38] Light- and medium-duty trucks and delivery vehicles in fleets generally produce higher levels of GHGs and criteria pollutants than passenger cars

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https://ethree.com/documents/E3_Final_RPS_Report_2014_01_06_with_appendices.pdf [as of October 27, 2014].

[37] SCE accounts show 28 percent of residential accounts are multi-family units (SCE data), and census data shows 34 percent of MUDs are buildings with more than 20 units. *See* U.S. Census Bureau, "2013 American Community Survey: Units in Structure," *available at* http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_1YR_B25024&prodType=table [as of October 27, 2014].

[38] *See* e.g., R.13-11-007, SCAQMD staff Opening Comments in Response to AFV OIR, filed August 29, 2014, pp. 3-5. *See also* CARB, California Local Air District Directory, *available at* http://www.arb.ca.gov/capcoa/roster.htm [as of October 27, 2014] (identifying: SCAQMD; San Joaquin Valley Unified APCD; Antelope Valley AQMD; Eastern Kern APCD; Great Basin Unified APCD; Mojave Desert AQMD; Santa Barbara County APCD; and Ventura County APCD).

and are often based in disadvantaged communities.[39] In addition, fleet EVs are very visible in the community – potentially creating a showroom effect similar to workplace charging.

- *Disadvantaged communities*: Targeting these areas is especially important for SCE because its territory contains a high share of areas characterized as disadvantaged by the CalEPA.[40]

B. Market Education Addresses a Key Barrier

SCE's proposal includes a broad Market Education effort and TE Advisory Services program to address barriers to EV adoption created by low levels of awareness and understanding of EVs and the benefits of fueling from the grid. SCE's Market Education efforts and TE Advisory Services will provide new, cost-effective channels for reaching and educating customers (both residential and commercial) to provide them with more complete information when making decisions about their vehicle needs. SCE's proposal addresses the awareness barriers discussed above in Section II of this volume and is broader than current SCE efforts, which are limited to customers that have already expressed an interest in EVs. SCE's proposal will proactively reach out to targeted customers and will enable all customers to make informed decisions about the options available, fueling cars and fleets from the electric grid, environmental benefits, and other transportation electrification issues.

SCE's proposal requests funding through 2017 for the Market Education efforts and TE Advisory Services. These programs complement the Charge Ready program and should start promptly to encourage market acceleration. Because these efforts are appropriate for consideration as part of SCE's general rate case going forward, SCE plans to propose appropriate funding to continue these efforts in its 2018 General Rate Case.

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[39] The average output of both carbon dioxide and host of other pollutants is higher in larger, more fuel-intensive vehicles. *See* Environmental Protection Agency, Office of Transportation and Air Quality, "Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks," October 2008, pp. 4-5, *available at* http://www.epa.gov/otaq/consumer/420f08024.pdf [as of October 27, 2014].

[40] Cal. Health & Safety Code § 39711 instructs the CalEPA to identify "disadvantaged communities" for investment opportunities, based on the community's geographic, socioeconomic, public health, and environmental hazard criteria. CalEnviroScreen 2.0 identifies these communities by census tract. 26 percent of SCE's service territory population resides in the top 20 percent of the statewide CalEnviroScreen 2.0 census tracts.

IV.
UTILITY INVESTMENTS AND MARKET EDUCATION PROGRAMS WILL GENERATE VALUABLE BENEFITS FOR ALL RATEPAYERS AND COMMUNITIES AT LARGE

A. EVs Create Uniquely Flexible Load that Supports Reliable Electric Service by Addressing Current and Future Grid Problems

EV charging is very flexible load that can help to cost-effectively integrate an increasing amount of intermittent renewable energy flowing into the grid.[41] SCE has made significant investments to modernize the grid, and EV charging can take advantage of these improvements. Both the Charge Ready and Market Education programs are designed to leverage this flexibility and associated load management services EVs connecting to a modern grid can provide.

SCE's proposed Charge Ready program provides more reliable electric service, enhanced resource utilization, and optimized grid operation by providing charging infrastructure in long dwell-time locations where charging loads are most flexible. Most fleet vehicles and EVs parked at MUDs and some other long-dwell locations can charge overnight when grid utilization is low. Similarly, EVs parked at workplaces can charge off-peak in the morning hours. Compared to flat rates without time-related pricing signals, the net lifetime benefits per EV are about $1,400 higher with time-of-use rates that encourage off-peak charging.[42] Daytime, long dwell-time EV charging can provide additional benefits in relation to increasing renewable penetration by absorbing excess solar generation and reducing the evening ramp in net load.

EVs coupled with demand response or other load management capabilities are a valuable preferred resource for the electric grid.[43] The Charge Ready program's design includes several features

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[41] *See* Energy Division Staff White Paper, "Vehicle-Grid Integration: A Vision for Zero-Emission Transportation Interconnected throughout California's Electricity System," October 2013, *available at* http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M080/K775/80775679.pdf [as of October 27, 2014]. *See also* CAISO, "California Vehicle-Grid Integration (VGI) Roadmap: Enabling vehicle-based grid services," February 2014, *available at* http://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf [as of October 27, 2014].

