BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking to Consider Alternative-Fueled Vehicle Tariffs, Infrastructure and Policies to Support California's Greenhouse Gas Emissions Reductions Goals	Rulemaking 09-08-009 (Filed August 20, 2009)

SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) RESPONSE AND OPENING COMMENTS ON ORDER INSTITUTING RULEMAKING TO CONSIDER ALTERNATIVE-FUELED VEHICLE TARIFFS, INFRASTRUCTURE AND POLICIES TO SUPPORT CALIFORNIA'S GREENHOUSE GAS EMISSIONS REDUCTIONS GOALS

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SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) RESPONSE AND OPENING COMMENTS ON OIR 09-08-009

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I.

INTRODUCTION AND EXECUTIVE SUMMARY

Pursuant to the August 20, 2009 Order Instituting Rulemaking (OIR) to Consider Alternative-Fueled Vehicle Tariffs, Infrastructure and Policies to Support California's Greenhouse Gas Emissions Reductions Goals, Southern California Edison Company (SCE) hereby files its response and opening comments addressing the questions and other issues identified in the OIR.

SCE welcomes the opportunity to participate with the Commission in considering the impacts electric vehicles may have on California's electric infrastructure, and what actions the Commission should take ensure readiness in the investor-owned utilities' (IOUs) service areas. A variety of factors driving the electrification of transportation (*e.g.,* state and federal policy, technological innovation, consumer demand) have created a sense of urgency to ensure electric system infrastructure readiness to support electric transportation. Although there is a great deal of uncertainty as to how the market for electric vehicles – including plug-in electric hybrid

vehicles (PHEV) and battery electric vehicles (BEV), collectively, plug-in electric vehicles (PEVs)) – will ultimately develop, it is clear that PEVs hold significant promise for achieving reduced petroleum consumption and greenhouse gas emissions in California. Accordingly, SCE supports the Commission's goal of addressing issues that may impact a smooth and successful transition of a portion of California's gasoline-powered vehicles to PEVs.

SCE appreciates the OIR's recognition that Commission policy for PEVs should be consistent with existing important policies for California's electric system, including ensuring electric system reliability, developing appropriate and reasonable rates and incentives for PEVs, optimizing electric system asset utilization, and improving the integration of intermittent renewable resources. SCE discussed each of these key policy areas extensively in its Comments on the Commission Staff's May 22, 2009 White Paper, which are incorporated in the record of this OIR.[1] Consideration of these key policy areas should help define the Commission's proper role in ensuring PEV readiness in California, and appropriately guide the Commission's resolution of the issues raised in this OIR.

SCE appreciates the OIR's ambitious scope; however, care should be taken to address the right issues at the right time. Because of the uncertainties in the PEV market, some of the issues raised in the OIR may be better addressed at a later time. The OIR would be well-served to proceed in a manner that seeks to address urgent and near-term issues related to the PEV market readiness first, and focus on longer-term issues after the near-term issues have been resolved.

As with any developing market, the PEV market is expected to progress in stages, each of which will present unique challenges to a smooth and successful transition in California. SCE views the PEV market in two stages: Early Market and Growing Market, as depicted in Figure I-1 below.

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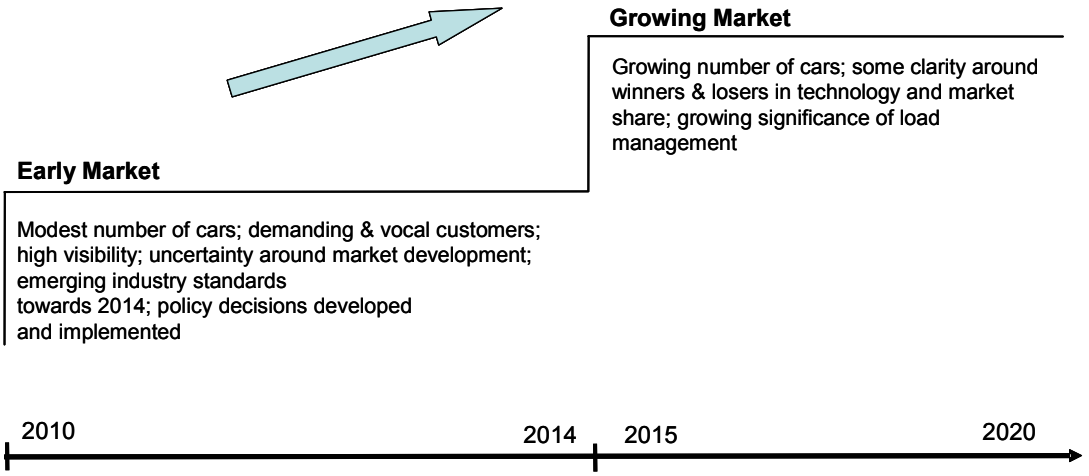
[1] *See* OIR, p. 30, stating "we intend to incorporate into the record for this rulemaking the recent staff white paper issued by the Commission's Policy and Planning Division, dated May 22, 2009 . . . .We also plan to incorporate comments on the May 22, 2009 staff white paper as part of the opening and reply comment process for this rulemaking."

Figure I-1
PEV Market Stages



In the Early Market (2010-2014), SCE anticipates the launch of approximately 15 PEV models by automakers with fairly rapid sales growth during the period due to early adopting consumers and government incentives.

A. Early Market (2010-2014)

Principally, for the Early Market, SCE anticipates the need to have processes in place to (i) adequately accommodate customers' PEV charging installations; (ii) educate customers and other stakeholders (*e.g.,* auto dealerships and local officials, particularly in communities with likely early adopters) about the installation process (*e.g.,* how to be "plug-in ready") as well as the benefits of time-of-use rates for off-peak charging; and (iii) effectively manage the distribution system impacts of early-adopters' PEVs. SCE expects to incur incremental costs starting in 2010 for these PEV readiness efforts, and will require a reasonable process for seeking recovery of these costs. As discussed below, SCE recommends a separate application process for the incremental PEV costs through 2014.

The Early Market presents the need for improved coordination among the various California regulatory agencies and local governments to help streamline the overall process for building permits, inspection and installation of PEV charging equipment for PEV customers requiring 240 volt (V) charging circuits. There are a multitude of steps and parties that affect the timing of residential PEV charging and circuit installation, which, without improved coordination, could present an unreasonable obstacle to PEV adoption. Therefore, early in this OIR, the Commission should consider ways it can encourage improvement in processes that are outside of its regulatory oversight but impact the customer's experience in establishing PEV service.

The Early Market also anticipates the introduction of a Low Carbon Fuel Standard (LCFS) in California, which, if properly structured, can appropriately incentivize the use of electricity as a low-carbon transportation fuel. The Commission's input on the California Air Resources Board's (CARB) LCFS regulation is critical to a thoughtful, effective and lawful implementation of the LCFS; however, the opportunity for the Commission to weigh-in on these issues is fast closing. The Commission should undertake a meaningful review of the LCFS issues early in this OIR. The Early Market requires examination and resolution of the Commission's jurisdiction over third-party PEV service providers. Rules and requirements for third-party PEV service providers operating in the IOUs' service areas need to be established early in this OIR to ensure reliable electricity service, consumer protections and a level playing field in the marketplace.

In addition, the Commission needs to consider the codes and standards for PEVs that impact on IOU service. Smart PEV standards are already under consideration by National Institute of Standards and Technology (NIST) and Society of Automotive Engineers (SAE); they are expected to be completed by early 2013 and will address demand response, load management, metering and communication bridging capabilities. The Federal Energy Regulatory Commission (FERC) plans on adopting the NIST recommendations, and California and the other 49 states should follow so that the nation has a single national standard.

Accordingly, SCE recommends that this OIR should first examine and resolve the Early Market issues, as follows.

1. Process for IOU Recovery of Incremental PEV Readiness Costs

Given the timing of the filing of SCE's 2012 General Rate Case (GRC) in 2010, SCE requires early direction in this OIR on whether it must include PEV readiness costs in its 2012 GRC, or alternatively whether one or more separate applications may be used to seek recovery of costs associated with PEV readiness through 2014. Given the uncertainties associated with forecasting incremental costs for PEV readiness through 2014, the Commission should consider whether separate applications are appropriate for evaluating incremental PEV costs for Early Market readiness, and whether mechanisms like a two-way balancing account are needed. SCE would prefer to use separate applications and a phased approach to seek recovery of 2010-2014 incremental PEV costs: Phase 1 (2010-2011) and Phase 2 (2012-2014). SCE plans to file an advice letter to establish a memorandum account for recording incremental PEV costs effective January 1, 2010.

Accordingly, the Commission should issue a ruling early in this OIR giving direction to SCE and the other IOUs on the process to be used for seeking recovery of incremental costs associated with PEV readiness in the early stages of the PEV market, when forecasting costs can be difficult given uncertainties in adoption rates, patterns and market growth.

2. Jurisdictional Issues Related to Third-Party PEV Service Providers

Early in this OIR, the Commission should address whether and to what extent it will exercise regulatory jurisdiction over third-party PEV service providers, because this issue is foundational to many other issues raised in this OIR. For example, many questions in the OIR pertain to third-party charging infrastructure, which cannot be fully addressed unless and until the Commission determines whether resale of electricity for PEV charging will be permitted, and, if so, to what extent. SCE recommends that one of the first workshops held in this OIR

should be devoted to Commission jurisdictional matters related to third-party PEV service providers.

3. Examination of LCFS Issues

The Commission should schedule a workshop to take place early in this OIR to consider the appropriate LCFS "regulated party" for allocation of the LCFS credit – a critical issue in finalizing the LCFS regulation – and other related LCFS issues. LCFS credits will be generated starting in 2011; therefore it is essential that the Commission make appropriate recommendations to CARB on these important issues by mid-2010. The resolution of this issue has important implications for IOU ratepayers, and warrants the Commission's input to ensure a proper outcome. The merits of the issues are discussed in SCE's response to OIR Questions 33 and 34, herein.

4. Stakeholder Coordination on PEV Adoption Processes

Another early workshop in this OIR should be dedicated to the need for improved coordination among the various California regulatory agencies, local governments, automakers, auto dealers and IOUs to help streamline the overall process for building permits, inspection and installation of PEV charging equipment (levels 2 and 3).

5. Adoption of National Standards for PEVs

NIST is expected to release several rounds of national PEV standards in the coming years. Once NIST's first set of recommended national standards for PEV are finalized in December 2009, the Commission should promptly issue a decision in this OIR adopting those standards related to PEV integration for the IOUs' service areas. The Commission's adoption of NIST's standards for the IOU service areas can provide an important catalyst for their adoption in other California jurisdictions, and toward a single national requirement.

6. Charging Infrastructure Development

Topics related to PEV charging infrastructure development would benefit from one or more workshops in this OIR to explore market participation, barriers to entry, charging options and needed solutions, the IOUs' roles in the PEV charging infrastructure market, metering arrangements, safety, reliability, and consumer protection issues.

7. PEV Rates and Programs

SCE also recommends a workshop on PEV rates and programs in this OIR to consider the merits of PEV subsidies, alignment with related policy objectives, including zero net energy residential and commercial premises, IOU treatment of LCFS credits, appropriate IOU programs and incentives, and other related topics.

* * *

To recap, SCE recommends a series of workshops to address the following broad topics:

- Jurisdictional Issues Related to Third-Party PEV Service Providers;
- LCFS Issues;
- Stakeholder Coordination on PEV Adoption Processes;
- Charging Infrastructure Development;
- PEV Rates and Programs.

This series of workshops is designed to address the issues that impact on IOU readiness for Early Market PEV adoption.

In addition to the workshops, the Commission should take action early in this OIR to:

- Issue a ruling early in this OIR giving direction to SCE and the other IOUs on the process to be used for seeking recovery of incremental costs associated with 2010-2014 Early Market PEV readiness.

- Issue a decision in this OIR adopting NIST's recommended national standards for PEVs related to PEV integration for the IOUs' service areas once they are finalized in December 2009.

B. Growing Market (2015-beyond)

Aside from the Early Market issues discussed above, other issues in this OIR are longer-term in nature because they are relevant to readiness for the Growing Market. Once the Early Market issues are concluded, the Commission should seek input from parties in this OIR on the appropriate time and venue(s) for considering longer-term PEV readiness issues.

II.

SCE'S RECOMMENDED PROCESS AND TIMELINE FOR ADDRESSING THE EARLY ISSUES IN THIS PROCEEDING

Based on the priorities identified above, SCE proposes the following schedule for addressing and resolving the early issues in this OIR.

Table II-1
Proposed Schedule for Early OIR Issues

Issue ruling providing guidance on process for IOU incremental PEV cost recovery through 2014	By December 30, 2009
Schedule and hold a workshop on Jurisdictional Issues Related to Third-Party PEV Service Providers, LCFS Issues and Stakeholder Coordination on PEV Adoption Processes	By January 31, 2010
Final decision on NIST standards for PEVs	January 2010
Issue draft decision adopting NIST standards for PEVs for IOU Service Areas	By February 28, 2010
Schedule and hold workshops on Charging Infrastructure Development and PEV Rates and Programs	By April 30, 2010
Issue recommendations to CARB on LCFS issues	By June 2010

SCE looks forward to working with the Commission and stakeholders in this OIR to ensure readiness for PEV adoption in California.

