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**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA**

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| Order Instituting Rulemaking to Consider Alternative-Fueled Vehicle Programs, Tariffs, and Policies. | Rulemaking 13-11-007 (Filed November 14, 2013) |

# ADMINISTRATIVE LAW JUDGE'S RULING SETTING PREHEARING CONFERENCE AND REQUESTING COMMENTS

This ruling schedules a Prehearing Conference (PHC) for February 26, 2014 to address the scope, schedule, and other matters for both Tracks 1 and 2 of this Rulemaking. This ruling also requests comments on questions regarding Track 1 Vehicle-Grid Integration (VGI) and provides an additional opportunity to present written comments following the December 4, 2013 Energy Division Workshop on VGI, Plug-in Electric Vehicle (PEV) and electric vehicle supply equipment financing.

This Rulemaking was issued on November 22, 2013, and requested opening comments on the Energy Division Staff's whitepaper entitled, *Vehicle-Grid Integration: A Vision for Zero-Emission Transportation Interconnected throughout California's Electricity System* (Whitepaper) and other initial questions. The Rulemaking set two concurrent tracks. The first examines the potential value of VGI. The second track will focus on the development of new alternative fuel vehicle tariffs. Both tracks will explore whether related financing opportunities can unlock long-term value in PEVs or reduce upfront costs as a means of accelerating PEV adoption and infrastructure deployment. Parties

were directed to file Opening Comments on December 13, 2013 and Reply Comments on December 20, 2013.

Energy Division held a one-day December 4, 2013 workshop to address the Whitepaper. The workshop had a full agenda and parties expressed a desire to provide more detailed comments to the Whitepaper than was possible in short public comments and discussion opportunities available at the time. In addition, an Energy Division Workshop Summary Report (Summary Report) is attached to this ruling. The Summary Report is intended to encapsulate the issues, proposals and views expressed at the workshop. We will allow additional comments on the Whitepaper and in response to the Summary Report as set forth below.

In addition, we invite comment on three specific questions:

1. What programmatic changes can be made to support VGI as a resource within existing or proposed state energy programs and policies, such as demand response, resource adequacy requirements, energy storage, interconnection, and net energy metering?
2. What immediate, near-term actions should the Commission undertake to support the development and implementation of VGI use cases and applications?
3. In consideration of the Use Case prioritization proposed in the Whitepaper, are there near-term actions that the Commission should avoid in order to not preclude progress on Use Cases considered to be more complex?

The parties are directed to file and serve comments addressing the questions presented above and any additional comments that have not already been presented on both the Whitepaper and the Workshop Summary (which is attached to today's ruling) no later than Wednesday, February 19, 2014.

This ruling sets a PHC for Wednesday, February 26, 2014 commencing at 10:00 a.m., in the Commission Courtroom, State Office Building, 505 Van Ness Avenue, San Francisco, CA 94102.

The PHC agenda will address the following issues:

1. Positions of the parties, scope and schedule of the proceeding, and other procedural matters not already included in the written PHC statements;
2. Need for technical workshops on particular issues; and
3. Other topics as the interest of justice and efficient case management require.

A detailed agenda will be sent to the parties before the PHC.

**IT IS SO RULED.**

Dated February 5, 2014, at San Francisco, California.

/s/ IRENE K. MOOSEN
Irene K. Moosen
Administrative Law Judge

R.13-11-007 IM2/vm2

# ATTACHMENT

## WORKSHOP SUMMARY REPORT

**R.13-11-007**
**December 4, 2013 Workshop Summary Report**

**Vehicle-Grid Integration**

**&**

**Plug-In Electric Vehicle (PEV) & EV Supply Equipment Financing**

**Adam Langton**
**Noel Crisostomo**

**Energy Division**
**California Public Utilities Commission**

**January 31, 2014**

**http://www.cpuc.ca.gov/PUC/energy/altvehicles/**

**Introduction**

On November 14, 2013 the California Public Utilities Commission (CPUC) approved an Order Instituting Rulemaking (OIR) on Alternative-Fueled Vehicle Programs, Tariffs, and Policies. During the Rulemaking, the CPUC will address issues related to the expanding use of alternative fueled vehicles in California by continuing its work in R.09-08-009, supporting Executive Order B-16-2012, and achieving its action items identified in the Zero-Emission Vehicles Action Plan.

The proceeding has two concurrent tracks. The first track will evaluate the potential value of Vehicle-Grid Integration. The second track will focus on the development of new alternative fuel vehicle tariffs. Throughout these tracks, the proceeding will explore how financing opportunities can unlock long-term value in PEVs or reduce upfront costs as a means of accelerating PEV adoption and infrastructure deployment.

Track 1 began with an Energy Division staff- facilitated workshop on December 4, 2013 to explore issues related to Vehicle-Grid Integration and plug-in electric vehicle and electric vehicle supply equipment financing. The workshop also addressed issues presented in the Energy Division whitepaper, "Vehicle-Grid Integration: A Vision for Zero-Emission Transportation Interconnected throughout California's Electricity System."