[42] *See* "California Transportation Electrification Assessment, Phase 2: Grid Impacts," prepared by ICF International and E3, October 23, 2014, p. 19 and Table 18, *available at* http://www.caletc.com/wp-content/uploads/2014/10/CalETC_TEA_Phase_2_Final_10-23-14.pdf [as of October 27, 2014].

[43] Cal. Pub. Util. Code § 769 (a) includes electric vehicles in the definition of distributed resources. EVs coupled with demand response are a preferred resource. *See* footnote 8, *supra*.

to ensure that ratepayers realize these potential benefits. For example, Level 2 charging stations installed under the program must have demand response capability. Suppliers offering charging stations with multiple ports and other new load management technologies (e.g., power sequencing, power capping, power sharing) are encouraged to participate in the program. During the pilot phase, SCE will explore the need for new rates and load management programs for potential inclusion in Phase 2 of the program.

SCE's proposed Market Education effort is also designed to capture these ratepayer benefits by educating current and future customers about how they can lower their fuel costs (e.g., approximately $1 per gallon equivalent electricity prices off-peak). SCE will inform targeted customers (e.g., college campuses, workplaces) about the need for charging during times of solar over-generation when this becomes an issue.[44]

A. Benefits Are Expected to Accrue to Local Communities

The proposed programs will benefit the entire region by advancing a key strategy to improve air quality, consistent with the new, more stringent federal standards. This is especially important for residents in the SCE service territory's eight non-attainment districts, including the very populous South Coast, Ventura, and San Joaquin air districts. Since SCE's territory serves as a hub for long distance travel throughout the region, benefits from charging at long dwell-time locations or driving an EV on local freeways will spill over to surrounding communities. The availability of charging at long dwell-time destination locations and mass-transit stations served by Charge Ready will facilitate electric transportation throughout the region. For example, EV charging available at park-and-ride locations allows travelers to combine two low-carbon transportation options: EVs and public transportation via rail or alternative-fueled buses. Encouraging low-carbon public transportation also improves air quality and reduces traffic congestion, especially in the inner core of cities.

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[44] *See* "Investigating a Higher Renewables Portfolio Standard in California," *supra*, p. 13. *See also* Nancy Ryan, presentation for Breakout Session B3: *PEVs as Enablers for the Renewable Energy Future*, Plug-in 2014, San Jose, CA, July 30, 2014.

For each electric mile driven, an EV reduces emissions contributing to GHGs by approximately 75 percent, smog (ozone)-forming air pollutants by about 85 percent, and petroleum use by 100 percent compared to tailpipe, power plant, refinery, and other upstream emissions from gasoline-powered vehicles.[45] These benefits increase when charging is managed to optimize grid utilization or integrate renewable energy generation.

The GHG, air-pollution reduction, and energy security benefits of EVs when monetized are estimated to be over $3000 per EV over its lifetime, using conservative values.[46] The Commission and state legislature have recognized these additional ratepayer benefits.[47]

B. Incremental EV Load Is Beneficial for All SCE Customers

Adding EVs and their related electrical load is expected to exert downward pressure on electric rates for all customers, primarily by improving system utilization (load factor) because the grid requires less infrastructure addition and upgrades to serve additional EV load than incremental non-EV load. Under four rate and charging load shape scenario studies developed by Energy+Environmental Economics (E3), net revenues exceeded the cost of delivered energy for EV charging.[48] Positive net

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[45] Generation of electricity in California and the surrounding states has not used petroleum for many years. Full fuel cycle emission analysis for both BEVs and Gasoline shows in 2020 and 2025 that electric miles result in about 86 percent and 83 percent, respectively, less smog forming pollutants (reactive organic gases and oxides of nitrogen), and about 80 percent and 76 percent, respectively, less GHGs compared to gasoline miles. *See* "Advanced Clean Cars Summary," California Air Resource Board, p. 16, Figures 6 and 7, *available at* http://www.arb.ca.gov/msprog/clean_cars/acc%20summary-final.pdf [as of October 27, 2014].

[46] *See* "California Transportation Electrification Assessment; Phase2: Grid Impacts," *supra*, p. 60, Figure 20, for sum of carbon, health, and energy security benefits, and Section 5, pp. 46-54, for inputs to Figure 20.

[47] Decision (D.)11-07-29 discusses that it is essential to accelerate EV adoption to support reduction of GHG emissions and meet other state and national goals. D.11-07-029, p. 68. EV programs and policies must be in the ratepayer's interests as defined in Cal. Pub. Util. Code § 740.8: "direct benefits that are specific to ratepayers in the form of safer, more reliable, or less costly … electrical service … and activities that benefit ratepayers and that promote energy efficiency, reduction of health and environmental impacts from air pollution, and greenhouse gas emissions related to electricity … production and use, and increased use of alternative fuels."