III.

RESIDENTIAL CHARGING INFRASTRUCTURE AND POLICY

A. Introduction

The development of the residential PEV market will depend on a number of factors, including customer adoption of PHEV versus BEV, customer charging patterns at home versus at public charging stations and advancements in residential charging technologies. At this stage SCE believes the current regulatory practices and tariffs governing investments in meters and equipment on the customer side of the meter can appropriately accommodate initial PEV adoption in the IOU service areas through 2014. However, beyond 2014 the current approach will likely need to evolve to accommodate a more integrative technology approach to ensure longer term energy and climate objectives are met. This longer term perspective includes resolution on how to address metering PEV load, either through an on-car meter, metering within the charging unit, or by some other approach. Also, how to effectively incentivize and link PEV charging into a zero net energy home that includes solar, energy smart appliances and in-premise energy storage unit. To facilitate competition in the residential infrastructure market, the Commission should monitor and adopt EV-related national standards,[2] and engage other governmental and regulatory stakeholders to ensure proper oversight and coordination in the emerging PEV market.

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[2] The Smart Grid standards effort governs the design, installation and communication protocols by the appropriate international standards development organizations. National standards are recommended by NIST as part of the overall Smart Grid effort.

B. Responses to Specific Questions (1-8) in the OIR

1. What types of residential metering arrangements are appropriate for PHEVs and BEVs and why? Should the Commission require a particular metering arrangement, or should it allow more flexibility in metering arrangements by investor-owned utilities or others? If so, why?

Today, SCE offers EV customers three metering options depending on their selected rate. The customers may remain on their existing single meter, tiered electric service, or select one of three time of use (TOU) options: (i) TOU-EV-1, where the EV load is separately metered from the remaining house load (thus requiring dual metering); or one of two tiered TOU options: TOU-TEV, which provides a whole house (single meter) TOU option available only to customers with PEVs; or TOU-D-T, available to all residential customers. These rates were recently approved in Phase 2 of SCE's 2009 GRC proceedings and are expected to be available at least until 2012. In the Early Market, the Commission should allow the IOUs and customers flexibility in determining the most appropriate metering arrangement for any given situation to ensure an expeditious and uncomplicated customer experience that will help to foster PEV adoption.

Because SCE's standard, tiered Domestic rate would typically bill the incremental PEV usage at roughly $0.30/kWh (tier-5 rate), TOU rate options are generally more attractive options. Schedule TOU-EV-1 requires the installation of a dual meter adaptor and a separate interval meter for EV usage, which can be costly for both the utility and the customer. While this schedule provides relatively low off-peak charging rates without the negative impacts of the standard tiered rate, it may negatively impact the customer experience, as the required additional infrastructure may take significant time and expense to plan, design, install, inspect, test, and coordinate with local governments. Schedule TOU-TEV eliminates the dual metering inconvenience while providing lower cost off-peak charging rates. When compared to the Schedule TOU-EV-1 dual meter option, this rate option costs less to implement, significantly

reduces the processing time from purchase of an PHEV to plug-in at the customer premise, and provides a short-term solution prior to the installation of advanced meters,[3] which will enable separately measured EV usage.

During the Early Market, separate metering of EV usage may not be necessary and whole house metering in most cases may be adequate. In this nascent market, customer choice and preference should be reasonably accommodated, because metering configurations such as dual metering may be desirable in certain cases for the customer. As the market develops, requiring or limiting options to a specific meter arrangement would limit customer choice and possibly inhibit alternative metering arrangements using advanced metering capabilities[4] and future metering innovations. These capabilities are expected by 2015, when CARB requirements regarding separate EV kWh usage measurement for residential customers is expected to be necessary for LCFS credit.

2. How will electric vehicle meters or sub-meters and EVSE's interact with the advanced meters currently being installed across the service territories of investor-owned utilities? What policies does the Commission need to consider concerning any such interaction?

In the short term, technology limitations and advanced meter deployment schedules will limit potential EV metering arrangements. For example, EVSEs with built-in metering and "Intelligent Receptacle" (*i.e.,* "Smart Plug) technologies are under development, and once available, are expected to be able to communicate with SCE's advanced metering infrastructure (AMI) to measure EV usage. With regard to deployment schedules, the California IOUs' advanced meter deployments are scheduled for completion by 2012.[5] In consideration of

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[3] SCE's SmartConnect™ meter deployment began in September 2009 and is expected to be completed by 2012.

[4] Metering arrangement utilizing the advanced meter may include (1) EVSEs with built-in sub-metering, and (2) a wall mounted "Intelligent Receptacle" (*i.e.,* "Smart Plug") with built in sub-meter, or (3) other metering arrangements that leverage emerging technologies.

[5] SCE's Edison SmartConnect meter deployments began in September 2009 and are expected to be complete in 2012.

these conditions, the Commission should allow the IOUs and the customers the flexibility to determine the most appropriate metering arrangements and technologies for any given situation to foster expeditious and uncomplicated customer experiences with PEV adoption.

LCFS requirements[6] are expected to permit estimation of residential EV charging kWh until 2015, at which time SCE expects to have the capability to measure EV usage separately with its AMI system.[7]

As the PEV market develops and AMI meter deployments advance, existing metering arrangements are expected to be replaced by more sophisticated solutions. For example, measuring PEV usage may be accomplished through the use of an advanced meter channel and emerging submetering technologies, such as meter chips built into EVSEs, or a wall mounted Smart Plug. The open-architecture design associated with SCE's SmartConnect deployment was an important first step towards facilitating this interaction. As metering and communication technologies continue to evolve, the Commission should monitor the development of EV-related standards governing the design, installation and communication protocols by the appropriate international standards development organizations (SDOs) and as recommended by NIST as part of the Smart Grid standards effort underway. As NIST makes its formal standards recommendations, the Commission should adopt those standards that govern connection with the IOUs' systems. The adoption of these standards will provide maximum product availability for California consumers.

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6 Pursuant to the LCFS regulation adopted in April 2009, and amended by the 1st and 2nd 15-day notices. http://www.arb.ca.gov/fuels/lcfs/lcfs.htm

7 For LCFS requirements for fleet and public-access charging customers, *see* SCE's response to Question 9.

3. <u>What kinds of equipment and electrical improvements will typically be needed to support residential charging for PHEVs and BEVs, e.g., EVSE's, metering, electrical system upgrades? Who should pay for residential equipment and improvements required to support PHEVs and BEVs, and why?</u>

Residential infrastructure components/activities include charging infrastructure from (1) the utility grid to the residential meter (currently paid for by utility ratepayers and/or line extension customers), and (2) meter connections to the vehicle charge point (currently paid by customers).

The specific infrastructure components from the utility grid to the residential meter today includes meters, dual meters, dual meter adapters, installation, and upgrades to local distribution and transmission facilities (*e.g.*, transformers, circuits, etc.). In addition, if dual meter adapters are used, they may require wiring, obtaining city permits, and city inspections, which are obtained by the customer.

The specific infrastructure from the meter to the vehicle charge point typically includes the following components: panel upgrade (as necessary), EVSE box, conduit, wiring circuit breaker, and sometimes trenching, pedestals and other equipment. Installation of the infrastructure would typically require the following activities: the panel capacity assessment, purchase of EVSE box, certified installation labor, service disconnect and reconnect, obtaining city permits, and city inspections. See discussion in SCE's responses to Questions 18 and 19.

Commission regulation may be necessary for certain charging infrastructure beyond the IOU meter that affects system reliability, such as PEVs with unusually high power charging requirements. In such cases, existing tariff provisions provide for assessing this non-standard distribution system-related cost back to the customer. While SCE generally supports the current infrastructure investment framework, the Commission may want to consider the potential for IOU in-premise charging infrastructure investment.

4. What policies should the Commission adopt to encourage competition and innovation in the market for residential infrastructure development for PHEV and BEVs?

The Commission can encourage competition and innovation in the residential charging infrastructure market in at least a few ways. First, the Commission should adopt national codes and standards (communications, connectors, *etc.*) generated through NIST as they relate to enhancing system reliability, security and safety. Second, the Commission should focus on issues that have direct implications on the reliability of the electric system, such as higher power charging and interconnection of third party service providers. The Commission should not pick technology winners, but rather allow the market to do so. Additionally, the Commission should find appropriate ways to facilitate coordination among various stakeholders in the process including automakers, auto dealers, governmental and regulatory agencies that impact on PEV residential infrastructure development.

5. Should the Commission consider allowing utilities to invest in and rate-base residential electric vehicle charging in order to encourage and support early adoption of PHEVs and BEVs? If so, what components of the infrastructure should the utility be authorized to invest in, e.g., wiring upgrades, EVSE? Should utility investment continue once the market matures? What impact might this have on the competitive marketplace relating to electric vehicle charging infrastructure by non-utility entities?

This OIR should consider whether IOUs should invest in and rate-base PEV charging to encourage and support early adoption of PEVs. Investments could include all critical residential EV infrastructure (*e.g.,* charge port infrastructure, in-premise circuits, and wiring upgrades) to the extent utility ownership is beneficial to customers. Allowing utilities to invest in such equipment may be needed to encourage and support the early adoption of PHEVs and BEVs in California; however impacts on a competitive marketplace would need to be assessed.

SCE recommends taking up IOU investments as part of a workshop on Charging Infrastructure Development in this OIR.

6. If a utility proposes to own customer-premises EVSE's, how will the Commission ensure that near-term EVSE and metering capital investments are interoperable with future generations of PHEV and BEV technology?

There should be no difference in future interoperability if a utility and/or third party install or owns EVSE, because the Commission can ensure the desired interoperability by adopting the national codes and standards (communications, connectors, *etc.*) generated through NIST as they are recommended. The NIST effort has a priority action team (PAP 11) focused on vehicle interoperability and is making recommendations on applicable interoperability and security standards. Also see response to Question 19 for additional discussion.

7. What approaches are there to provide PHEV and BEV charging for owners who do not have regular access to a garage for residential recharging (including single family dwellings and multiple dwelling units (MDUs) like apartments, condominiums, and duplexes)? What regulatory issues does the Commission need to address relative to infrastructure for such residents?

As correctly implied by this question, not all residential customers will have the necessary infrastructure to support vehicle charging at their residences. In the near term, charging will need to occur either at work, at public charging locations, or through some combination of utility and/or third-party charging providers.

For the longer term, the marketplace is likely to develop innovative solutions for customers that do not have regular access to a garage for residential recharging. Building codes that facilitate the installation of residential charging infrastructure for single or multiple family dwelling units without garage access should be considered for new construction and retrofits.

SCE suggests that this topic be included as part of the Charging Infrastructure Development workshop later in this OIR, and include discussion of non-residence charging

options, including grid reliability, business models, use of existing metering arrangements, future metering needs, who pays for the infrastructure (*i.e.*, utility, third party, customer, or local government), and customer impacts (*e.g.*, rates, programs, billing, and payments).

8. How can the Commission, in coordination with utilities, relevant state agencies, federal authorities, local governments, and other entities, streamline EVSE permitting, installation, and approval processes from the time of PHEV and BEV purchase to EVSE activation? What jurisdictional barriers should be assessed to achieve a streamlined permitting, installation, and activation process for residential EVSE?

The activities associated with EVSE permitting, installation, and approval processes cross multiple regulatory jurisdictions, which have the potential to negatively impact an expeditious and uncomplicated customer experience with PEV adoption. For example, EVSE installations may require local building code compliance and city inspections, both of which fall outside of the IOUs' control and the Commission's regulatory oversight.

The Commission should consider ways it can encourage improvement in processes that are outside of its regulatory oversight but affect the IOU customer's experience in establishing PEV service. The Commission should also support the California Energy Commission (CEC) and other relevant government agencies in establishing consistent building codes, inspection processes, certification requirements, and education programs. See SCE's responses to Questions 17, 19, and 39 for more on the need for coordination between public and private sectors to streamline the customer experience.

SCE recommends a workshop early in this OIR to address stakeholder coordination to streamline PEV infrastructure installation processes.

IV.

COMMERCIAL AND PUBLIC CHARGING INFRASTRUCTURE AND POLICY

A. Introduction

Development of commercial and public charging infrastructure policies raises many of the same issues as residential charging infrastructure. As with residential charging infrastructure, in seeking to facilitate the development of commercial and public charging infrastructure, the Commission should recognize the importance of (i) flexibility in addressing current and future metering needs; (ii) consistent, national PEV standards; and (iii) coordination among stakeholders and governmental and regulatory agencies to streamline PEV processes.

B. Responses to Specific Questions (9-14) in the OIR

9. How should electricity used for PHEVs and BEVs be metered at commercial and public charging facilities?

As discussed in response to Question 1, the Commission should allow the IOUs flexibility in determining the most appropriate metering arrangement for any given situation to foster expeditious and uncomplicated customer experiences with PEV adoption.