This Summary Report captures the December 4, 2014 workshop issues, views and proposals to facilitate the Parties' further comments and aid the Commission's consideration of Track 1 issues.

**Contents of Report**

- Summary of VGI Feedback
- Summary of PEV and EVSE Financing Feedback
- Workshop Agenda
- Energy Division Staff Notes
- Attendance Contact Information

**Summary of VGI Feedback**

**Party-Recommended Policy Principles & Priorities**

- Use VGI as a means to scale up adoption to meet Governor's Goals for 1.5 M ZEVs by 2025 and 80% reductions in GHG.
    - Enhance the value proposition of transportation electrification in all market segments.
    - Maximize electric VMT for PHEVs and enable greater mobility for BEVs.
    - VGI should not compromise a customer's electric mobility.
    - Customers should have the ability to choose from a variety of VGI approaches.
- VGI activities should seek to minimize negative grid impacts and enhance grid reliability, and they should facilitate the integration of renewable energy resources.
- Implement cost-effective solutions immediately while designing policies that remain open to future developments in technology and diverse business models
    - Utilities, automakers, and service providers should have the ability to pursue a variety of business models and benefit from the savings that they provide to PEV drivers and general ratepayers.
- Encourage and coordinate marketplace innovations that enable continuous improvement in technologies deployed.
    - Allow the market to solve issues related to customer/provider agency and technological development.
    - Regulatory agencies should rely on consumer demand and industry collaboration to decide upon appropriate standards for VGI.
    - Policies implemented should be agnostic to vehicle technologies and allow for a level playing field with other resources.
    - Immediate implementation should not result in stranded assets.
- Do not needlessly set California-specific standards, yet allow for experimentation.
    - Coordinate with other states' ISO/RTOs and PUCs in setting policies
    - Continue to lead the way in ZEV deployment a policy.

**Remaining Questions**

- The value of Vehicle-Grid Integration is not well understood.
    - What parameters (list of costs and benefits) and assumptions should we include in an evaluation of the market value of VGI? In addition to that of the customer, from whose perspective should we examine value?
    - What is the value of PEVs providing services to different market recipients (the wholesale market, distribution system, or customer)? How do these change based on the application, time, and location?
    - At what point is the market for a particular service saturated and the associated value for it decreases? How does this vary on the system or local scale?
    - How sensitive to performance risk are business plans that attempt to monetize value of different VGI applications to entities (CAISO, IOU, customer)? How can this be structured to maximize value to the end customer?
    - What is the threshold for value from V2G in order for OEMs to justify adding the associated functionalities to cars? What level of certainty is necessary for business planning to enable an OEM's movement to provide V2G?
- Connecting to charging infrastructure is a threshold issue when considering VGI.

- Where are PEVs concentrating today?
- Where should the state prioritize future charging locations to enable greater mobility beyond current travel patterns?
- How much charging is needed for high levels of electrification?
- What capacity (Level 1, Level 2, DC FC) is needed to maximize electric VMT for different shares of PHEV and BEV?
- How is the value of a VGI use case sensitive to power level and charging situation (market segment, location, length available, retail or wholesale application served)?

**Party-Suggested CPUC Action Items**

- Determine Value of VGI.
  - Complete a meta-analysis of previous university, National Lab, and industry research on the value of different applications for PEVs as electrical system assets. Determine an appropriate methodology to evaluate value, building off of Storage and Demand Response Cost-Effectiveness tools.
  - Order the utilities to propose their estimates for value.
  - Work with CEC and CAISO to develop a research agenda given the ongoing pilots, Interagency Roadmap, and upcoming solicitations for the Electric Program Investment Charge proposals related to PEVs and VGI.
- Clarify Complementary Proceedings and Policies to Develop a Market for VGI.
  - Align with other CPUC proceedings focused on distributed energy resource markets. What policies and rules from other proceedings apply to PEVs (i.e. Demand Response, eligibility for Net Energy Metering, Electricity Storage Procurement Requirement, Resource Adequacy etc.)
  - Provide clarity on intent of interconnection rules and consider complexities that arise from combining multiple types of technologies.
  - Ensure that this proceeding enables the use of PEVs to solve the right questions in the context of other resources.
  - Determine a balance between the need for a level playing field among preferred distributed energy resources and the CPUC's responsibilities under the ZEV Action Plan.
- Determine a course of action to implement VGI.
  - Establish guidance for the industry by stating priorities and policy principles for VGI.
  - Recognize the spectrum of options available for VGI and design policies that allow for immediate and near term implementation of use cases, while not precluding future technologies and business models from development.
  - Where possible, use existing regulations or modifications thereof to enable use cases.
  - Order the utilities to each propose different methods of capturing value with EV service providers and returning to value to customers. Deploy solutions on pilot bases, testing different models, continuously evaluating, and applying lessons to future regulatory decisions to modify VGI programs currently in operation.
  - Provide regulatory clarity on definitive issues that may not be solved by the market. Who is the customer: the IOU, the aggregator, the primary meter customer, the PEV owner? What is the resource: an aggregation of PEVs, the primary meter, individual PEV?