[48] E3 analyzed ratepayer impacts of PEV charging for Pacific Gas and Electric Company (PG&E), SCE, San Diego Gas & Electric Company (SDG&E), and the Sacramento Municipal Utility District (SMUD) in the recent California Transportation Electrification Assessment. E3 found that EVs pass the CPUC's Ratepayer Impact Measure (RIM) test by finding that EV benefits are larger than EV costs. The RIM test examines EVs from the perspective of a utility ratepayer who does not have an EV and asks whether EVs will cause their (*Continued*)

revenues from EV charging reduce the revenue requirement that must be collected from non-EV drivers, putting downward pressure on costs for all customers. Of course, a significant number of EVs are needed to see substantial benefits. SCE's programs proposed in this Application are intended to facilitate increasing the rate of adoption toward a level that will produce these benefits.

C. The Charge Ready and Market Education Programs Will Offer Participating Customers a Wide Range of Options and Assistance

The Charge Ready and Market Education programs will help prospective participating customers overcome the barriers of cost and complexity by providing a complete, turn-key, customer-friendly solution. The Charge Ready program is not one-size-fits-all, but instead will provide customers with many choices, such as whether to install Level 1 or Level 2 charging stations and whether to offer free or paid charging to EV users. Customers will also be able to choose from several electric rate options to best manage their energy and demand charges and participate in load management and eventually demand response options.

D. Disadvantaged Communities Will Benefit from Charging Infrastructure and an Expanded EV Market

The Charge Ready program will make direct infrastructure investments in disadvantaged communities. Complementing the increase in charging infrastructure, the Market Education programs will help low-income customers, fleet operators, and businesses in disadvantaged communities take advantage of available incentives to buy both light- and medium-duty EVs.[49] As the EV market

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rates to go up or down absent any other factors. Specifically, E3 compared the revenue collected under time-of-use (TOU), flat, tiered and "mixed" rate scenarios (that EV owners might select) and compared them to detailed costs to serve EV load including one of the first published analysis of the incremental transmission and distribution (T&D) system costs and all the other costs to supply electricity to EVs (e.g. energy, capacity, renewables requirements, GHG allowances, and administrative overhead). *See* "California Transportation Electrification Assessment, Phase 2: Grid Impacts," *supra*, Section 6.3, pp. 62-64, and Figure 24 for details, and Section 5, pp. 46-54, for background.

[49] Cal. SB 1204 (2014 Cal. Stats. ch. 524) and Cal. SB 1275 (2014 Cal. Stats. ch. 530), signed into law by Governor Brown in September 2014, modify the existing Clean Vehicle Rebate Project (CVRP) and Hybrid (*Continued*)

expands, more EVs will enter the used car market and create a supply of increasingly affordable EVs. With leased vehicles representing 51 percent of the EV market, this process is starting now.[50]

Indirectly, disadvantaged communities will benefit from improved air quality as the market penetration of EVs rises. These communities are disproportionately affected by the negative environmental consequences of gasoline-powered vehicles because many are located in polluted transportation corridors. The Charge Ready program's focus on fleet electrification will benefit disadvantaged communities where fleets are often based, in addition to providing infrastructure in the communities that could be used by residents purchasing or leasing EVs, such as at local workplaces and MUDs.

E. The Charge Ready and Market Education Programs Will Help Create Jobs in the Community and Provide Opportunities for SCE's Suppliers, Including Diverse Business Enterprises

SCE anticipates that the Charge Ready program will create many jobs for electricians, engineers, and construction workers. While much of the Charge Ready program's costs will be for equipment, SCE anticipates contracting for a significant portion of the required services, potentially including engineering, design, and construction, as well as advertising and marketing efforts. The E&O programs will require expenditures on creative and communications services. Media purchases will include

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and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) grant programs to bring additional state incentives to disadvantaged communities beyond those already required by Cal. SB 535 (2012 Cal. Stats. Ch. 830 § 2).

[50] According to a Center for Sustainable Energy survey, as of October 17, 2014, 6,221 of 12,199 total respondents reported leasing, rather than purchasing, their electric vehicle. *See* Center for Sustainable Energy, "EV Consumer Survey Dashboard," Dealership Experience tab, *available at* http://energycenter.org/clean-vehicle-rebate-project/survey-dashboard [as of October 27, 2014].

advertising in communications outlets serving the many diverse communities within SCE's service territory. Furthermore, these jobs can be created locally, which would provide economic benefits.[51]

SCE proudly participates in the Commission's voluntary supplier diversity program, which sets a goal of procuring 21.5 percent of the company's annual spend on goods and services from Women, Minority, and Disabled Veteran Business Enterprises (WMDVBEs).[52] In 2013 (latest year of reporting), SCE's total procurement with WMDVBEs exceeded $1.4 billion, or 41 percent. At SCE, spending with WMDVBE firms has increased 97 percent since 2009, and continues to exceed the Commission's 21.5 percent target.[53]

F. The Charge Ready and Market Education Programs Will Help Businesses in All Aspects of the EV Charging Market

The primary goal of the Charge Ready program is to help EV charging grow and succeed so that the market for EVs can grow and succeed. In developing the program, SCE consulted with prospective participating customers; charging station installers, owners, and operators; equipment providers; and providers of network, billing, and other related services. SCE staff also participated in and learned from

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[51] This UC Berkeley study considered a wide range of positive and negative impacts from EVs on job creation and the economy, but on the whole found net benefits. *See* D. Roland-Holst, "Plug-in Electric Vehicle Deployment in California: An Economic Assessment," University of California, Berkeley, Department of Agricultural and Resource Economics, September 2012, *available at* http://are.berkeley.edu/~dwrh/CERES_Web/Docs/ETC_PEV_RH_Final120920.pdf [as of October 27, 2014].