Similar to existing metering arrangements, meter configurations for commercial and public charging facilities may be: (1) master-metered; (2) sub-metered; or (3) individually metered. Master metering or single meters may be sufficient for commercial fleets and certain public charging facilities as individual billing may not be necessary. For publicly available commercial charging stations, sub-metering and individual metering may be preferable, as these options allow for billing for specific usage.[8]

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[8] However, the LCFS regulation is expected to require fleet charging facilities and public access charging facilities to measure the kWh for the electricity used as a transportation fuel (*i.e.,* PEVs and other ET) to receive the LCFS credit. CARB has indicated that the LCFS rule may be amended in the coming years. The Commission and utilities should monitor the cost-effectiveness, practicality and other issues related to this LCFS requirement and make recommendations as needed.

As the market develops, the Commission and IOUs should evaluate the use of smart meters and other metering technologies as a replacement or supplement to the existing commercial and public charging metering arrangements. SCE expects that metering arrangements using the advanced metering capabilities may be preferred, as these metering arrangements would enable PEV specific usage measurement. Furthermore, consistent with residential metering standards, the Commission should support the development of PEV-related standards governing the design, installation and communication protocols by NIST. Once developed, the Commission should work with the CEC and others to adopt these standards across California.

10. Who should pay for commercial and public meters, EVSE, and related upgrades?

SCE generally supports the current regulatory practices and tariffs regarding investments in meters and equipment on the utility and customer side of the meter. Equipment "beyond the IOU meter" should generally be paid for by the customer (*e.g.,* commercial entity, local governments). Federal, state and local governments and the Commission should explore AB 118[9] and other public funding options for public vehicle charging stations.[10] See SCE's response to Question 35.

11. How should the Commission ensure that commercial and public charging facilities are cost-effective, openly-accessible, and interoperable with a Smart Grid system?

As discussed in response to Questions 2, 4 and 6, the Commission should support the development of PEV-related standards governing the design, installation and communication

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[9] "AB 118 is the guiding legislation for the AQIP and the ARFVTP. The AQIP and the ARFVTP are funded through 2015 via increases to the smog abatement, equipment registration, and vessel registration fees," Light-Duty Vehicle Electrification in California: Potential Barriers and Opportunities, Staff White Paper Draft, May 22, 2009, Matthew Crosby, page 48.

[10] Staff White Paper Draft, May 22, 2009, Matthew Crosby, page 42.

protocols by national SDOs such as NIST. Once developed, the Commission should work with the CEC and others to adopt these standards across California. The Commission may not have oversight of commercial and public charging cost-effectiveness and open-accessibility, because these decisions may be made by the commercial entity or local government or other governmental agencies. SCE suggests that Commission's role regarding commercial and public charging facilities should be explored as part of the Charging Infrastructure Development workshop, which SCE recommends be held later in this OIR, as discussed in Section II.B above.

12. Are additional building codes needed for residential, commercial and public charging facilities to supply sufficient electrical services to PHEVs and BEVs? What role, if any, can the Commission play in this regard?

PEV specific building codes will be a necessary component for developing and adopting residential, commercial and public charging facility standards as well as developing interoperability with the emerging Smart Grid. This is especially important given the anticipated mass market PEV acceptance, emerging technologies, and multiple metering arrangements that may place greater pressure on local governments and other agencies to keep up with and monitor compliance with local building codes.

The Commission should coordinate appropriately with the CEC and local governments in regards to residential, commercial, and public charging facilities building codes and standards. In addition, as discussed in responses to Questions 2, 4 and 6, the Commission should support the development of EV-related standards governing the design, installation and communication protocols by NIST. See SCE's responses to Questions 17 and 19.

SCE recommends that the workshop on Charging Infrastructure Development include a discussion of the appropriate state and local jurisdictions for EV-related building codes for residential, commercial, and public charging facilities.

13. What policies should the Commission adopt to facilitate competition and innovation in the commercial and public infrastructure market?

The Commission can encourage competition and innovation by adopting national codes and standards (communications, connectors, *etc.*) generated through NIST as they relate to enhancing system reliability, security and safety. The Commission should also focus on issues that have direct implications on the reliability of the electric system, such as high-power charging and interconnection of third party service providers. The Commission should not pick technology winners, but rather allow the market to do so. Additionally, the Commission should find appropriate ways to facilitate coordination among various governmental and regulatory agencies that impact PEV residential charging infrastructure development.

These issues should be considered as part of the Charging Infrastructure Development workshop in this OIR.

14. What issues need to be addressed related to the relationship between regulated electricity utilities and third-party electric vehicle service providers that are proposing and/or implementing charging services at residential, commercial and public locations?

There are number of foundational issues the Commission should consider regarding the relationship between electric utilities and third-party PEV service providers. Discussion and resolution of these issues will provide the groundwork for developing specific policies and processes governing the roles and responsibilities of the respective parties. Some relevant considerations include:

1. Regulatory Oversight. Whether and to what extent third party infrastructure providers and installers are subject to regulatory oversight of the Commission.
2. Standards. What role the Commission should take in ensuring that third party charging infrastructure abides by the NIST Smart Grid and EV interoperability standards and other SDO standards, as appropriate.

3. Sale for Resale. Whether third parties should be permitted to resell electricity for motor fuel, and, if so, on what basis.
4. Consumer Protections.
5. Grid Safety and Reliability, Load Management.

V.

LEGAL ISSUES RELATED TO THE OWNERSHIP AND OPERATION OF CHARGING INFRASTRUCTURE

A. Introduction

The circumstances and implications of Commission regulation in the third-party EVSP market must be determined in the context of the EVSP models and the specific services they may seek to provide. There is some uncertainty as to which EVSP models, if any, are likely to emerge, particularly in the Early Market. It will be important to gain a better understanding of the types of third-party EVSP models that may be introduced, particularly in the Early Market, to effectively address the legal issues raised in the following questions.

B. Responses to Specific Questions (15-16) in the OIR

15. Under what circumstances are third-party electric vehicle service providers public utilities and/or electrical corporations pursuant to Pub. Util. Code § 216 and Pub. Util. Code § 218? What implications do Pub. Util. Code § 216 and Pub. Util. Code § 218 have on the competitiveness of the third party electric vehicle service provider market? If the Commission has jurisdiction over third-party electric vehicle service providers, what is the appropriate level of regulatory oversight?

Under the code, electrical corporations are public utilities and subject to Commission regulation when they deliver commodities to or perform services for the public for compensation or payment.[11]

Electric plant is broadly defined in the code as any fixtures or other property owned, controlled, operated or managed in connection with or to facilitate the delivery or furnishing of electricity for power.[12] This broad definition would appear to encompass EVSE. Accordingly, EVSPs owning, controlling, operating or managing EVSE for compensation in this state may be subject to Commission regulation as a public utility.[13]

Certain electrical corporations are expressly carved out of the definition of a public utility, including Energy Service Providers providing direct access (DA) service.[14] Accordingly, EVSPs that provide DA services would not be subject to Commission regulation as

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[11] *See* Public Utilities (P.U.) Code Section 216.

[12] *See* P.U. code Section 217.

[13] In 1991, the Commission carved out of the definition of "gas plant" and "gas corporations" service stations selling natural gas (NG) to the public for use as fuel for natural gas vehicles. The Commission reasoned that NG provided for motor fuel could not be reasonably interpreted as furnishing NG for "power." The legislature later passed a bill (SB 547) that specifically carved out from the definition of "public utility" facilities that sell natural gas at retail to the public solely for use as motor vehicle fuel. *See* P.U. Code Section 216(f). That the legislature exempted natural gas fueling stations from the definition of a public utility suggests that the legislature viewed these corporations as being "gas corporations" within the meaning of the code, and absent an express exemption, subject to Commission regulation as "gas corporations" providing public utility services.

[14] *See* P.U. Code Section 216(h).

a public utility, but would need to conform to the Commission-adopted decisions and rules for DA (*e.g.,* Rule 22).

The implications of Commission regulation in the third-party EVSP market cannot be considered on a generalized basis, but rather must be viewed in the context of the EVSP models and the specific services they may seek to provide. From SCE's view, there is some uncertainty as to which EVSP models (if any) are likely to emerge, particularly in the Early Market. It will be important to gain a better understanding of the types of third-party EVSP models that may be introduced, particularly in the Early Market. Some potential models would appear to include:

- EVSPs providing DA. Given the likelihood that DA will reopen for non-residential costs on a limited basis under SB 695, the ESP model may be viable in the Early Market. The Commission has already adopted specific decisions and rules that govern ESP service, and these rules are already designed to provide a level playing field for ESPs and IOUs, and therefore would be entirely applicable in the context of EVSPs providing DA.

- EVSPs seeking to resell electricity. Currently, resale of IOU electricity is prohibited under Rule 18, with limited exceptions. To the extent EVSPs seek to resell electricity for motor fuel, the Commission needs to consider appropriate rules for the resale of electricity for motor fuel, and to continue to protect consumers against resale in other areas. The Commission must also consider whether to regulate resale rates, as it currently does for the limited resale exceptions in Rule 18, or whether to allow the resale of electricity as motor fuel at unregulated rates. There may be customer equity issues, particularly for IOU residential customers that have no access to home charging at regulated IOU rates, as well as safety issues, that may warrant some regulation of any resale of electricity for transportation fuel.

- EVSPs seeking to sell EVSE to the public. To the extent this activity is limited to the sale of EVSE in which the EVSP retains no ownership, control, operation or management of the EVSE for compensation, this activity would not be considered a public utility service, and would be outside of the Commission's jurisdiction. To the

extent the EVSP retains ownership, control, operation or management of the EVSE for compensation, then it would be considered a public utility service subject to regulation by the Commission.

- EVSPs seeking to bundle the furnishing of electricity with other services. This activity is currently prohibited under Rule 18 unless it is part of a rental for premises or space that does not separately identify usage and does not vary with usage. The prohibition is intended to protect consumers from resale of electricity by unregulated entities.[15]

Determining the appropriate level of Commission oversight of third party EVSPs will necessarily involve consideration of the specific EVSP models and services, and will need to strike the right balance between the policy objective of not hindering a competitive market with the Commission's duty to ensure safe electricity service and protect public utility consumers.

SCE recommends that the Commission schedule a workshop early in this OIR to examine these issues, as they are foundational to many other matters in this OIR and may require early resolution.

16. <u>What statutory changes, if any, should the Commission propose to the legislature to encourage innovation and competition in the charging infrastructure market?</u>

At this point, it is premature to recommend any legislation to encourage innovation and competition in the charging infrastructure market. The Commission needs to consider the extent of its regulatory oversight of the market, and its proper role in encouraging competition in the charging infrastructure market, before it can reasonably consider whether legislative changes are appropriate.

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15 *See e.g.,* D.92109.

VI.

CODES AND STANDARDS

A. Introduction

Development of codes and standards, including connector and EVSE standards, are proceeding well and most are expected to be in place by 2009-2011, in line with BEV, PHEV and smart meter deployments. California and the other 49 states should adopt the NIST recommendations as they are issued so that the nation has a single national requirement. In the process, the Commission should determine the basic requirements for EVSE to interconnect with the grid.

B. Responses to Specific Questions (17-19) in the OIR

17. Please identify current and pending Society of Automotive Engineers vehicle design and interface technical requirements, the Underwriters Laboratory listed components and systems, and the National Electric Code, California Electric Code, and California Building Code Regulations that govern the installation, operation, and maintenance of charging infrastructure at the residential, commercial, and public charging EVSE. How does the timeframe for each code and standard adoption impact current and future vehicle and EVSE products? What role, if any, can the Commission play in improving or encouraging this process?

To date, most important codes and standards efforts are expected to be completed in the 2009-2011 timeframe, which is in line with BEV, PHEV and smart meter deployments. SCE has included in **Appendix A** a detailed discussion and list of the codes and standards and their current status. NIST's current effort to consolidate smart grid standards including PEV-related standards will help ensure that various standards development organizations (*e.g.,* SAE,

Underwriters Laboratory, *etc*.) are collaborating toward a common national strategy.[16] NIST recently published its first set of 31 Smart Grid standards, which include the initial set for PEVs. These standards will be submitted to the FERC in November. California and the other 49 states should follow and adopt the NIST recommendation so that the nation has a single national requirement.

Codes and standards for fast charging (level 3 – 50 to 200 kW per coupler) and building codes for new construction appear to be on a longer timeframe. See Appendix A for detail. In addition, the standards for a smart EVSE might not be finalized until about 2012 and bi-directional power standards may be finalized after that (see Question 19 for details).

Existing EV standards cover function, construction and installation of charging equipment and local city or county building permit processes and inspectors usually enforce them at the time of installation. Operation and maintenance of charging equipment are generally not covered by standards.

The Commission should consider the need for a coordinated statewide effort to address the ease and timeliness of installation, inspection and permitting processes by cities and counties for PHEV and BEV infrastructure. There may also be a need for certification of infrastructure installers and a statewide strategy for maintenance of charge port infrastructure. SCE believes this type of effort will be needed to avoid duplication and prepare the State for PEV market launch in late 2010.