**Characteristics of Use Case Implementation**
**The value of VGI will be sensitive to various parameters, which include:**

- During what timeframe it is implemented: immediate or near-term or long-term
- Degree of system complexity and integration necessary to implement a use case. Note: this is a subjective measure and CPUC/stakeholders must determine the appropriate perspective and corresponding assumptions on costs and benefits.
- Required level of customer interactions and decision-making to enable the application.
    - VGI should be simply understood and accompanied with education and outreach.
- Segment targeted:
    - Light Duty Vehicles: Single Family, Multifamily Residential
    - Light Duty Vehicles (fleets): Commercial/Institutional, Industrial
    - Medium Duty and Heavy Duty Vehicles (fleets): Commercial/Institutional, Industrial, Public Transportation
- Application of service: retail and/or wholesale
- Charging Power Level: L1 vs. L2 vs. DC Fast
- Vehicle Type: PHEV or BEV and associated electric range
- Direction of Power-flow: V1G or V2G
- Whether or not the resource is aggregated to provide the service
- The use of cost-effectiveness or a cost-benefit ratio to determine which approaches to implement.
- Billing and metering systems architectures: Advanced metering Infrastructure or Cloud-to-Cloud
- How to “Open the market to cash flow”? What is the mechanism to set a price for VGI
    - Grid operators need a standardized method to send desired behaviors to different service providers and PEVs. A grid-signal could be based on:
        - GHG Emissions-content of marginal electricity that would be consumed
        - ISO-originated system-wide grid-conditions, disaggregated by the utility upon the distribution system level (unknown at what point: substation/feeder/local transformer) after which a charging control technology might be used.
    - Rates and pricing should be improved in tandem or as a substitute for a “grid signal.”
        - Tariff and Rate-dependent :Locational and dynamic, Time of Use, Seasonal, or Tiered

**Summary of Financing Feedback**

**Need for Financing:**

- The PEV market is still in the "innovators" stage. Investment is essential for technology and production improvements, further vehicle adoption and infrastructure deployments.
- High electrification is necessary for near term air quality and long term decarbonization goals.
- The State should find ways to enable investment in public infrastructure since it is a good use of funds, especially because it is needed to meet the long term adoption and emissions goals.
- Legislation continues funding for state programs but goal is to sustain industry without subsidy through private and consumer investment.
- Barriers:
    - Renewables 100 Policy Institute:
        - Customers: upfront cost, access to incentives, access to credit, information
        - Manufacturers: limited demand, uneconomical technology, concern for ROI.
        - EVSPs: legal/regulatory, lack of 1) infrastructure, 2) demand, 3) standardization
    - National Association of State Energy Officials, Center for Climate & Energy Solutions:
        - Legal/regulatory/institutional: 1) rules on contract types and terms, 2) restrictions on financial institution ownership and reserve assets
        - Information deficiency: new technologies may affect credit ratings and access to low-cost capital, financial models
        - Financial products risk: new financial instruments and/or application of traditional instruments to new technology is considered to be illiquid, discouraging investors from taking on risk.
        - Scale: transaction costs are disproportionately high given small market size. Need for standardized loans to quickly assess risk and reduce cost.

**Options for Implementation**

- Up front Incentives for PEVs
    - Participant: Provided by utility and paid back through additional revenue from marginally higher energy rates
    - Ratepayer: Utility procures future value of PEV battery for use in stationary grid storage, as long as investment benefits general ratepayers. Decouple sales of vehicle & battery.
    - Ratepayer: Market Transformation subsidies
    - Polluter: Utility returns revenue from sales of Low Carbon Fuel Standard credits to the benefit of EV drivers
- Increase availability of EVSE
    - Allow a market to develop, but take action today because we can't continue to wait for existing models to fill gaps or find out whether one option has failed.
    - Direct policies and allow pilots such that the IOUs and third parties can determine or demonstrate their "appropriate roles" in providing infrastructure.
    - What are the various pathways and business cases for public EVSE?
        - If there are non-viable business cases that are essential to gain public confidence in PEV adoption, who should take action and how?
    - Customers expect at least some level of utility involvement in infrastructure.
    - Potential solution is to segment responsibility according to most appropriate strengths and to ensure competition: customer acquisition/origination, competitive solicitation

according to IOU engineering specifications (?), permitting, installation, ownership, operation of network, maintenance.
    - Pilot-derived data should drive policy decisions.