[52] CPUC General Order (GO) 156, Rules Governing the Development of Programs to Increase Participation of Women, Minority, and Disabled Veteran Business Enterprises in Procurement of Contracts from Utilities as Required by Public Utilities Code Sections 8281-8286, Adopted by D.88-04-057 on April 27, 1988, Effective May30, 1988, *available at* http://docs.cpuc.ca.gov/PublishedDocs/PUBLISHED/GRAPHICS/171157.PDF [as of October 27, 2014].

[53] *See* SCE's GO 156 Report, "Supplier Diversity: 2013 Annual Report/2014 Annual Plan," March 2014, *available at* http://www.cpuc.ca.gov/NR/rdonlyres/5338AE22-A786-424E-ABDB-2C6E8F7DD23E/0/SouthernCaliforniaEdison2013AnnualWMDVBEReportandAnnualPlanfor2014perD1105019March.pdf [as of October 27, 2014].

several recent workshops[54] assessing the impediments that have hindered the infrastructure build-out in workplaces and multi-unit dwellings improve the Charge Ready program design.

Through the Charge Ready and Market Education programs, SCE will enable expansion of the EV charging market. SCE's proposed approach of enabling numerous third-party charging station suppliers to qualify to provide charging equipment and services in the Charge Ready program will stimulate innovation and possibly new business models in the charging market. The program's scale will bring needed volume to third-party charging station providers and operators, which will create stability and enable new market entrants. By focusing on what SCE does best (including working with customers, creating safe, cost-effective interconnection with the distribution grid, retaining qualified contractors to do trenching, electrical upgrades, and other installation work), SCE will enable companies throughout the EV charging ecosystem to focus on what they do best (create and provide EV charging station equipment and services, communications technology and networks, additional vehicle-grid integration technologies).

Another benefit is that information gleaned from the Charge Ready program will be shared with stakeholders to inform future state policy and utility programs (e.g., data and learnings on costs and cost containment strategies, load forecasting and power procurement, distributed resources plans, barriers to charging installations, load management options, renewables integration, impact of rates and demand charges, technology trends). SCE will provide this information in regular reports to the Commission's Energy Division to inform future Commission policy and utility program design.

This targeted, short-term program should stimulate additional private sector investment in support of the state's goals for transportation electrification. This is especially important now, since public sector dollars are shrinking.[55]

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[54] *E.g.*, PEV Collaborative, two CARB workshops, three CEC workshops, the Governor's Workplace Charging symposium, the ZEV Action Plan workshop, the VGI Roadmap workshop, CPUC workshops, and two recent three-day EPRI conferences.

[55] The federal grants from the American Reinvestment and Recovery Act of 2009 and the federal tax credits for charging stations have expired. Grant programs from the CEC and air districts in the SCE service territory for charging stations have only averaged less than $1.5 million per year over the last eight years and are not large (*Continued*)

G. More SCE Customers Will Have Access to Resources that Support Using EVs to Meet Their Driving Needs

The Market Education efforts will increase the number of people who are informed about EVs and the benefits of fueling from the grid, while the Charge Ready program will deploy essential infrastructure, making it possible for more people to use EVs for their transportation needs. Whether they choose BEVs or PHEVs, whether they prefer to charge at home, at work, or at other destinations, the programs will support customers' charging needs. The Charge Ready program and Market Education efforts will enable more businesses to electrify their fleets, help their employees, save on fuel costs, reduce their environmental footprint, and answer Governor Brown's call for increased workplace charging.[56]

H. Accelerating Near-Term Adoption of EVs in California Provides an Immediate Financial Benefit and the SCE Proposal Would Leverage Existing Tax Credits and Rebates for EVs

Federal income tax credits are available to the first 200,000 purchasers of EVs from each automaker.[57] Timely action to stimulate EV sales here means that Californians could maximize California's share of this first-come-first-served federal benefit, which could inject additional money into California's economy. Both the Schwarzenegger and Brown administrations led efforts to maximize California's share of the federal grants and tax incentives for renewable energy facilities and

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parts of future spending plans. *See* "2014-2015 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program," California Energy Commission Report, April 2014, Table 2, *available at* http://energy.ca.gov/2013publications/CEC-600-2013-003/CEC-600-2013-003-CMF.pdf [as of October 27, 2014].