SCE recommends these statewide coordination topics be discussed as part of the Early Market Processes workshop. See SCE's responses to related Questions 8, 12 and 39

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[16] NIST Draft Publication, *NIST Framework and Roadmap for Smart Grid Interoperability Standards Release 1.0* from the Office of the National Coordinator for Smart Grid Interoperability, Sept. 2009.

18. How important is consumer choice as to Charging Levels ((Level 1, 2 or DC)? If important, how may the Commission best balance driver and grid benefits for all residential, commercial, and public charging infrastructure?

Consumer choice is important; however the Commission should consider the full cost implications of this choice as the electric grid costs are borne by all customers, not just those making the choice to increase load by the equivalent of two plasma TVs plugged into a 120V outlet (level 1: 1.5 kW) or half a house (level 2: 3 kW-7 kW) or a whole house (upper level 2: 16 kW-19 kW). Today, automakers are driving the level of charging on the PEVs, and what they recommend (level 1, level 2, or DC) is based on the size of their battery and their consumer research. Consumers want convenience of rapid charging and favorable price signals for charging, and BEV owners do not want to become stranded.

In the Early Market stage, PHEVs will be both level 1 and 2 capable and BEVs will be predominately level 2, but level 1 charging is expected to be widely used in the very Early Market. SCE estimates that about 40% of customers will have level 1 charging at home, 60% of customers will choose to have level 2 charging at home in the Early Market, and market research finds that at least 95% of charging will be done at home or in fleets.[17] The public-access charging locations will grow slowly. Much however depends on the adoption rate of PHEVs versus BEVs.

As discussed in response to Questions 20-23, there are very different impacts on the electric system from the different types of charging. Some automakers and EVSE suppliers may try to market higher power charging for PEVs as a competitive advantage. The level 2 standard (soon-to-be-adopted) will allow up to 19.2 kW at 240 V. High-power level charging will become a costly issue for the distribution grid, resulting in the replacement of distribution transformers serving residential customers.

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[17] EPRI/SCE Market Study – Plug-in 2009, August 12, 2009.

SCE expects to continue conducting customer research and is currently performing distribution system impact analyses to better understand the relationship between customer charging behavior, charging level adoption and the magnitude and timing of distribution system impacts.

As the PEV market grows charging level options will become more complex and dynamic. Charging level penetration will be governed by vehicle sales type (*e.g.*, PHEV versus BEV), range, the number of PEVs per home, vehicle design features (*e.g.*, battery size), home infrastructure cost implications, the cost of energy at home, work, or public-access locations, and the availability of public charging technology. SCE expects that level 2 charge port systems will emerge as the dominant system by 2013, and that more public-access charge port systems will be built to meet demand. Automakers are expected to market higher power charging, and they could add more range to BEVs (GM Volt is an early example with 40 miles range), which means a larger battery and more demand for level 2. Level 3 fast charging (50 – 200 kW per coupler) will likely evolve into a commercial application on commercial circuits and could emerge in the next decade to a small degree. However, there are technology issues (*e.g*. coupler size, accelerating battery degradation) to be resolved along with uncertain consumer preferences. As the market develops, industry stakeholders (utilities, automakers, regulators) will need to understand the trade-offs raised by this question.

Possible topics for an OIR workshop on Charging Infrastructure include examining the overall cost-effectiveness and systems impact of high-power charging envisioned by some automakers (*e.g.,* 19 kW level 2 at homes), their marketing of this as a consumer benefit, and grid-related consumer research in general, and updates on distribution system impact studies (see response to Question 20.).

19. What role can the Commission play to ensure EVSE compatibility with a unified EVSE conductive charge coupler standard (J1772) for all residential, commercial, and public charging EVSE within regulated utility service territories? What role can the Commission play to ensure that EVSE be forward compatible with emerging Society of Automotive Engineers loads, messages, and programs communication standards (J2293, J2836, and J2847)?

The Commission has an opportunity to guide and influence "smart charging" by considering requirements for EV infrastructure to interact with the grid, especially in the early years of the PEV market. In 2001, CARB mandated automakers and EVSE suppliers to comply with SAE J 1772,[18] and CARB staff has proposed to update this requirement after the new version of SAE J 1772 is updated.[19] Basic EVSE standards and connector standards are the purview of SAE and NIST and are expected by year-end. The marketplace is expected to adopt this connector standard, so Commission action is not needed.

Regarding the Early Market through 2012, smart vehicle charging standards are under consideration by NIST (as detailed in the "NIST Framework and Roadmap for Smart Grid Interoperability Standards Release 1.0" dated September, 2009) and SAE and should be finished by the end of 2012 or in early 2013 and will address demand response, load management, metering and communication bridging capabilities. EVSE manufacturers are currently working on various smart EVSE configurations currently. NIST will make recommendations on standards to FERC and states (see Question 17). The goal is for this national standard to be adopted by all states to avoid different vehicle charging conventions among the different states.

Also in the Early Market stage, the IOUs will continue to work with the EVSE manufacturers to encourage development of smart EVSEs that can communicate with the smart

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[18] California Code of Regulations, Title 13, Section 1962.2.
[19] http://www.arb.ca.gov/msprog/zevprog/hevtest/hevtest.htm. *See* July 16, 2008.

grid. See Appendix A for a simple chart on the salient points regarding the various types of EVSE (*e.g.,* level 1 and 2; basic and future smart features).

In the Growing Market, smarter PEVs will likely emerge and supplant some of the capabilities that were initially engineered into the smart EVSE. As the market matures, and vehicles become more sophisticated, the EVSE will look more like a pass-through device.

Possible topics on EVSE are part of the Charging Infrastructure Development workshop include discussing the basic requirements for EVSE to interconnect with the grid.

VII.
ELECTRICAL SYSTEM IMPACTS

A. Introduction

There could be significant impacts from PEV load on transformers and distribution lines in older parts of the system. Impacts on the generation and transmission system are longer-term issues, but it will be important to set the right expectations for consumers in the beginning of the market (*e.g.*, encouraging and incenting off-peak charging for the distribution and generation system). Technological solutions to load spikes should be implemented.

B. Responses to Specific Questions (20-23) in the OIR

20. What are the potential electrical distribution system impacts associated with geographically concentrated PHEV and BEV charging in the near-term? How will utilities anticipate these impacts and make capital investments needed to ensure service network reliability? How should the utility capital investments be paid for and recovered?

Level 1 charging at home is roughly equivalent of two 600W plasma TVs plugged into a 120V outlet continuously for several hours, and is not expected to pose any significant distribution system infrastructure issues for SCE. Level 2 charging (6kW at 240 V) is likely to be

adopted by a majority of consumers (see SCE's response to Question 18) and can pose challenges to transformer loading if PEV adoption is clustered. SCE anticipates that level 2 charging of BEVs and some PHEVs will cluster[20] in certain communities and could pose distribution system infrastructure challenges in older, more-established, neighborhoods, although not likely to cause undue problems until 2013 and beyond. SCE is proactively developing distribution infrastructure mitigation plans.

SCE is conducting its own detailed analysis on the degree to which transformer upgrades and re-prioritizing circuits for 4 kV to 12-16kV voltage upgrades will be needed. In earlier stages of the market, level 2 public charging is expected to emerge to a much larger degree while level 3 public charging (50 - 200 kW per coupler) is not projected to be a significant factor due to the expected small market penetration (assumed to be less than 1% by 2020). Level 2 and 3 public charging will be on commercial circuits and managed like other commercial circuits, but may not be responsive to price signals and IOU load management. In addition, it is possible that there could be power quality impacts to the distribution system from niche-market BEVs.[21]

Distribution capital and Operations and Maintenance (O&M) costs and their recovery are typically considered in IOU GRCs, and SCE is scheduled to file its 2012 GRC late in 2010. However, the Commission should consider separate ratemaking proceedings for recovery of incremental PEV costs during the Early Market. SCE expects to begin incurring incremental PEV operational and capital infrastructure costs in 2010 and 2011, which requires a separate application for cost recovery for this period of the Early Market. For 2012-2014 (SCE's GRC period), estimations regarding PEV adoptions, their associated infrastructure requirements, and supporting O&M processes vary greatly, so forecasting in 2010 (for inclusion in the GRC) the necessary capital investments for the 2012-2014 time period would be difficult. As stated in Section II.A above, SCE would prefer to use separate applications and a phased approach to seek

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[20] UCLA Market Research, *California's Green Market Geography,* 2008.

[21] Examples of BEVs not under SAE J 2894 are neighborhood EVs, electric scooters and three-wheel EVs.

recovery of 2010-2014 incremental PEV costs: Phase I (2010-2011) and Phase 2 (2012-2014). SCE plans to file an advice letter to establish a memorandum account for recording incremental PEV costs effective January 1, 2010.

21. What commercial and public infrastructure options are most likely to be deployed, e.g., Level 1 charging facilities, Level 2 charging facilities, "service station" model DC charging facilities, and/or battery swap stations? Should the Commission adopt policies to favor certain charging options taking into consideration cost-effectiveness, grid benefits, ability to meet PHEV and BEV driver charging demand, and ability to reduce BEV driver "range anxiety"?

SCE's responses to Questions 18 and 20 provide estimates on how the commercial and public chargeport infrastructure options will develop in the early and developing market stages. In addition, the battery swap station model is expected to develop slowly, as it requires fast charging of batteries and cooperation of automakers to standardize battery packs. Most commercial fleet, workplace and public charging is expected to be level 2 focused, but will also accommodate level 1 for neighborhood PEVs, electric scooters, electric bikes, and similar equipment. The Growing Market stage is hard to predict, given the complicated and dynamic marketplace.

As far as policies, SCE recommends that the Commission place priority on safety, grid reliability, minimizing costs and maximizing benefits to ratepayers, sending the right price signals, load management, and appropriate IOU programs. Also see SCE's responses to Questions 18 and 19. In a later phase of this OIR, a topic for inclusion in the Charging Infrastructure Development workshop should be the issues and trade-offs noted in this question.

22. What potential load shape impacts associated with PHEV and BEV charging should utilities anticipate in the near-term? How can time variant pricing, demand response programs, and advanced meters mitigate load spikes associated with uncontrolled, simultaneous charging found to occur at specific times of day, for example, when drivers arrive home from work? How should the Commission address potential load spikes if a large number of customers begin charging simultaneously when lower electricity rates apply under TOU rate schedules?

It is expected that PEV commuters and new car buyers will plug their cars in at home in the early evenings and at work or in public during the day. Because their numbers during the Early Market are expected to be small, from a total load perspective they should have minimal impact on the load shape of the grid. In addition, control technologies provided by some automakers are expected to be able to "tell" the vehicle to charge during the IOU's "off-peak" period.

Several technology solutions exist to deal with potential load spike issues. IOUs can work with smart EVSE suppliers on remotely-capable on-off switches that could be used to delay or interrupt charging and avoid load spikes, and with automakers on other solutions. A different type of load spike will occur when BEVs that require or encourage 19.2 KW charging are introduced (see SCE's response to Question 18.)

As workplace, commercial and public charge sites become common, demand will begin to increase during the 8 a.m. to 5 p.m. timeframe. At this time, it is difficult to project load impacts with current market data. However, advanced meters, TOU rates for PEVs, and demand response programs should be helpful in addressing load spike and load impact concerns in the long-term (see SCE's response to Question 19). These tools should be combined with effective education and outreach to all PHEV and BEV stakeholders – consumers, manufacturers, dealers, employers, cities and government agencies. Load spike solutions should be a topic in a later OIR workshop on Longer-Term Distribution System Impacts.

23. In the long term, what are the benefits and drawbacks on electric generation and transmission associated with projected PHEV and BEV market growth in California?

The Commission Staff's White Paper and SCE's comments on it together appropriately identify the potential benefits, drawbacks and costs of electric generation associated with PHEVs and BEVs. In SCE's view, generation and transmission impacts of PHEVs and BEVs are not urgent issues that must be addressed in this OIR. They are longer-term concerns that can (and should) be addressed in the Commission's Resource Adequacy or Long-Term Procurement Plan proceedings. In the long term, reducing the generation and transmission impacts of PHEVs and BEVs will depend on the success of modifying consumer behavior through the use of TOU rates and other programs.

VIII.
TARIFF RELATED

A. Introduction

Two primary objectives for tariff and rate design are equity and understandability. The use of common standards (as reflected in rules and tariffs) for all market participants supports both of these objectives. The deployment of advanced metering systems and associated TOU rate structures will help to ensure the appropriate and consistent cost recovery from all customers, including PEV owners and operators. Any proposed deviation from existing cost causation rate design principles will likely need to be examined as part of a separate ratemaking proceeding. Ultimately, customers will need to be educated to understand how their temporal charging behavior affects their charging costs.

B. Responses to Specific Questions (24-32) in the OIR

24. Should the Commission authorize a default time variant electric vehicle rate applicable to all residential electric vehicle tariff customers? What changes, if any, to the rate protection provisions of AB-1X are needed to authorize a default time variant electric vehicle rate applicable to residential customers?