**Remaining Questions**

- PEV Financing
    - Risk
        - How to minimize addition of risk in the customer's purchase of a PEV?
        - Who is customer for VGI services? Customer/aggregator/utility/CAISO?
        - What is driving PEV buyers' specific concerns about purchases? The specialization of the battery is the primary driver of cost and also is the greatest liability if additional parties interact with the customer. How sensitive is the viability of the battery financing option to the uncertainty of battery life?
        - Who takes on risk and associated costs with financing? What effect does a parties assumption of risk reduce value?
    - Motivators of/barriers to customer purchases
        - Upfront incentives are likely more effective at enabling utility notification than rates, since rates and operational costs are not the primary adoption barrier.
        - Incentives must generally exceed $1000 to be meaningful in a customer's decision-making process in a PEV purchase.
        - What choices do customers want and need in terms of choice? Do off-peak rates appear to "limit" customer choice? Need for other ways to encourage charging based on grid conditions?
        - There may be an aversion or incompatibility between ensuring customer mobility and the centralized management of batteries.
- EVSE Financing
    - Utility Role and Relation to Third Party Competitors
        - What is the importance of utility in developing infrastructure that would not otherwise be supplied in a competitive market?
        - Are the societal benefits from increased electrification and risk aversion to providing financing to this nascent market a sufficient justification to expanding the traditional role of the utility?
        - Should utilities be allowed to finance infrastructure, but not own it? Is it appropriate for the utility to be a lender to the third parties?
        - Are there means of segmenting the EVSE infrastructure task among IOUs and EVSPs that yield the desired effects on adoption while not imposing risks on ratepayers?

**Party-Suggested Policy Principles & Priorities**

- Take actions to scale up adoption now to meet emissions targets.
- Enable uses for all market segments by increasing accessibility to PEVs and encouraging the deployment of infrastructure.
- Implement solutions that increase value and reduce risk for both customer electric mobility and general ratepayers.
- Allow customers that desire to electrify to choose among program and provider options.

- Enable business model innovation for utilities and third parties by encouraging pilots that derive data on which to base policies.

**Party-Suggested CPUC Action Items**

- Explore whether financing should be a part of the utility's core business.
- Provide customer choice and reduce risk, by providing different types of offerings based on the level of PEV/customer's interaction with and benefit to grid.
- Determine (with ARB) if PEVs require additional qualifications as an energy efficiency resource because they enable fuel switch and have societal benefits.
- Leverage lessons learned from other proceedings including EE Financing.
- Determine whether utilities may gain a return on investment on VGI/infrastructure financing to ensure corporate incentives are aligned.

**California Public Utilities Commission**
**Rulemaking 13-11-007**
**Vehicle-Grid Integration and Financing Workshop Agenda**
Wednesday, December 4, 2013
CPUC Auditorium, 505 Van Ness Avenue, San Francisco
10:00 a.m. – 4:30 p.m.

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| 10:00 | Welcome and Overview | Com. Carla Peterman |
| 10:15 | Presentation of CPUC Energy Division Staff VGI White Paper | Adam Langton, CPUC |
| 10:35 | **Panel 1:** Introductions<br>• Peter Klauer, CAISO<br>• Richard Lowenthal, ChargePoint<br>• Ed Kjaer, SCE | Moderator:<br>Adam Langton, CPUC |
| 10:40 | Question 1: Do you agree with the Energy Division proposed use case framework? Do you agree with the prioritization of these use cases? | |
| 11:00 | Break | |
| 11:15 | Question 2: Does the Energy Division staff white paper capture all the regulatory barriers associated VGI?<br>Question 3: Are the four regulatory questions the right areas of focus for this proceeding? | |
| 11:50 | Wrap up VGI discussion | Adam Langton, CPUC |
| 12:00 | Lunch | |
| 1:15 | Presentation of Gaps and Barriers to AFV Financing | Randall Winston, Governor's Office |
| 1:30 | **Panel 2:** Utility Role in Addressing Up-Front Vehicle Costs<br>• Snuller Price, E3<br>• Adam Langton, CPUC<br>• Alex Keros, GM<br>• Aaron Johnson, PG&E | Moderator:<br>Noel Crisostomo, CPUC |
| 2:30 | Break | |

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| 2:40 | **Panel 3:** Utility Role in Addressing Infrastructure Installation Costs<br>• Mark Duvall, EPRI<br>• Greg Haddow, SDG&E | Moderator:<br>Damon Franz, CPUC |
| 4:00 | Wrap up and next steps | |