[56] *See* D. Hull, "Gov. Jerry Brown, Corporate Leaders Tout Electric Vehicles," San Jose Mercury News, September 16, 2013, *available at* http://www.mercurynews.com/business/ci_24107581/gov-jerry-brown-corporate-leaders-tout-electric-vehicles [as of October 27, 2014].

[57] Eligible credits range from approximately $3400-$7500 per vehicle. Assuming an average credit value of $5000, 200,000 purchases yields $1 billion per automaker. Assuming 20 automakers brings the estimated total credit value to $20 billion.

smart grid investments provided by American Recovery and Reinvestment Act of 2009. This is a similar opportunity that merits a similar sense of urgency.

SCE's proposed Charge Ready program and Market Education efforts complement and leverage state and federal funds invested to reduce the incremental price of EVs compared to their gasoline-powered counterparts. Given the large amounts of government funds committed for EV purchases and the lack of government funds invested in charging infrastructure in recent years,[58] a limited-duration market acceleration program such as SCE's proposal increases the likelihood of achieving state goals while also benefiting ratepayers in the many ways described above in this Section.

[58] *See* footnotes 29, 55, and 57, *supra*. In addition, CARB's Clean Fuel Vehicle Rebate program has spent $166 million since its inception on EV rebates. *See* Center for Sustainable Energy, "CVRP Rebate Statistics," *available at* http://energycenter.org/clean-vehicle-rebate-project/rebate-statistics [as of October 27, 2014]. CARB's long term plans for rebates for light duty ZEV rebates is $125 million per year, and at least $25 million per year for medium and heavy duty ZEVs. *See* "Fiscal Year 2014-15 Funding Plan for the Air Quality Improvement Program and Low Carbon Transportation Greenhouse Gas Reduction Fund Investments," California Air Resources Board, June 26, 2014, *available at* http://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf [as of October 27, 2014].

V.

SCE'S PHASE 1 PILOT WARRANTS EXPEDITED REVIEW

If EV adoption does not accelerate soon, it is highly unlikely California will achieve the trajectory necessary to realize its ambitious 2020 through 2050 carbon and air quality goals and requirements. As stated, given the importance of SCE's proposal and recognizing the uncertainty associated with some elements, SCE proposes to implement the program in two phases. Phase 1, which is a one-year pilot, will include the deployment of up to 1,500 charging stations and complementary broad Market Education and Outreach. The objective of the pilot is to inform and refine the design and cost estimates and develop success measures for Phase 2 of the Charge Ready program and Market Education efforts. SCE expects to spend up to $22 million in ratepayer funding to deploy approximately 1,500 EV charging stations and complementary Market Education and Outreach during the pilot phase. SCE plans to hold quarterly status meetings with the Commission staff and other stakeholders throughout the Pilot, and to refine the Charge Ready program and Market Education efforts as necessary prior to the full implementation proposed for Phase 2. SCE expects to file a report with the Commission detailing the first nine (9) months of the Pilot, which will inform the Commission's consideration of Phase 2 and allow SCE to supplement its showing, as appropriate, prior to a Commission decision on Phase 2.

Expedited review and approval of the pilot phase will allow SCE to undertake critical market acceleration activities before California's carbon goals and air quality requirements become unattainable. Therefore, SCE requests that the Commission phase its consideration of this Application into two phases:

- Phase 1 of this proceeding should consider the merits of SCE's proposed pilot on an expedited basis, with a final decision by April 2015. SCE's Phase 1 request is supported by Volumes 1 and 2 of SCE's testimony.
- Upon issuance of a decision on Phase 1, the Commission should proceed with Phase 2, calling for intervenor testimony and hearings (if necessary) promptly on the heels of SCE's filing of its Pilot report and any supplements or changes to SCE's Phase 2 testimony in

January 2016. A final decision on Phase 2 should be issued by April 2016. SCE's Phase 2 requests are supported by Volumes 1, 3, 4 and 5 of SCE's supporting testimony.

To facilitate expedited implementation of the Pilot, SCE also plans to request the Commission's approval to establish a memorandum account to allow it to record certain pre-deployment pilot costs in advance of a final Commission decision on the Phase 1 request.

VI.

SUMMARY OF REQUESTS

In this Application, SCE seeks authority to:

(i) Expeditiously proceed with its Phase 1 Pilot over a 12-month period beginning in April 2015 at an estimated cost of $22 million. Phase 1 will include the deployment of infrastructure to support up to 1,500 charging stations, as well as broad Market Education activities;

(ii) Establish the Charge Ready Program Balancing Account (CRPBA) to provide for the recovery of Phase 1 Pilot recorded revenue requirements, which include recorded Phase 1 incremental costs, effective upon a Commission decision in Phase 1 of this Application;

(iii) Limit reasonableness review of the CRPBA to ensure all recorded costs are associated with Phase 1 Pilot activities as defined and adopted by the Commission in Phase 1 of this proceeding;

(iv) Hold quarterly status meetings with Commission staff and other stakeholders during Phase 1, and file a report on the Phase 1 activities and update SCE's Phase 2 testimony as necessary in January 2016;

(v) Proceed with Phase 2 of SCE's Charge Ready Program over a four-year period beginning in April 2016 at an estimated cost of $333 million;

(vi) Modify the CRPBA to provide for the recovery of Phase 2 Pilot recorded revenue requirements, which include recorded Phase 2 incremental costs, effective upon a Commission decision in Phase 2 of this Application; and

(vii) Limit reasonableness review of the CRPBA to ensure all recorded costs are associated with Phase 2 activities as defined and adopted by the Commission in Phase 2 of this proceeding.