The Commission does not need to consider authorizing default time variant pricing for EV charging in this proceeding. A default time variant pricing requirement for PEV charging would appear to be unnecessary given a likely tendency of PEV customers to select available optional time variant service to obtain the lower charging rates offered in the off-peak periods for separately measured EV loads. Under SCE's current rate structure, PEV customers can achieve over $700 in annual benefits available by charging at reduced off-peak rates (about $0.10/kWh) compared to charging at the highest tier rate (about $0.30/kWh).[22] However, to preserve customer choice, SCE does not require EV loads to be separately metered or be served on a TOU rate.[23]

SCE notes that the legislation modifying Assembly Bill (AB) 1X (Senate Bill (SB) 695 passed by the California Legislature in September 2009) took nearly 2 years of negotiating and significant legislative effort. This legislation already defines a timeline for default TOU service for residential customers to be as early as 2013. Since PEV adoption is expected to be fairly low between now and then, it seems unnecessary to burden this OIR with discussion of this issue.

Another option that the Commission may consider is the treatment of EV load by the Los Angeles Department of Water and Power (LADWP). The LADWP tariffs provide an additional baseline type allowance for residential customers who own PEVs, similar to

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[22] Assumes 300 kWh/month at a $0.20/kWh delta times 12 months.
[23] Customer may voluntarily elect to forego their AB1X protections to receive TOU service. *See* D.06-07-02. .

allowances provided to customers with all electric home usage. This option could be made available when customers elect to remain on a tiered time variant or non-time variant rate option rather than opting for a non-tiered time variant rate. While this treatment would serve to lessen the barrier to entry caused by charging at high upper tier rates, it does not provide the advantages of TOU pricing in helping to mitigate any adverse system impacts. This approach would require modification of P.U. Code Section 739 regarding baseline allowances, which would take significant effort, potentially eliminating this as a near-term objective of this OIR.

25. <u>What rates should apply to customers charging their PHEVs or BEVs at commercial, industrial, and public charging facilities that are in the same service territory as their home utility?</u>

As the utilities deploy their smart meters, all non-residential load will be required to take service on a TOU rate that would provide appropriate price signals whether this load is measured separately or as a part of the greater site load. The generation TOU cost drivers would be similar across these classes of customers, so no differentiation is necessarily needed. Whether the PHEV/BEV load is incremental to, or the majority of, any particular site's load, the cost of serving it can be recovered equitably through the existing rate structures.

Currently, the IOUs provide reduced rates to PEV customers as a means to help mitigate a perceived barrier to entry, especially for early adopters. However, as the Staff's White Paper points out, existing electric rates provide very competitive marginal travel costs compared to gasoline costs, possibly making these early adopter reduced rates unnecessary. If it is determined that the existing rate structures do not pose a significant barrier to entry, SCE would opt for simplicity and consistency in the rate designs. In Question 29 below, the Commission asks a related question as to whether the benefits provided by the PEV load should be applied directly to such load. The existing EV rates were rationalized by these benefits but it is not known whether these particular rate structures truly mitigate a barrier to entry or correctly value any offset externality costs. SCE believes that the issue of reduced rates is an important one for

the Commission to provide guidance on in this OIR process, and recommends it be included as a topic for discussion in the PEV Rate Issues workshop.

The extension of standard commercial and industrial rate options to third-party charging entities raises resale and other legal issues, which should be addressed early on in this OIR because they are foundational to many of the other issues raised in this proceeding.

26. What rates should apply to third-party operators of commercial charging facilities? Should the Commission establish new rates for commercial charging facilities taking into account the costs and benefits created by these entities?

Third-party operators of charging facilities should be charged a commercial or industrial TOU rate inclusive of all applicable meter and customer charges. As previously noted, the extension of standard commercial and industrial rate options for third-party charging raises resale and other issues that should be addressed early on in this OIR, because they are foundational to many other issues in this proceeding.

The subject of assessing and assigning costs and benefits is quite complex and will require extensive collaborative work among all stakeholders for not only third-party service provider rates, but for all PEV rates.

27. How should a customer pay when charging a PHEV or BEV in another utility's service territory? Please evaluate options set forth below, or suggest alternative approaches

The issue of charging PHEV or BEV outside of home service territory is a long-term consideration because all available options have not been well-studied. In the short term, SCE envisions a PHEV or BEV charging infrastructure that accelerates adoption of PEVs and installation of charging equipment based on a "pay at service" model. This equipment should also support PEV load management. This approach may further lead into the development of

more advanced features as the market evolves. Below are SCE's comments on the options suggested by the Commission.

a) A customer pays a posted price for electricity to a specific electric charging provider at the time of the transaction, similar to how gasoline is purchased

This option works well for charging PHEV and BEV in another utility's service territory because customers can easily make a currency, credit card or debit card payment to the charging provider. While customers would potentially be paying at different fuel prices across utilities, the price differentials are not likely to be large (relative to the gasoline or diesel price differences), and not a significant barrier.

b) The second utility bills the customer's home utility and the home utility adds the electric vehicle electricity cost to the customers' energy bill. A third-party clearing house could facilitate these transactions

In SCE's view, this concept would be very expensive and complex to implement, as it involves metering technology in the car, mobile communications and a national transaction clearinghouse. Ultimately, it does not seem to add significant customer value. In any event, the technology deployments needed by the automakers, multi-state IOUs and municipal utilities to support this nationally are at least a decade away, particularly given that automakers have been reluctant to place meters in their vehicles' electronics.

c) A customer has a relationship with a third party charging provider and pays that third party wherever the customer charges

To the extent the third party is a load-serving entity, such as an ESP or CCA, the customer would be billed by the ESP or CCA as part of SCE's consolidated bill option

under Rules 22 and 23; alternatively, ESPs have the option of billing their procurement customers separately under Rule 22.

To the extent the third party seeks to establish a relationship with the customer as a reseller, issues of sale for resale need to be addressed, as previously noted.

d) A customer has a choice of all or some of the above options

From the customer's perspective, having a variety of options for paying for PEV charging would be convenient. A variety of options should be made available to the extent practicable and cost effective.

28. What types of costs and benefits are generated by electric vehicle adoption on different aspects of the electricity system, including transmission, distribution and procurement costs?

As previously stated in response to Question 23, generation and transmission impacts of PHEV and BEV are not urgent issues that must be addressed in this OIR. They are longer-term concerns that can (and should) be addressed in the Commission's Resource Adequacy or Long-Term Procurement Plan proceedings. In the long term, reducing the generation and transmission impacts of PHEV and BEV will depend on the success of modifying consumer behavior through the use of TOU rates and other programs. As discussed in these comments and in the Staff's White Paper, capital costs are expected to be concentrated in localized distribution circuits or transformers with increased O&M costs to facilitate consumer adoption. The degree to which customers' charging patterns improve overall system load factors will help quantify the net physical system and procurement benefits of PEV market expansion. Quantifying these impacts will require a detailed study of customer adoption rates, charging patterns, and geographical distributions over the next decade. These same cost studies that will define the net impacts on the various systems will be necessary to effectively construct the desired cost-based rate structures.

29. Should the electric vehicle rate structure be designed to align rates with the system costs and benefits of PHEVs and BEVs, and if so, how? Should the Commission assign additional costs and benefits attributable to PHEVs and BEVs to specified electric vehicle rate classes or socialize the costs and benefits attributable to PHEVs and BEVs to all customer classes? Should the PHEV and BEV rate classes bear existing rate component costs?

Yes, all rate structures should align with costs. Rates designed in this manner will be lower for those customer classes with proportionally higher off-peak usage without burdening the remaining ratepayers. Specific cost studies can be performed to provide a more appropriate cost-based rate structure. Any additional rate discounts need an assessment of 1) the value of the net benefits provided by PEV deployment, and 2) whether rate discounts are an effective means to reduce barriers to entry. Alternatives to rate discounts include the provision of infrastructure credits and/or vehicle buy-downs.

Any PEV rate structures should be based on cost causation principles. General rate-making principles do not try to take into account every particular customer's or end-uses' utilization of services funded by various rate components and SCE sees no reason to do so here. If SCE successfully receives the value of avoided carbon from the LCFS fuel-switching considerations, these credits could be accounted for in reduced generation expenses and flowed through to customers via the normal ratemaking process. This issue should be more fully vetted in a workshop on PEV Rate Issues, which should also include identification of any costs and benefits[24] expected to be, but not currently included, in existing rate structures.

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[24] For example, the benefits in P.U. Code Section 740.8.

30. Should the electric vehicle rates reflect the marginal cost of service, particularly for off-peak electricity charging and, if so, how?

All rates should reflect the marginal cost of service and be comprised least the marginal costs of providing electricity (delivery and generation) plus all non-bypassable charges.[25] If the question is intended to ask whether the off-peak electric generation rate should consist of only the marginal energy cost, the question involves a larger policy question of whether PEV adoption should be subsidized, and whether those subsidies should be provided through rates or by other means to address potentially more significant barriers to entry. The first step of rate design is to determine the relevant cost bases to determine whether there is any justification for such a discount relative to the standard rate. If the load warrants a lower (cost-based) rate, an analysis to determine whether such a rate meets customer objectives should be made. If it turns out that such rate structures do not meet the policy objectives (once they are determined), the degree of necessary subsidy would need to be determined along with the corresponding issue of who pays for these subsidies. This issue should be addressed in the OIR's workshop on PEV Rate Issues.

31. Should rate incentives be created for electric vehicles to be paired with distributed generation incentive programs, such as the California Solar Initiative (CSI) and Self-Generation Incentive Program? Should rate incentives be created for electric vehicles to be paired with demand response programs? How should these incentive programs be incorporated into electric vehicle rate structures? Who should pay for such incentives?

For three primary reasons, it would be premature to consider pairing PEV rate incentives with distributed generation (DG) or demand response (DR) incentive programs, especially in the early stages of the OIR process. First, initial OIR efforts should be focused on

[25] The Commission's EDR decision (D.07-11-052) provides guidance regarding certain floor price calculations that could serve as a starting point for this discussion.

answering the basic questions surrounding incentives and/or subsidies that should or should not be provided to the PEV customers. Second, assessing the value of combinations of programs is difficult under any circumstances, even when the value of the separate programs is known. Because the value associated with the PEV market has not yet been determined, any combination of incentives that would be considered would have no factual basis. Second, the saturation of the DG and DR incentive programs is relatively small (both estimated to be less than 2%), therefore efforts to focus on this small niche of customers could prove to be a distraction to getting the fundamentals right. Third, as is explored in SCE's response to Question 32, research and development (R&D) on Vehicle to Grid (V2G) and Vehicle to Home (V2H) technologies have not been tested or evaluated to link PEVs with CSI or the Self Generation Incentive Program.

In the case of demand response programs, time-differentiated rates such as TOU or Critical Peak Pricing encourage off peak charging. Additional incentives for demand response, if any, should be targeted at those cost elements included in the cost-based rate structures that can reasonably be avoided. Several reasons suggest placing PEV demand response low on the list of priorities. First, it will be several years before a significant number of vehicles enter the market. Second, the success of TOU rates at encouraging off-peak charging is not yet known. With respect to the direct control of EV charging loads, communication networks via the EVSE and the utility via the SmartConnect network is still a few years away.

Regarding other incentives, the primary question is whether the PEV market requires additional incentives in order to remove significant barriers to entry. As stated in SCE's Comments on the Staff's White Paper, PEV incentives could come in several ways such as vehicle buy-downs and/or infrastructure credits in addition to IOU rate reductions. Once a net PEV benefit is established and barriers to entry assessed, appropriate incentives can be developed. An OIR workshop is not needed as these issues should be several years away.

32. Under what circumstances can utilities and third parties aggregate PHEV and BEV services to participate in California Independent System Operator (CAISO) ancillary service markets? What policies, if any, does the Commission need to consider in this regard?

There are many technical issues with aggregation of PHEV and BEV energy into ancillary services, which are commonly called "Vehicle to Grid" (V2G). While V2G has been studied conceptually by the University of Delaware, the Independent System Operator in the Mid-Atlantic (PJM), and the California Independent System Operator (CAISO), additional engineering-economic analyses are needed to show V2G as feasible on a large scale. Of greater potential value in the near term is the integration of the vehicle into the home energy ecosystem toward zero net energy homes, as demonstrated by SCE in its "Garage of the Future." The potential for a home owner to link vehicle charging and demand response to its home energy management system, including a solar panel, is a more likely outcome in the next decade.

SCE understands the theoretical potential that V2G could have when a significant volume of vehicles in the marketplace are equipped with bi-directional power capability and higher metering resolution (requiring more expensive infrastructure). Directly linking BEV and PHEV charging to intermittent renewables (see OIR at page 17) similarly is longer-term and will need a mature and proven Smart Grid system. SCE notes that V2G was well-covered in the Commission's EV workshop in July 2009 on the Smart Grid OIR.

Given the combination of relatively low near-term PEV volumes, uncertain customer charging patterns, and communication technology that is several years away, SCE recommends that V2G not be included in this OIR. At this point, the Commission should support utility RD&D on vehicle-to-home technology and related efforts.

IX.