**Energy Division Staff Notes**

| | **Welcome & Overview** |
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| Carla Peterman | Part of a new rulemaking, responding to Governor's target of 1.5 million EVs on the road by 2025.<br>Explore how utilities can integrate PEVs with grid, unlock value to drivers<br>Role of IOU will need to be determined<br>Whether and how to integrate into wholesale markets<br>What is feasible and practical to expect from fleet owners, drivers, etc.<br>Address utility's role in financing – consider the value proposition<br>Does it make sense to consider new financing mechanisms?<br>PEVC: New ideas. Renewables 100 report. |
| ALJ Moosen | Feedback on OIR due December 13. Open to different deadline for comments on workshop. |

| | **Energy Division Staff White Paper: Vehicle Grid Integration** |
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| Adam Langton | Vehicle Grid Integration and Financing<br>  <br>CPUC - VGI & Financing December 4 |

| | **Panel 1: Vehicle-Grid Integration** |
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| Adam Langton | *Question 1: Do you agree with the Energy Division proposed use case framework? Do you agree with the prioritization of these use cases?* |
| Richard Lowenthal | The value of VGI potentially may exceed the retail cost of electricity, potentially enabling free charging.<br>Disagree with Fragmented Actor part of the framework (Alignment of Actor Objectives). Private interests can figure it out and we do it everyday. Should focus on providing services to the ratepayer. If a VGI market is open to cash flow, it'll be solved by private industry.<br>The whitepaper must be clearer on what is most urgent or most important. Does not think that the fleet case is first. Residential, Multifamily, and Workplace charging is closer to VGI than is described in the Paper. Urgency is bringing this to mass market. |
| Ed Kajer | Sales are growing, but the market is still nascent. Consumers are diverse, not "one size fits all." In SCE territory, which represents 10% of the U.S. market and 40% of the California market, PHEVs are more prevalent (65%), unlike BEVs in Northern California.<br>Charging at night at Level 1 is important to minimize impact (75% of charging |

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| | energy is done at home). Adequate. Not enough deployment of L1.<br>¾ of commutes are less than 40 miles. The availability of L1 workplace charging may double electric VMT and electric driving range for PHEVs.<br>Many of the regulatory questions of VGI rely on volume and throughput and become more of an issue in the long term. Suggest that CPUC instead focus on accelerating vehicle adoption by enabling low cost, simple, near term solutions.<br>SCE fundamentally agrees on the prioritization in the White Paper. However, greater coordination is needed to integrate the whitepaper's prioritization into the Interagency CAISO/CEC/CPUC VGI Roadmap.<br>Use Additions to the Whitepaper: (1) Increase the adoption of TOU through better rate design. (2) Encourage Level 1 charging since you can charge 4 times as many vehicles on L1 with equivalent grid impact as one car charging at L2. L1 can be used for shaping. (3) Integrate the Whitepaper's concepts into the Storage Procurement Requirement so that the millions of used batteries, with remaining energy, can be used in Second Life applications.<br>Need volume in the near term in order to achieve an end state for V2G. |
| Peter Klauer | Starting simply and building in complexity is right for progress, which is necessary before V2G. Whitepaper is missing discussion on how the owner will have a choice to provide retail or wholesale benefits. Needs to sort out the issues with distribution system and wholesale market.<br>Clarify level of the service agreement, which depends on the modeling arrangement. Based on the intended application, the cost of interconnection, registration etc. could reduce value. Need to better understand the Where/how/what questions related to grid services: IOUs/Wholesale Market/Third Parties? The customer will have to choose. |
| Adam Langton | *White Paper proposed moving from one case to another and adding complexity. Where do we end up? How do we design policy to not build a bias for a certain use case?* |
| Richard Lowenthal | Agrees with the concern about biasing policy. Important to bring in players, ensure drivers are participants in VGI. Do not use AMI network, because it takes the driver out of the equation. Need a network to provide services through cloud, architect a system that brings in all players. |
| Ed Kajer | The way VGI has been laid out, we lack data on value. Caution against stranded investments and unintended consequences. Given that this is new technology, ask how to start while reducing cost, complexities, and barriers? Learning, understanding, and adapting will enable with more sophisticated models. Take it step by step since VGI work is unprecedented |
| Peter Klauer | Examine costs from different perspectives. Providing services is expensive since the grid is designed for large generation power plants with 1-way power flow. Should determine how to take advantage of with cars coming right off of the lot with Level 1, 1-way inverters. System outages are even more costly than interconnecting an untested resource. Introduce simple cases, introduce those cars cost-effectively and progressively manage other use cases to get job done. |
| Max Baumhefner | Start with V1G, which could provide bulk of the value with least complexity for everyone, in addition to fleets |
| Andrew Levitt | V1G versus V2G argument is less contentious since everything V1G needs V2G |