VII.

CONCLUSION

SCE's proposed Charge Ready program and Market Education efforts are designed to help achieve California's ambitious environmental goals that require a dramatic increase in electrification across transportation sectors, and we must act now. Without market acceleration during this critical time, the window to realize these goals will close. SCE will continue to do its part to help the state and Commission achieve their policies, from enabling transportation electrification today, increasing renewable resource diversity tomorrow, and addressing new storage and load-balancing challenges in the longer term.

Appendix A

Witness Qualifications

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF EDWARD T. KJAER

Q. Please state your name and business address for the record.

A. My name is Edward Kjaer, and my business address is 2244 Walnut Grove Avenue, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at the Southern California Edison Company.

A. I am the Director of the Transportation Electrification Division within the Energy and Environmental Policy section of SCE's Regulatory Affairs operating unit. I am responsible for the division's efforts to perform cross-functional planning and coordination of Transportation Electrification activities for SCE (including light/medium/heavy duty PEVs, SCE's fleet electrification, electrified ports, forklifts, transit and other goods movement).

Q. Briefly describe your educational and professional background.

A. I attended Massey University in New Zealand, where my studies focused in the areas of marketing and business economics. Between 1980 and 1985, I held a number of advertising positions in New Zealand culminating in the position of Account Director in charge of the Nissan and Sanyo advertising accounts. After emigrating to the U.S. in 1985, I worked on the launch of the Acura Division (1985-1988) for American Honda's Advertising Agency, rising to the position of Vice President. From 1988 through 1995, I worked for Mazda Motor of America, rising to the position of Corporate Marketing Manager. Beginning in 1996 and to the present, I have held several positions in the Edison family of companies including: Director of Sales and Marketing, Edison EV; Director, Automotive Division, Edison EV; and at Southern California Edison- Director of ET Division; Director PEV Readiness and finally today, I am the Director of the Transportation Electrification Division.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor the portions of the following

volumes of Exhibit SCE-01, entitled *Prepared Testimony in Support of SCE's Charge Ready Application*, as identified in the Tables of Contents thereto: Volume 01 – Policy; Volume 02 – Charge Ready and Market Education Pilot; and Volume 03 – Phase 2 Charge Ready Program Design Implementation Plan, and Costs.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was prepared under my supervision.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best judgment?

A. Yes, it does.

Q. Does this conclude your qualifications and prepared testimony?

A. Yes, it does.

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF RONALD O. NICHOLS

Q. Please state your name and business address for the record.

A. My name is Ronald O. (R.O.) Nichols, and my business address is 8631 Rush Street, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at the Southern California Edison Company (SCE).

A. I am currently the Senior Vice President of Regulatory Affairs for SCE. As such, I am responsible for regulatory policy and regulatory filings with the Commission, as well as relevant policy and filings with the Federal Energy Regulatory Commission, the California Air Resources Board, California Energy Commission and other federal and state regulatory agencies.

Q. Briefly describe your educational and professional background.

A. I have a Bachelors of Science degree in Agricultural Economics and Business Management from the University of California, Davis. Prior to joining SCE, I was General Manager/CEO of the Los Angeles Department of Water and Power (LADWP) from 2011 to 2014. Before joining LADWP, I had a 30-year consulting career in the energy and water utilities industry as a Managing Director at Navigant Consulting, Inc. in that international firm's energy practice from 1997 to the end of 2010 after the firm of Resource Management International, Inc. where I was a co-founder sold to Navigant. I was at Resource Management International from 1980 to 1997. Prior to co-founding Resource Management International, between 1975 and 1980, I held positions with the California Energy Commission and the California Department of Water Resources. In April 2014, I joined Southern California Edison Company in my current position as Senior Vice President of Regulatory Affairs. I have previously testified before the California Public Utilities Commission in quasi-legislative proceedings prior to joining SCE.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor the portions of Exhibit SCE-01, entitled *Prepared Testimony in Support of SCE's Charge Ready Application*, Volume 01 – Policy, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best judgment?

A. Yes, it does.

Q. Does this conclude your qualifications and prepared testimony?

A. Yes, it does.

Appendix B

Details Supporting Figure II-3

Appendix B
Details Supporting Figure II-3

Figure II-3 of this volume of testimony, entitled *Estimated Charging Infrastructure Required to Support ZEV Adoption in SCE's Service Territory and Proposed Charge Ready Deployment*, utilizes two types of forecasts – one for the number of vehicles in the market and another for the associated amount of charging infrastructure needed to support that vehicle forecast. The vehicle forecasts are derived from an average of eight expert forecasts, research conducted by Lawrence Berkeley National Lab (LBNL), and SCE's internal expertise. Charging infrastructure needs calculations rely on research conducted by National Renewable Energy Labs (NREL) and the EPRI. Each of these forecasts are needed to calculate the charging infrastructure estimated in Figure II-3. SCE's methodology is explained below.