LOW CARBON FUEL STANDARDS

A. Introduction

SCE strongly supports the Commission's objective to consider appropriate recommendations for CARB's treatment of electricity under the LCFS in this OIR. Determination of the LCFS "regulated party" for electricity and allocation of the LCFS credit is an urgent issue, and SCE is concerned that the Commission's opportunity to make recommendations to CARB on this issue is fast closing. CARB staff plans to recommend amendments to the current LCFS regulations by December 2009, and may consider additional amendments in 2010. Under this timeline, there is a short window of opportunity for the Commission to weigh in on the recommended amendments to the LCFS regulations.

The Commission's input on the LCFS regulations is critical to a thoughtful, effective and lawful implementation of the LCFS. As such, SCE urges the Commission to take prompt action to formulate appropriate recommendations to CARB on the issues raised in Questions 33 and 34 below. The Commission should schedule a workshop to take place early in this OIR to consider the relevant issues to determining the appropriate LCFS "regulated party" for electricity and allocation of the LCFS credit, and other LCFS issues discussed below. Because LCFS credits will be generated starting in 2011, it is essential that the Commission make its recommendations to CARB on these important issues by mid-2010.

B. Responses to Specific Questions (33-34) in the OIR

33. What recommendations, if any, should the Commission make to the California Air Resources Board regarding the treatment of electricity under the Low Carbon Fuel Standard?

The Commission should recommend that CARB revise its LCFS regulations to provide that LSEs, as the providers of electricity fuel, are the "regulated parties" that generate and hold LCFS credits for the benefit of their electricity customers.

The LCFS, first established by Executive Order S-01-07, is a statewide goal to reduce the carbon intensity of California's transportation fuels. CARB adopted the LCFS rule in April 2009.[26] The LCFS is intended to diversify California's transportation fuel supplies, decrease the greenhouse gases emitted from those fuels, and establish a sustainable market for cleaner burning fuels.[27] As a transportation fuel, electricity has a much lower carbon intensity than gasoline or other liquid fuels. By encouraging electrification, IOUs can help reduce transportation emissions and aid the liquid fuels sector in achieving its LCFS carbon intensity compliance goal.

While the electricity sector is the key to reducing the carbon intensity of the transportation sector, doing so will impose additional economic burdens on the IOU ratepayers. To serve increased market penetration of electric vehicles, SCE may need to make significant investments in electric infrastructure, metering services, load management equipment and services, LCFS reporting and auditing, credit trading, and other generation, transmission, and distribution costs related to serving an increased load. In addition, increased use of PEVs results in additional costs to the IOUs to mitigate higher greenhouse gas (GHG) emissions, and comply with the State's renewable portfolio standard (RPS) goals. Effective regulation will create the

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[26] *See* Resolution 09-31(4/23/09), available at http://www.arb.ca.gov/regact/2009/lcfs09/res0931.pdf.

[27] Office of Governor White Paper: *The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting our Economy* (1/8/07).

proper incentive for low-carbon electrification without unfairly transferring the liquid fuel sector's compliance costs to electricity customers. Electric transportation (ET) is an example of how increasing electricity use can be an effective and efficient means of reducing statewide GHG emissions. However, the economic burden of doing so must not inequitably fall to the electric sector and its ratepayers. In other words, the LCFS, the AB 32 cap-and-trade program, and the State's RPS program should work together so that electricity and gasoline prices for transportation fuel diverge. For example, if LSEs are the regulated parties under the LCFS, the LSEs can pass through to their customers the value of the LCFS credits and send the correct price signals to further encourage ET.

A model that focuses on the fuel provider – and in the case of electricity as a transportation fuel, the LSE as the fuel provider – makes sense because the LSE is in the best position to further the goals of the LCFS. LSEs are best able to develop rate structures and programs that can encourage ET. Under the supervision of the Commission or the governing body of a publicly-owned utility, the LSEs would not profit on the sales of electricity to their customers, but instead pass through the value or benefits of any LCFS credits related to those sales to their customers, including ET customers, in the form of reduced ET rates, through the provision of additional infrastructure, and/or to offset higher costs resulting from increased ET programs and services. These reduced ET rates, infrastructure, cost offsets and other incentives will encourage and incentivize the use of electricity as a low-carbon transportation fuel, which is the goal of the LCFS.

By selling the LCFS credits associated with the electricity fuel provided by LSEs, either into the LCFS credit market or the AB 32 allowance market, LSEs can mitigate the added costs to customers of serving an increased load. The IOUs as LSEs, unlike private entities not generally engaged in providing electricity as a public utility service, are in a position to provide new ET-related services, incentive rates and infrastructure on a broad, non-discriminatory basis to all customers generally. Thus, LCFS credits are appropriately provided to the IOUs because they are the regulated electricity fuel providers under the LCFS. CARB should allocate the

credits to the IOUs because the credits will most efficiently mitigate the significant costs of these reduced ET rates and infrastructure that are (1) additional to what the utilities would otherwise provide, and (2) necessary to facilitate carbon reductions from the transportation sector.

The electric sector will be instrumental in reducing emissions from the liquid transportation fuels sector, and LCFS credits represent a meaningful and appropriate opportunity to offset the cost of providing this benefit to society. If these costs are not offset with LCFS credits, then the bill paid by SCE's customers – including SCE's ET customers – will have to cover these costs, thereby subsidizing the cost of reducing GHG emissions in the transportation sector.

Currently, in addition to credits being provided to the LSEs, CARB is proposing to have some LCFS credits (as it pertains to electricity as a fuel) go to unregulated third-party infrastructure providers. SCE does not oppose private entrepreneurs who are customers of the LSEs and who seek to develop new products and services to grow the ET market. However, SCE is opposed to modifying the fundamental structure of the LCFS as it applies to direct providers of electricity, solely for the purpose of providing a direct subsidy from SCE's customers to those private developers. Few details concerning the subsidies and set-asides proposed by third-party non-LSEs have been provided; however, it is already clear that these proposed subsidies to private developers are fundamentally in conflict with the public purpose and design of the LCFS. Because third-party infrastructure providers currently are not regulated by the Commission, the CEC, or municipal utility governing bodies, there is no guarantee that the unregulated third parties will return the LCFS credit value to customers. Only by becoming regulated retail utilities or ESPs can third-party infrastructure providers reasonably assure CARB that the LCFS value will flow back to customers. Currently, there is no indication that these third-party providers intend to return this LCFS value back to customers. As provided above, the LCFS is – and should remain – focused on the entities which provide fuel and thus can effectuate the goals of the LCFS.

Should CARB allow third-party infrastructure providers to be the regulated party, electricity customers should not be held responsible for the additional GHG emissions and RPS costs associated with the increased electricity load. Increased electrification will displace GHG compliance costs to the electricity sector as it becomes responsible for emissions that would otherwise be attributed to the liquid fuels providers. Accordingly, SCE encourages CARB and the Commission to mitigate these costs in their regulatory proceedings. For example, the Commission could adopt a rule providing that the IOUs will not be responsible for the incremental GHG emissions resulting from electric transportation, given that the fuel switching results in a net reduction in GHG. In the absence of awarding LCFS credits to the LSEs, such a rule could assist electricity customers in offsetting the cost of providing this societal benefit.

SCE recommends an early OIR workshop to explore LCFS issues relating to electric transportation.

34. If a utility generates and sells credits under the Low Carbon Fuel Standard regulation due to customers' use of electricity as a transportation fuel, what should the utilities do with the revenue from the credits?

Consistent with its previous public statements, SCE anticipates that the Commission will allow SCE to pass on the value of the LCFS credits to its customers to offset the cost of serving the additional load created by ET. The credits will benefit electricity customers in the form of bill reductions, additional infrastructure investments, and/or other cost offsets.

SCE looks forward to working with the Commission, CARB, and other stakeholders to evaluate these options to determine the appropriate treatment of the costs of serving the ET load and the disposition of the LCFS credit value.

X.

PROGRAMS AND INCENTIVES

A. Introduction

The Commission should carefully evaluate the issues associated with program incentives, because longer-term developments may impact on the need for and/or magnitude of such programs.

B. Responses to Specific Questions (35-38) in the OIR

35. Should utilities and/or government provide low-interest finance incentive programs for residential and commercial EVSE? Should these programs incorporate tax incentives available through the American Recovery and Reinvestment Act (ARRA) of 2009?

SCE recognizes that the availability of capital, or the lack of access to capital, can be a powerful force in the development of a market. The Commission has raised the matter of financing in several proceedings, and most recently in this OIR proceeding and in the 2010-2012 Energy Efficiency funding proceeding (A.08-07-021 et al.).

As stated in SCE's Comments on the Commission Staff's White Paper, the primary issue connected with any on-bill financing program is the extent to which an IOU can function as a lending institution without running afoul of state and federal lending laws. In the recent past, the Commission has approved financing programs for customers to encourage investment in energy efficiency, but only under limited circumstances.[28]

In A.08-07-021 et al., the Commission approved $71 million in on-bill financing for small to medium commercial customers for the IOUs. On the matter of the Commission's

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[28] *See* California Department of Corporations Release No. 60-FS, available at http://www.corp.ca.gov/Commissioner/Releases/60-FS.asp).

interest in additional financing, the Commission agreed with the IOUs and other parties on the need to form a statewide financing task force to address the myriad of issues involved in on-bill financing for residential customers given high turnover rates and other factors. SCE has the same concerns over financing for PEV (and related infrastructure) and stresses the need for further assessment to help guide Commission policy, SCE will fully support any effort in this regard.

Currently, federal, state and local governments are taking the lead in providing supplemental funding for the incremental cost of the PEV and the PEV infrastructure:

- The American Recovery and Reinvestment Act of 2009 (ARRA) provides a federal tax credit for the PEV based on size of the battery (up to $7,500) for the first 200,000 PEVs from each automaker,[29] and the Emergency Economic Stabilization Act of 2008 provides a tax credit for the PEV infrastructure in 2009 and 2010 (50% of the cost up to $2,000 for residential and up to $50,000 for business).[30] However, Internal Revenue Service has not yet issued rules for qualifying for the PEV infrastructure tax credit. Other alternative fuels receive a federal tax break for fuel use, but not electricity.[31] In addition, federal bills HR 2454 and S. 1462 envision direct loan programs for clean technologies including PEVs.[32]

- The AB 118 program, administered by the CEC and CARB, provides grants and/or loans for both the incremental cost of PEVs and for PEV infrastructure. In addition, AB 118 permits the agencies to leverage other funds and allow private, public or non-profit sectors (or partnerships) to run the grant and loan programs.[33]

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29 Public Law 110-343 section 205 as modified by Public Law 111-5 section 1141, 1142, 1143 and 1144.
30 Public Law 110-343 section 207 as modified by Public Law 111-5 section 1123.
31 Public Law 109-59 section 11113.
32 *See* the Clean Energy Deployment sections in these bills, available at www.govtrack.us/congress/billtext.xpd?bill=h111-2454 and www.govtrack.us/congress/bill.xpd$bill=s111-1462.
33 Go to www.energy.ca.gov/altfuels/ab_118 bill_20071014_chaptered.pdf.

- Some of the California air quality management districts have funds that can be provided to offset the incremental cost of the PEV or the PEV infrastructure and have done this in partnership with CEC and CARB in the past.

Any low-interest financing effort by the Commission should take the above funding sources into account. SCE recommends this issue be handled as part of the Commission task force mentioned above.

36. <u>Should utilities and/or government provide incentives that encourage customers to purchase higher-efficiency electric vehicles rather than less efficient electric vehicles, and if so, how should the incentives be structured?</u>

The PEV market is simply not mature enough to fully assess the relative value between PEV vehicles that have yet to make it to market. Further, the relative efficiency between vehicles will factor into the customer's purchase decision. More efficient vehicles will reduce operating expenses and the customer will need to decide whether this reduced operating expense warrants any additional purchase price. Once the market becomes more mature and if it is determined that any increased vehicle cost precludes a more efficient vehicle purchase, the IOUs may request funding for such an incentive program as part of their tri-annual energy efficiency filings. This would warrant a modification to the existing energy efficiency cost-benefit tests to include non-electric energy savings. Another reason to defer any consideration of such a program is the risk of prematurely defining high and low efficiency vehicles, which may suppress innovation in emerging technologies.

37. <u>How should the Commission ensure that any policies developed related to electric vehicles provide a level playing field for transportation fuels and technologies?</u>

Although SCE supports the development of a competitive market, providing a level playing field with other transportation fuels and technologies may be outside of the

Commission's jurisdiction with the exception of NG vehicles. However, all the transportation fuels compete with each other and have a very different government incentive structures including PEV purchase incentives, high occupancy vehicle lane access, and exemptions from road taxes. For example, liquefied natural gas (LNG) fuel receives a federal tax credit of 50 cents per gallon and compressed natural gas (CNG) fuel receives 50 cents per gasoline gallon equivalent[34], while electricity does not receive any such tax credit. However, because many transportation fuels and technologies may also be outside of the Commission's jurisdiction (*e.g.,* ethanol, methanol, biodiesel fuels), this further complicates any attempts to develop a "level playing field." In regards to potential IOU rate incentives designed to level the playing field, discounted PEV rates may be offered through limited application of marginal cost floor pricing in the off and super off-peak periods (see SCE response to Question 29). A workshop topic in this area is low priority given the complexity of the subject and the many roles played by other government entities.