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| | needs. The only addition for V2G is an interconnection. Starting with V1G, keep V2G in mind and take on V2G once V1G is operational. Regarding availability of V2G capable cars, the whitepaper should lower the threshold. Are OEMs open to this? CA is important and it can lead. V2G could be DR as a retail application by responding to signals from the ISO, coded through the PDR model. Could change PDR to allow for V2G. |
| Stacey Reineccius | Need to accelerate tenant occupied segment, which comprises 50-67% of the market, and is not receiving benefits of electrification. Need faster chargers coupled with demand mitigation. Clarify jurisdictional issue of two-way power flow. An essential issue is access to dedicated parking? Paper should consider how to deal with adequacy of infrastructure. Coordinate with Storage Proceeding. Need simpler process for interconnecting with ISO, potentially through allowing aggregation. Agrees with Richard that the market will solve the fragmentation. |
| Ed Kajer | Need additional research and data. In SoCal, 75% SF and 25% MF. Where are vehicles concentrating? SCE's just using Polk's data on Hybrid as a proxy. |
| Jim Baak | Need to understand customer behaviors: what they need vs. what they want. Need to understand how VGI affects the capital cost of the battery, cost to customer. If this is designed incorrectly, it could have a tremendous negative impact for acceptance. Need education and outreach. |
| Paul Stith | Enable actions by small OEMs, which may comprise the largest asset classes. Potential case for school buses. Look for subtle tweaks to regulations but don't lock out other types of strategies from being eligible |
| Josh Goldman | Keep use cases at the forefront and learn and develop based on real world data. For example an EV2G project using 500 bidirectional inverters in the Port within the LA basin for 3-5 years. Multi-MW capacity. Initially focusing on school buses. |
| Adam Langton | *Question 2: Does the Energy Division Staff White Paper capture all the regulatory barriers associated VGI?* |
| Peter Klauer | Additional barriers may arise from greater complexity. Issues learned from DoD pilot include: (1) Lack of clarity load for transportation vs. Load for wholesale market: what's the proper meter for different types of load used for different purposes. (2) Rule 21 and WDAT didn't contemplate full range of opportunities for small resources and the ability to participate at multiple levels. (3) Interconnections may become more complex when coupled with other technologies like PV and storage.<br>Primacy issue: (1) Must manage, register, and track resources to prevent conflicting signals, prevent double counting, and so that the resource isn't spread too thinly. (2) Manage through a Grid Condition Signal from CAISO to the IOU or Aggregator to the PEV. CAISO doesn't have the visibility to transfer signal through T&D to customers for compensation. Need to determine how to manage the wholesale and retail signals. |
| Ed Kajer | Flip-side of barrier is opportunity: RPS, storage. Determine synergies and connections into other proceedings. Concern about unintended consequences from sending market signal to customers who respond with PHEV10/20/35/100. Market signals, if implemented incorrectly, can end up with PHEVs drained without sufficient range, requiring to pump gas. |
| Richard Lowenthal | IOUs should be able to receive investor benefits to encourage VGI actions. |

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| | Do not use AMI communications structure. Strongly recommend a new cloud-based architecture. Don't roll out hardware, must force the IOUs to use modern technology. Rolled out DR in other jurisdictions because it used cloud-cloud.<br>Employers do have relationship with their employees.<br>Unlock the value from DR. Technology incentive programs aren't working correctly don't allow for success.<br>Qualify for on-bill financing, since EVs could be considered an efficiency measure from fuel-switching. |
| John Goodan | Set priorities/"primacy" correctly: Reduce GHG, Don't harm the grid and enhance T&D reliability through signals, Preserve vehicle mobility.<br>If not through rates, second best is to use a signal that is consumed by UDC, which could further disaggregate signals based on individual circuits. Could build a program around that.<br>Should reshape the underlying load: Address "seahorse curve" (originally not a duck): absorbing over-generation reduces total MW of ramps. Determine how to scale to GWs of V2G? Aligning actors is difficult and costly.<br>At what point is market saturated? If we had MWs of vehicles, there wouldn't be value. 80% of our problems can be solved with V1G and reshaping the curve.<br>Should we do what's sexy or what's simple? |
| Dean Taylor | Another workshop to Determine principles: (1) minimize cost to driver. (2) Prioritize grid benefits by value.<br>Should we pick technologies? Is there reason to favor certain business models? |
| Andrew Levitt | Telemetry and interconnection details are important for program but leave details to the tech innovators in the market—keep clear of making standards. Clarify roles with respect to barriers, but ensure that rules aren't burdensome.<br>Evaluate highest/best uses at a given spot at a point in time. Need a monitoring system or a grid condition signal. |
| Jim Baak | Make sure when scrutinizing economics & tariffs, to not solve for the wrong problem. Be flexible and coordinate with other sections considering other changing grid resources (DR, Energy Imbalance Market, SW PV) |
| Chetna Nanjappa | Regulatory barriers from DOD pilot. Interconnection and market models should not be designed specifically for CA, but with ISO Council and other PUCs. |
| Lee Krevat | He has a vision of the future with millions of cars charging at times when they provide benefits, don't hurt the duck curve, etc. Instead of talking about how we should do it. Avail many different solutions early in the market, then evaluate.<br>Don't exclude any types of models. |
| Paul Stith | Don't lock a resource into a specific application and enable switching/bundling for the site, retail, and wholesale market. Build the market to enable reverse power flow. |
| Stacey Reineccius | Agree with SDG&E regarding open to innovations<br>Since details are in the weeds, clarify the policy intent because the IOUs need encouragement and are cautious/conservative. Slowing down deployment.<br>What happens when you release energy? How are aggregators compensated?<br>GHG-content signal in addition to Grid Condition Signal, a motivator for people to respond. |
| Ed Kajer | Have a workshop to lay out an RD&D Agenda should outline how to coordinate |