A. Vehicle GHG Scenarios and Nearer Term Forecasts

For the higher EV population projection in Figure II-3, SCE drew upon the expertise of LBNL and used the light-duty EV scenario from its assessment of how California can achieve an 80 percent emissions reduction from 1990 levels by 2050.[59] In an effort to be conservative, E3 (under SCE's direct supervision) modified LBNL's scenario downward to be in line with the more conservative population of vehicles in the CARB scenario (which assumes more use of transit, car sharing, etc.). For the lower EV population projection in Figure II-3, SCE used a vehicle forecast that averaged eight expert forecasts, which SCE has used in proceedings such as CEC workshops.[60]

B. Calculating Charge Ports Associated with EV Population

The associated amount of charging infrastructure needed to support the EV population is described in terms of charge ports. Charge ports are individual charging plugs coming from a station and can be thought of as synonymous with parking spaces (assuming one EV per port per day in long dwell-time parking locations where moving cars is challenging). SCE calculated market needs in charge ports

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[59] *See* footnote 17, *supra*.

[60] Forecasts come from financial institutions (Citigroup, Morgan Stanley), consultancies and market researchers (Boston Consulting Group, Gartner, Pike, Bloomberg, EPRI) and governmental agencies (CEC). *See* footnote 18, *supra*.

as opposed to charging stations to reduce forecast complexity,[61] minimize potential reader confusion, and remain in line with industry standards.

SCE used what industry experts refer to as an "attach rate" to determine the total number of charge ports needed to serve a population. An "attach rate" is a ratio of charge ports relative to the total population of EVs in the market. For example, an attach rate of 100 percent or 1:1 means that for every charge port there is one EV in the market. An attach rate of 50 percent or 1:2 means that there is one charge port for every two EVs in the market.

Because at-home-charging is convenient, available, and is therefore the primary charging point for most EVs, it has an attach rate of greater than 90 percent.[62] Away-from-home charging is a more challenging estimate, and involves a more detailed assessment of vehicle population and type in a charging market segment, assumed mileage, charging speed and charging behavior. Because of these complexities, SCE relied on reports published by NREL[63] and EPRI.[64] Each of these institutions looked at the need for away-from-home charging market segments in 2020. The attach rates were then applied to the two EV forecasts explained above.

C. Workplace Charging Calculation Assumptions

SCE's assumed workplace attach rate was calculated by averaging the high and low scenario attach rates published by EPRI (56 percent and 15 percent respectively) and NREL (37 percent and 23

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[61] Depending on manufacturer's design, charging stations can have anywhere from one to eight charge ports. For modeling purposes, SCE assumed that roughly two ports per charging station would be a market weighted average therefore 30,000 charging stations allocated across each market segment would satisfy the calculated 60,000 charging port market need in 2020.

[62] *See* footnotes 63 and 64, *infra*.

[63] *See* "California Statewide Plug-In Electric Vehicle Infrastructure Assessment" Final Project Report, Prepared by the National Renewable Energy Laboratory for the California Energy Commission, Alternative and Renewable Fuel and Vehicle Technology Program, CEC-600-2014-003, May 2014, *available at* http://www.energy.ca.gov/2014publications/CEC-600-2014-003/CEC-600-2014-003.pdf [as of October 27, 2014].

[64] *See* "Guidelines for Infrastructure Planning: An Explanation of the EPRI Red Line/Blue Line Model," Electric Power Research Institute, June 16, 2014, abstract *available at* http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002004096 [as of October 27, 2014].

percent respectively[65]) to come up with a workplace average attach rate of 33 percent, as shown in Table B-1 below. The attach rate was then applied to the SCE average of eight vehicle forecasts to arrive at the conservative forecast in Figure II-3 for the number of charge ports, and the LBNL 2050 vehicle number was used for the high scenario in Figure II-3.

Table B-1
EPRI and NREL 2020 Attach Rates for Workplace Charging

Source	Attach Rate
EPRI (Benefit Charging Scenario)	15%
EPRI (Free Charging Scenario)	56%
NREL (Home Dominant Scenario)	23%
NREL (High Public Access Scenario)	37%
Average of EPRI and NREL Scenarios	*33%*

D. Multi-Unit Dwellings Calculation Assumptions

As residences, MUDs have similar characteristics (i.e., parking duration, resident desire for convenient charging, assigned parking spot) to single-family residences. As such, SCE used an average of the attach rates assumed for residential charging stations from NREL's two scenarios (97 percent for Home Dominant and 89 percent for Public Access). However, the number of large MUDs that would qualify under the Charge Ready program is much smaller than the number of single-family residences assumed by NREL. Therefore, their 93 percent average attach rate needed to be reduced to represent only large MUDs. SCE achieved this by applying two factors – the percentage of MUDs relative to single-family residences in SCE territory (28 percent[66]), and the percentage of MUDs that have greater

[65] *See* "California Statewide Plug-In Electric Vehicle Infrastructure Assessment" [NREL] Final Project Report, *supra*, pp. 16 (Table 4) and 32 (Table 8). Take the adjusted public and workplace charge ports from Table 4 by the charge events per day from Table 8 to make NREL's forecast comparable with EPRI. As a result, both EPRI and NREL percentages reflect one vehicle per charge port.