38. How could electric vehicle adoption impact other Commission policies and initiatives including the Renewable Portfolio Standard, the Long-Term Energy Efficiency Strategic Plan, energy efficiency goals, and zero net energy homes goals?

In the Early Market stage, the number of vehicles in the near term is expected to be too small to impact the programs listed in this question. In the Growing Market, there may be a need to discuss these linkages.

As Natural Resources Defense Council (NRDC) pointed out in the July PEV workshop in the Smart Grid OIR, switching from a gasoline vehicle to a PEV reduces household energy use (in NRDC's illustrative example), from about 10,000 kWh (of gasoline) to 3,000 kWh of electricity. This phenomenon has implications that should be examined in long-term

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[34] http://www.ngvc.org/pdfs/FederalFuelTaxCredit.pdf.

energy efficiency planning and zero-net-energy-home planning by state agencies. For one thing, energy is saved in this case when electricity use goes up. In other words, fuel switching from gasoline to electricity, while it increases kWh, is an energy efficiency measure. Similarly greenhouse gases are reduced in this case when electricity use goes up. The net greenhouse gas reduction for the BEV according to the State Alternative Fuels Plan is about 72%.[35] This effect and its impact are discussed more in Questions 33 and 34, as there are cost implications to ratepayers once the electricity sector greenhouse gas emissions are capped under AB 32. As discussed in response to Question 34, the goal should be for the correct price signals to be sent to consumers. The RPS program, the upcoming cap-and-trade program and LCFS should work in tandem so that the price difference between gasoline and electricity diverges. A possible topic for a portion of the OIR workshop on LCFS Issue is the exploration of this related energy use issue.

XI.

EDUCATION AND OUTREACH

A. Introduction

As the PEV market develops, IOUs and other stakeholders will need to provide proactive customer education on EVSE issues, load management and PEV rate options. The Commission should encourage and facilitate a collaborative framework that aims at providing customers the right information at the right time.

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[35] Go to http://www.energy.ca.gov/ab1007/index.htm and http://www.energy.ca.gov/ab1007/ca-greet_model/.

B. Responses to Specific Questions (39-42) in the OIR

39. What entities and programs best facilitate customer outreach and education regarding convenient and timely EVSE installation options and customer tariff education to ensure awareness of off-peak versus on-peak charging costs?

PEV purchases will require customers to understand multiple aspects of PEV adoption, such as differences between PHEVs and BEVs, EVSEs and installation options, metering arrangements, and rate choices. The potentially complex purchase and installation processes involve multiple parties that may provide PEV information to the customer (*i.e.*, PEV manufacturers, PEV dealers, EVSE manufacturers, EVSE installers, city inspectors, utilities, state agencies, and local governments), creating the potential for conflicting or confusing messages. However, the opportunity exists to begin educating customers now, in order to facilitate the PEV purchase process and streamline required charging infrastructure installation.

Given the number of potential information providers, a collaborative effort will be most effective at educating customers regarding EVSE installation options and customer tariffs. Customers need the right information at the right time to help them to make informed decisions. Thus, customer outreach and education should focus on two aspects: (1) creating general awareness of charging stations and EV rates, and (2) providing detailed information regarding customer-specific EVSE and tariff options. In the Early Market stage, IOU education and outreach efforts should focus primarily on creating awareness, while leveraging co-marketing partnerships with key market players, including but not limited to PEV manufacturers and dealers, contractors, government agencies and statewide education programs, as appropriate. The education process is expected to help SCE understand where the vehicles are located, which is important for planning distribution system upgrades.

As the PEV market develops, IOU marketing and education efforts should continue to provide general awareness information, while also informing customers of their

particular EVSE installation options and IOU-specific tariff options. This approach is consistent with a recent EPRI study, in which sixty-seven percent of customers would like their utility company to provide them with information on charging options, the availability of PEVs in their area, and a list of public charging spots and prices.[36] See responses to Questions 8 and 17 on related outreach issues.

XII.

SCOPE

A. Introduction

Priority issues related to electric system readiness for PEVs need to be given appropriate attention and resolved before issues of lesser urgency related to natural gas vehicles and other electric transportation technologies are considered.

B. Responses to Specific Questions (40-42) in the OIR

40. Should the Commission consider natural gas vehicles as part of this rulemaking, or consider natural gas vehicle issues through utility filed Application(s) and/or Advice Letter(s)? What are the near-term tariff, infrastructure, incentive programs or other issues that the Commission should address with respect to natural gas vehicles?

The Commission would further its objective of supporting California's GHG emission reduction goals by including NG vehicles (NGV) in this OIR. Many of the policy issues raised in this OIR are likely to be applicable to both NGVs and PEVs. For example, this OIR seeks to examine circumstances under which the Commission should regulate third party PEV service providers as public utilities and/or electrical corporations and the implications of

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[36] *See Characterizing Consumer's PHEV and BEV Electric Infrastructure Expectations*, Electric Power Research Institute, August 2009.

doing so on market competitiveness.[37] This issue is equally applicable to third party NGV service providers; therefore it would make sense for the Commission to consider this issue in the context of both PEVs and NGVs. The Commission may decide that different approaches are appropriate for PEVs and NGVs; however it may be more efficient to consider policy issues applicable to both PEVs and NGVs in this OIR.

However, SCE believes the inclusion of NGVs in this OIR requires the Commission to appropriately prioritize the issues to ensure that near-term issues related to electric system readiness for PEVs are addressed in a timely manner and that NGV issues do not unreasonably detract from that effort. SCE suspects that many of the issues related to NGVs will be less urgent than some of the issues facing the IOUs for PEVs.

41. Should the Commission consider medium-duty electric vehicles, heavy-duty electric vehicles, and off-road electric vehicles as part of this rulemaking? If so, what issues specific to these vehicles should the Commission consider?

The Commission would further its objective of supporting California's GHG emission reduction goals by including other ET technologies in this OIR. Apart from PEVs, there are many other ET technologies -- from high-speed rail and dual-mode electric freight rail to heavy-duty PHEVs -- with national GHG reduction potential in the hundreds of millions of metric tons annually by 2050. There are also several stationary technologies where electrification can bring large reductions in GHG and contribute to other societal benefits. Because the electricity sector issues associated with these ET technologies are largely the same as those associated with PEVs, it would make sense for the Commission to review these technologies and their implications in this OIR, as well.

As with NGV issues, SCE expects that many of the issues related to other ET technologies are not as urgent as the near-term issues related to electric system readiness for

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[37] *See* Questions 15 and 16 *supra*.

PEVs. Accordingly, the Commission should prioritize and resolve the near-term PEV issues before undertaking consideration of other ET technologies. Specific issues related to other ET technologies are more appropriately considered later in this OIR; therefore SCE recommends that the Commission solicit input on the specific issues to be considered regarding other ET technologies later in the OIR, once the near-term issues are addressed.

42. What other issues should the Commission consider in this rulemaking? What are your recommendations regarding those issues?

At this point, SCE has not identified any additional issues that warrant inclusion in the scope of this OIR.

XIII.

CONCLUSION

SCE appreciated this opportunity to provide comments.

Respectfully submitted,

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Appendix A

APPENDIX A

CURRENT AND PENDING CODES AND STANDARDS THAT GOVERN THE INSTALLATION, OPERATION, AND MAINTENANCE OF CHARGING INFRASTRUCTURE AT THE RESIDENTIAL, COMMERCIAL AND PUBLIC CHARGING EVSE

The Society of Automotive Engineers (SAE):

Document	Title	Status
J1711	*Recommended practice for measuring the exhaust emissions and fuel economy of Hybrid-Electric Vehicles*	Under Revision[38]
J1715	*Hybrid Electric Vehicle (HEV) and Electric Vehicle (EV) Terminology*	Under Revision
J1772™	*SAE Electric Vehicle Conductive Charge Coupler (Dictates EVSE Design Requirements, Charging Levels, AC and DC Power Couplers for conventional and fast chargers)*	Under Revision
J1773	*SAE Electric Vehicle Inductively Coupled Charging*	Issued[39]
J1797	*Recommended Practice for Packaging of Electric Vehicle Battery Modules*	Issued
J1798	*Recommended Practice for Performance Rating of Electric Vehicle Battery Modules*	Issued
J2288	*Life Cycle Testing of Electric Vehicle Battery Modules*	Issued
J2289	*Electric-Drive Battery Pack System: Functional Guidelines*	Issued
J2293 / 1	*Energy Transfer System for Electric Vehicles – Part 1: Functional Requirements and System Architectures*	Under Revision
J2293 / 2	*Energy Transfer System for Electric Vehicles – Part 2: Communication Requirements and Network*	Under Revision

[38] Existing standard currently under document revision.
[39] Standard is approved and available for implementation.

	Architecture	
J2344	*Guidelines for Electric Vehicle Safety*	Under Revision
J2380	*Vibration Testing of Electric Vehicle Batteries*	Issued
J2464	*Electric Vehicle Battery Abuse Testing*	Under Revision
J2758	*Determination of the Maximum Available Power from a Rechargeable Energy Storage System on a Hybrid Electric Vehicle*	Issued
J2836 / 1	*Use Cases for Communication between Plug-In Vehicles and the Utility Grid*	Pending Approval[40]
J2836 / 2	*Use Cases for Communication between Plug-In Vehicles and the Supply Equipment (EVSE)*	Pending Approval
J2836 /3	*Use Cases for Communication Between Plug-In Vehicles and the Utility Grid for Reverse Power Flow*	Under Development[41]
J2841	*Utility Factor Definitions for Plug-In Hybrid Vehicles Using 2001 US DOT National Household Travel Survey Data*	Issued
J2847 /1	*Communication between Plug-In Vehicles and the Utility Grid*	Under Development
J2847 / 2	*Communication between Plug-In Vehicles and the Supply Equipment (EVSE)*	Under Development
J2847 / 3	*Communication between Plug-In Vehicles and the Utility Grid for Reverse Power Flow*	Under Development
J2894 / 1	*Power Quality Requirements for Plug-In Vehicle Chargers – Part 1: Requirements*	Under Development
J2894 / 2	*Power Quality Requirements for Plug-In Vehicle Chargers – Part 2: Test Methods*	Under Development
J2907	*Power rating method for automotive electric propulsion motor and power electronics sub-system*	Issued

[40] Standard has been finalized and is waiting approval from the committee for publication.
[41] New standard being developed.

J2908	*Power Rating method for hybrid-electric and battery electric vehicle propulsion*	Issued

Underwriters Laboratories (UL):

Document	Title	Status
UL 50	*Standard for Enclosures for Electrical Equipment*	Issued
UL 1439	*Determination of Sharpness of Edges on Equipment*	Issued
UL 1741	*Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources (This standard will play a significant role in the future with vehicle to grid power transfer applications)*	Under Revision
UL 1998	*Software in Programmable Components*	Under Revision
UL 2202	*EV Charging System Equipment*	Under Revision
UL 2231	*Personnel Protection Systems for EV Charging Circuits*	Under Revision
UL 2251	*Plug, Receptacles and Couplers for Electric Vehicles*	Under Revision
UL 2594	*Document Not Yet Titled (Certification for EV Charging cordset)*	Under Development

International Electrotechnical Commission (IEC) / *International Organization for Standardization* ISO::

Document	Title	Status
IEC 60870-6	*Tele-control Protocols Compatible with ISO and CCITT Standards*	Under Revision
IEC 61334	*Distribution automation using distribution line carrier systems*	Under Revision
IEC 61850	*Power System IED Communication and Associated Data Models*	Under Revision

IEC 61851	*Electric Vehicle Conductive Charging System (European Equivalent to US SAE J1772)*	Under Revision
IEC 61851-24	*Electric Vehicle Conductive Charging System (European Equivalent to US SAE J1772)*	Under Revision
IEC 61970	*Energy Management System Application Program Interface*	Under Revision
IEC 61968	*Application integration at electric utilities-system interfaces for distribution management (Data Models being extended with SmartEnergy 2.0)*	Under Revision
IEC 62196/1	*Plugs, Socket-Outlets and Vehicle Couplers*	Under Revision
IEC 62196/2	*Dimensional Interchangeability requirements for pin and contact-tube vehicle couplers*	Under Revisions
IEC 62350	*Communications Systems for Distributed Energy Resources*	Under Revision
IEC 62210	*Data and Communication Security*	Under Revision
IEC 62325	*Framework for Deregulated Electricity Market Communications*	Under Development

Institute of Electrical and Electronic Engineers (IEEE):

Document	Title	Status
1547	*Standard for Interconnecting Distributed Resources with the Electric Power System*	Issued
519	*Harmonic Control in Electrical Power Systems*	Issued
P1901	*Standard for Broadband over Power Line Networks*	Under Revision

2008 National Electric Code (NFPA 70: NEC):

Article	Title	Status
Art. 625	*Electric Vehicle Charging System*	Issued

2007 California Code of Regulations Title 24: (CCR Title 24)

Code	Title	Status
CEC Art. 625	*Electric Vehicle Charging System* *(Adopts & Slightly Alters the NEC, Updated every three years)*	Issued
CBC Art 1202	*Ventilation Requirements for Electric Vehicle Charging Sites*	Issued
CGBC Art A406.1.5.2.1	*Requires CBC Art. 406.2(Motor Related Occupancies) to add both a 20A -120V outlet and a 40A-240V outlet / prep. Infrastructure for future vehicle usage. (Please note that table 406.1.5.2 notes how many EV ready parking spots are required per ratio of conventional parking)*	Issued

2007 California Code of Regulations Title 13: (CCR Title 13)

Code	California Code of Regulations Title 13	Status
Title 13, section 1962, 2	*Electric Vehicle Charging Requirements*	Issued
Title 13, sections 2300-2317	*Requirements on Owners / Lessors of Retail Gasoline Stations to install outlets for designated clean fuels*	Issued

Many of the standards listed above, have been issued and have or will go through the normal process of updating. However there are a few standards listed above (in red) that are either undergoing major revisions or are completely new. These standards are the foundation for development of a ubiquitous charging system, PEV – Grid Communication and Grid Friendliness (PQ Requirements.) Below are the highlights of these standards:

- **SAE J1772:** Sets the requirements for a "universal" conductive coupler for conventional vehicle charging up to 19.2kW (100A Circuit at 240VAC). The standard describes the three charging levels as follows
    - **Level 1:** Fixed Standard Outlet up to 1.9kW (20A Circuit at 120VAC) via an EVSE box integrated with into the cord set.