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| | among organizations and maximize resource utilization. Fund market research. First challenge is fundamental market education: build understanding about PEVs, grid connections, and benefits |
| Richard Lowenthal | Anyone who's driven a PEV wants to buy one. Industry should address the technological barriers but CPUC should focus on determining value. Model financial benefit to customers. Determine the extent that the market could become easily saturated. |
| Adam Langton | *Question 3: Are the four regulatory questions the right areas of focus for this proceeding?* |
| Peter Klauer | Lack of Real Time grid-based services forces VGI in a difficult regulatory path. Rates aren't dynamic or even seasonal. Must determine how to send signal through to customers.<br>While there are multiple streams of value, we must find the most appropriate use case. Understand that the EV owner is the ultimate decision-maker. Prioritize customer choice and value to owner and grid. We need to think out of the box a bit in terms of where the value is coming from. |

| | **Presentation of Gaps and Barriers to AFV Financing** |
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| Randall Winston | Leads deployment & investment, but still in early market. Investment essential to improve tech, reduce production costs, accelerate adoption while deploying EVSE. B-16-2012. 50,000+ EVs in CA, sales are +250% vs 12/2012. Need to grow private sector investment. ~12 actions within 3 strategies: (1) Leveraging tools to support business attraction and expansion of ZEV companies; (2) Supporting demonstration and commercialization of ZEV-related technologies; (3) Supporting R&D activities at California universities and research institutions<br>Gov. signed legislation 9/2013 to bolster financing and lower upfront vehicle cost: (1) AB 8, reauthorizes the most important clean vehicle funding programs beyond 2015 and provides approximately $100 million each year between 2015-2022. (2) SB 359, maintains the CVRP and HVIP.<br>Build sustainable market w/o subsidy by growing consumer & private investment. Workshop w/ Treasurer's Office, the Renewables Policy 100 Institute, PEVC.<br>Barriers: (1) From the standpoint of customers: high upfront cost, restricted access to public incentives, access to credit, a lack of information. (2) Vehicle manufacturers: limited demand, uneconomical technology, and a return on investment that's too long for buyers. (3) EVSE Providers: legal and regulatory requirements; the need for more infrastructure; uncertainty about market demand; lack of industry standardization.<br>Solutions: decoupling vehicle and battery sales to reduce the upfront cost of the vehicle. To lower cost, allow newer and more efficient batteries to replace older ones, with used or second-life batteries providing benefits to the grid. CPUC pursuing PEV battery pilots with IOUs to explore different models.<br>GO participating in C2ES & NASEO's National advisory group. 2-year initiative to develop innovative financing mechanisms to accelerate the deployment of AFVs & AFV infrastructure. Will release white paper outlining barriers to private finance. Four barrier categories: (1) First, legal, regulatory or institutional barriers: |

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| | including rules for what types and terms of contracts organizations can enter into, and rules on what financial institutions can own and the reserve assets that are required. (2) information-deficiencies: including limited information about new technologies, which can affect credit ratings and pose a barrier to low-cost capital, or financial models that could help with deployment. Ex) limited history of EV battery life and their residual value makes it difficult for investors to implement the option of renting batteries rather than selling them. (3) financial products risk: because financial tools for EVs and EV infrastructure are new instruments or old instruments applied to new areas, they're generally considered illiquid assets. This poses challenges as an investor considers their liquidity risk, particularly in our post-financial crisis economy when managing risk is seen as essential. (4) Scale: as with manufacturing and other forms of production, the transaction costs for EV-related financial deals can be disproportionately high due to their current small size. If, for instance, loans for EVs and EV infrastructure could be standardized, then financial institutions could more easily and quickly assess risk, and ultimately drive down costs.<br>Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers & The Potential Role of Private Sector Financial Solutions, December 20, 2013 |