[66] SCE Customer Account Data.

than 20 units (34 percent[67]). The final attach rate, after these reductions, is 9 percent. Finally, as in the other market segments discussed, the conservative and high scenarios in Figure II-3 were once again differentiated using the average of eight forecasts and the LBNL 2050 forecast, respectively.

E. Other Long Dwell-Time Locations

SCE relied on an average of NREL's forecast of public charging need and narrowed the forecast to isolate only long dwell-time locations by assuming, as NREL does, that all Level 1 locations are long dwell-time, but that only 10 percent of NREL's Level 2 forecast would be long dwell-time, using data from a National Household Travel Survey (NHTS) of parking duration.[68] The NHTS study reported that about 10 percent of dwell times are greater than four hours, thus classifying them as long dwell-time. The corresponding attach rate of roughly 0.6 percent was applied to the two vehicle forecasts in the same manner used for workplaces and MUDs.

D. Fleets

SCE applied a slightly different methodology to calculate the need for fleet charging ports because little information exists on fleet adoption and charging needs. The fleet electrification values assume that the ratio of California's fleet vehicle population relative to its entire vehicle population is comparable to California's share of the national total number of vehicles. Based on 2009 Census Bureau data, California-registered vehicles comprise approximately 14 percent of all vehicles registered in the United States.[69] In 2012, the U.S. Department of Transportation recorded 10.7 million nationwide fleet vehicles.[70] Assuming 14 percent of fleet vehicles are registered in California, the state had 1.5 million

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[67] GeoLytics census data as of Q3 2013, prepared using American Community Survey 2010 census information and U.S. Census Bureau Economic Planning and Coordination Division 2013 census information.

[68] 2009 National Household Travel Survey (NHTS), *available at* http://nhts.ornl.gov/2009/pub/stt.pdf [as of October 27, 2014]. The NHTS is a federally funded survey performed every eight years by the Department of Transportation and Oak Ridge National Lab to understand the nation's average driving behaviors.

[69] *See* U.S. Census Bureau, Transportation: Motor Vehicle Registrations, Alternative Fueled Vehicles, *available at* http://www.census.gov/compendia/statab/cats/transportation/motor_vehicle_registrations_alternative_fueled_vehicles.html [as of October 27, 2014].

[70] *See* U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, National Transportation Statistics, *available at* http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_

(*Continued*)

fleet vehicles in 2012, comprising roughly 6 percent of California light- and medium-duty vehicles. SCE assumed that this ratio would stay constant through 2020. Using CARB projections of a 2020 California light- and medium-duty vehicle population of 27.4 million,[71] and assuming SCE's territory represents roughly 33 percent of California,[72] SCE estimates that there will be approximately 495,000 fleet vehicles in SCE's service territory in 2020. Finally, in its high case, SCE assumed fleet electrification at the same 4 percent forecasted rate for consumer light-duty vehicles in 2020,[73] and in its low case used a more conservative rate of half that (2 percent). This yields roughly 20,000 fleet vehicles for SCE's high case and 10,000 fleet vehicles for its low forecast. Fleet vehicles are assumed to have designated parking spots where they can park and charge when not in service. Thus, the number of vehicles is equal to the forecasted number of charging ports.

E. SCE Proposal

SCE believes that bold action by all market participants is required to advance the long dwell-time charging market and support the deployment of EV technologies. As such, SCE determined that it is capable of deploying up to one-third of the charge port market need by 2020 calculated in the conservative case described above (approximately 60,000 ports[74]). This significant deployment should make a sizeable impact on the charging market.

Because each customer segment could have a different allocation of ports per charging station installed, the actual number of charging stations deployed will depend upon which customers choose to

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statistics/index.html [as of October 27, 2014]. This amount was calculated after removing more niche vehicle types, which will likely not be electrified, including police vehicles and rental trucks.

71 *See* California Air Resources Board, Emission Factors (EMFAC) Emissions Database, *available at* http://www.arb.ca.gov/emfac/ [as of October 27, 2014].

72 Based on annual bundled load.

73 *See* Exec. Order No. B-16-2012 (March 23, 2012), *available at* http://gov.ca.gov/news.php?id=17472 [as of October 27, 2014].

74 *See* footnote 60, *supra.*

participate in the Charge Ready program. For modeling purposes, SCE assumed a market weighted average of roughly two ports per charging station, therefore roughly 30,000 charging stations allocated across each market segment would satisfy the calculated 60,000 charging port market need in 2020.