- **Level 2:** Fixed EVSE box (per NEC) with capacity up to 19.2kW (100A Circuit at 240VAC) and built in cord / coupler.
- **Level 3:** Is still under revision but is expected to be any charging device that is rated 20kW or greater and out either AC or DC power.

In addition, this standard outlines the basic design requirements for the EVSE (Electric Vehicle Supply Equipment) including the pilot signal parameters, ground fault circuit requirements and ventilation verification. It is very important to note that with this new standard vehicles will have the ability to charge with dual voltages (120V and 240V) using the same connector. This means that once adopted in North America all battery charging equipment under 19.2kW will have the same connector regardless of their voltage or current capacity. This will allow for a universal physical method by which to transfer energy (similar to the universal gasoline nozzle) to the PEV.

One concern with this standard is nomenclature. Although the charging levels are defined in terms of power range, the envelope is so broad (especially in level 2: 1.9kW – 19.2kW), and it would be useful to have a common nomenclature. Below are the basics on the three charging methods:

- **Conventional Charging**
  - Mainly Residential & Workplace
  - Charge time between 3 – 8 hours
  - Typically with SAE level 1 or level 2 power ratings.
  - Requires J1772 level 1 & level 2 connector
  - Typical charging level is very broad - approximately 1.0 – 1.9 kW for level 1 (120V) and approximately 1.9 – 19.2 kW for level 2 (240V)
  - All PHEVs and BEVs will have this capability; PHEV and niche market BEVs with smaller battery packs will charge at 1.0 to 1.9 kW, and PHEVs with larger batteries will have a 3.3 kW option. BEVs will typically charge at 6.6 kW with some at 19 kW.
- **Fast Charging – lower level**
  - Mainly commercial applications
  - Charge time typically less than one hour but over 15 minutes.
  - Expected to be within SAE level 3 power rating

        - Will require a special J1772 connector designated for "Quick Charging" but will not require a trained attendant to operate
        - Will require 2nd charge port on the BEV or PHEV
        - Typical charging level is about 50 kW (can be either 208 V three-phase or 480 V)
        - Not clear if any PHEV or BEVs will have this capability – preliminary interest from Japanese carmakers
    - **Fast Charging - higher level**
        - "Gas Station" model in mainly commercial or industrial applications.
        - Charge time typically less than 15 minutes
        - Expected to be within SAE level power rating
        - Will require a special J1772 connector designated for "Fast Charging"
        - May require trained attendant to perform hook-up and charge.
        - Will require 2nd charge port on the BEV or PHEV
        - Typical charging level is about 100 -200 kW (typically 480 V)
        - Not clear if any PHEV or BEVs will have this capability – some interest in special applications such as buses.
- **SAE J2847**: This standard started as a revision to the existing SAE J2293 vehicle communication document in March 2008. However, the team soon realized that it would be too difficult to update the existing standard and voted to create a new one that would soon replace the existing. The purpose of this standard is to set the requirements, messaging and design basics for future PEV to Grid Communications that will enable functions such as load management. In early 2008, the SAE J2847 team guided by Southern California Edison and the Electric Power Research Institute (EPRI) created a set of vehicle use cases that led to the basic communication requirements. In addition, SCE has been instrumental in aligning the work at SAE with that of the development of Smart Energy 2.0 messaging under the Zigbee – Homeplug Alliance.[42] By combining these efforts the vehicle will have the means by which to communication with future smart

devices. Furthermore, under mandate of the U.S. 2007 Energy Security Act, the National Institute of Science and Technology (NIST) has been working to adopt a set of national standards that will enable and insure interoperability of devices in a smart grid environment. Of the many standards being considered under this effort, NIST was quick to recognize and move forward with adopting a PEV communication plan with SAE and Smart Energy 2.0 as the cornerstone.

- **SAE J2894**: In addition to enabling vehicle communication for load management, both electric utilities and automakers agree that chargers must be "grid friendly" and meet certain basic power quality parameters such as limiting harmonic distortion. Hence, the purpose of this standard is to capture the power quality chargers must meet in order to connect to the electric grid. This standard is expected to be finalized and issued by January 2010.

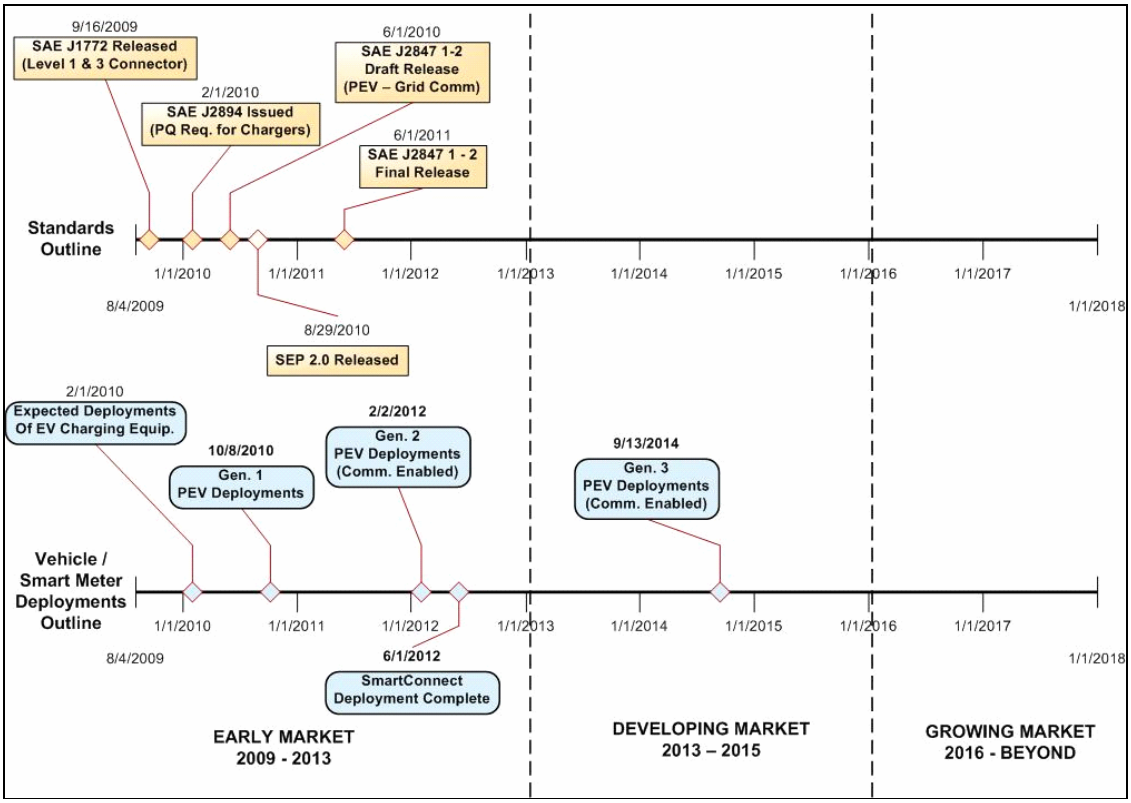
Figure 1 below is an outline of how standards, vehicle deployments and SCE smart meter deployments are expected to role out.

Continued from the previous page

42 The Zigbee – Homeplug alliance is a consortium of utility and equipment companies collaborating to develop the second version of Smart Energy.

Figure XIII-2

PEV Standards Timeline (except Quick Charging)



The timeline in Figure 1 does not apply to fast charging (at 100 – 200 kW or 20-50 kW). Automakers generally do not see a fast or quick charge network being developed. However, there may be some interest from a consortium of Japanese automakers in quick charging.43 Firms such as Better Place also are interested in quick charging as part of battery switch stations, but the consumers will not have to wait for the quick charging. It will take several years effort by the automakers and other parties to have the existing SAE 1772 coupler for quick charging modified. Additional work remains to be done on the impact of quick charging on the batteries. The impact (including possible accelerated aging) is expected to be different for the five major types of lithium-ion chemistries. Customers will need to be concerned if they have a PEV

43 On August 6, 2009, Nissan, Subaru, Mitsubishi and Tokyo Electric Power announced a consortium to work on quick charging of EVs. Asia Pulse, August 6, 2009.

battery that is not conducive to quick charging. Ultimately all of the standards detailed above will help shape the future of PEVs.

Finally, NIST in September 2009 released 31 draft standards for the smart grid, but these do not include any on PEVs. However, Table 3 in the NIST report lists 46 standards under review, which includes four standards on PEVs: SAE 1772, SAE J2293, SAE 2836/1-3 and SAE J2847/1-3.

Appendix B

APPENDIX B

An electric vehicle will need to connect to the grid via a 120 or 240 volt connection to achieve level 1 or level 2 charging. For level 1 charging a "cord set" with an integrated EVSE is required to interface between the vehicle's coupler and the standard power receptacle (usually NEMA 5-15), see figure below. For level 2 installations a fixed mounted Electric Vehicle Supply Equipment (EVSE) "module" or "box" would be required. A summary of minimum functional requirements and advanced "smart" features are summarized below.

	Minimum requirements	**Features for smart functionality**
120 Volt Level 1	• Socket should be a dedicated circuit (in order to avoid nuisance circuit breaker tripping) • 120 volt with ground • 15 A minimum • EVSE is in a portable cordset (similar to an extension cord) with SAE J 1772 compliant "coupler" • Not required by any agency except new and retrofit parking spaces under Green Building Code in motor vehicle parking sites for both commercial and residential sites) • Installation governed by National Electric Code Art. 625. • CARB code repeats 2001 version of SAE 1772 for vehicle and infrastructure (15 amp only) CARB plans on adding 20A in future when SAE 1772 is updated soon	• Requires an "Intelligent Receptacle" with the following: o Contains revenue grade meter "chip" o Contains relay or relay driver for load management/DR/curtailment o Contains communications capability and ability to serve as a "bridge device" between two different transport layers" • EVSE is in a portable cordset (similar to an extension cord) with SAE J 1772 compliant "coupler" • Forward compatibility / upgradeability needs to be considered in early models • Not required by any agency. • NIST, SAE and other SDOs are discussing and developing the required standards. . • Link to renewables integration or bi-directional power flows (In a more developed PEV market)

	Minimum requirements	Features for smart functionality
240 Volt Level 2	• EVSE "box" is permanently mounted and hard wired to dedicated circuit from main panel • SAE J1772 compliant "coupler" with hard-wired cable • Connections inside dedicated enclosure or EVSE "box" • Installation governed by National Electric Code Art 625 • Proper installation enforced by city and county building inspectors. • CARB codes repeats 2001 version of SAE 1772.	• Contains revenue grade meter "chip" • Contains relay or relay driver for load management/DR/curtailment • Contains communications capability • Forward compatibility / upgradeability needs to be considered in early models. • Not required by any agency. • NIST, SAE and other SDOs are discussing all of this. • Contains a Human – Machine Interface for inputting preferences • Link to renewables integration or bi-directional power flows

CERTIFICATE OF SERVICE

I hereby certify that, pursuant to the Commission's Rules of Practice and Procedure, I have this day served a true copy of **SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) RESPONSE TO OIR 09-08-009; ORDER INSTITUTING RULEMAKING TO CONSIDER ALTERNATIVE-FUELED VEHICLE TARIFFS, INFRASTRUCTURE AND POLICIES TO SUPPORT CALIFORNIA'S GREENHOUSE GAS EMISSIONS REDUCTIONS GOALS** on all parties identified on the attached service list(s). Service was effected by one or more means indicated below:

Transmitting the copies via e-mail to all parties who have provided an e-mail address. First class mail will be used if electronic service cannot be effectuated.

Executed this **5th day of October, 2009**, at Rosemead, California.

/s/ Alejandra Arzola
Alejandra Arzola
Project Analyst
SOUTHERN CALIFORNIA EDISON COMPANY

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Post Office Box 800
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