| | **Panel 2: Utility Role in Addressing Up-Front Vehicle Costs** |
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| Snuller Price | *Promoting Plug-In Vehicles*<br>E3 - CPUC_EV_12-4_v2.p |
| | How many resources do we have that can drive down costs for everyone? Not many.<br>Long-term carbon pathways. No pathway that actually achieves our 2050 goals without electrification. Now is a good time – good cars, electricity getting cleaner. We need off-peak load. 15% or so of 2050 goal is electrification of transport.<br>How to transform the market?<br>1. Provide incentives to reduce up-front cost. Three ways to finance:<br>Collect from all ratepayers via grid benefits<br>Collect just from the participant<br>Use market transformation subsidies.<br>2. Encourage availability of charging.<br><br>Revenues exceed costs and the difference is net benefits, which could be used for infrastructure, up-front rebates or lower rates.<br>Transformation in Phases:<br>Early: Provide ratepayer funding to reduce up-front costs, and use TOU pricing to encourage super off-peak charging. Plug-in hybrids make sense. Level 1 charging.<br>Existing infrastructure can accommodate.<br>Mid: Expand charging in MF/workplace through standards, incentives and make-ready construction. Use system benefits to lower retail rates.<br>Long-term: Expand charging infrastructure for "range anxiety" of EVs |

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| | Create dynamically controlled charging for additional grid benefits. |
| Adam Langton | *Financing Opportunities: Battery Second Life*<br>  <br>CPUC ED - Financing Opportunities Second |
| Noel Crisostomo | *Start off with gut reactions from the OEM and Utility Perspectives* |
| Alex Keros | I want to remind everyone first and foremost that we're talking about a car. At the heart of what we're trying to do is sell more cars and drive costs and complexity out of the system. We're going to have to be careful in these discussions moving forward.<br><br>How do we simplify the system? First and foremost we have to get rates right. We've only got 20% of EV drivers on TOU rates. We haven't even gotten to first base yet. We're still trying to talk to customer about rates.<br>Reduce –don't increase— system complexity.<br>The value of 120 V charging is just being overlooked.<br>Who is the customer? Is it the PEV driver? Is it the utility? Is it CAISO?<br>We are not properly characterizing the risk or even discussing it. Who takes on the risk? OEM, utility, aggregator? We're talking about the potential value of $100/month, but we're not talking about the risk.<br><br>The risk will get financed and it will dramatically reduce the value.<br>Pilots are a good way to flush out the risk. What are the first steps to benefit the customer?<br><br>Primary principle should be protecting the grid. |
| Aaron Johnson | It's good to have vehicle makers here, because it reminds us to roll over before we can crawl or walk.<br><br>A lot of the things we're talking about are things that we're talking about in other venues. We don't need to recreate those programs for electric vehicles. DR is much further down the road, and we need to leverage what's happening in the respective proceedings (DR + Storage).<br><br>We've been doing a lot of customer research around customer concerns. One of the top five concerns of those who did not buy an EV was the life of the battery. Until the battery is not seen as a precious item, we need to be very careful about asking them to do things with the battery.<br><br>Respond to the E3 analysis. We need to find a better way to engage with customers. May be useful for notification.<br><br>There were a number of public charging company bankruptcies, and that suggests a role for utility in charging infrastructure. This doesn't mean we'd own the charging equipment, but maybe the trenching and the wires. |

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| | In the near-term, lots of pilots. We have about six pilots right now, and I think that is the right way to approach these issues. |
| Noel Crisostomo | *One of the primary themes today has been how do we scale up? How does utility provision of an upfront incentive (rather than a rate) affect costs for ratepayers?* |
| Aaron Johnson | A lot of the discussion is about getting customers on the right rate. But our research shows that customers want control and choice, rather than being on a particular rate. Do we want to tell EV customers that they have to be on a particular rate? |
| Adam Langton | What we want to explore here is "is there a way the utility can utilize the value of the utility and monetize that as an up-front incentive?"<br><br>Regarding the battery, we understand that controlled charging doesn't have any impact on the battery life, and you can get all of the same benefits. |
| Alex Keros | I'm going to agree, but this is not as simple as an on/off switch. There is a lot of complexity, and there is a lot of risk. Who is going to take on that cost at the end of the day?<br><br>If the utility gave my customers $5,000, would I be happy? Yes. But when you infuse the risk, everyone is going to start charging for that risk and its going to change the dynamic. We are moving toward more customer interaction, but there is a lot of back-office associated with that.<br><br>We're trying to lower cost and complexity. When I talk about a bi-directional inverter that only adds complexity.<br><br>Generically in the vehicle world, anything less than $1,000 doesn't get the customer's attention. |
| Aaron Johnson | This gets into the utility moving to a space that is not our core business. So let me talk about rates. Rates don't come up in the conversation when talking about why people didn't buy cars. It's really upfront costs.<br>We are so early in this market. We are still way over in the innovators category. |
| Carla Peterman | *We are concerned about grid costs, but also benefits. This is a long-term issue, and we are at the early stages, but that's why it is important to get this right.*<br>*Want to ask about an idea that came up at the Governor's workshop, where the utility would own the battery and lease it.* |
| Alex Keros | We have the largest north American battery lab. One thing to consider is: compatibility, and what is the competitive landscape? There are warranty concerns, who is going to take responsibility for the battery? We are inherently conservative. We put a man on the moon every time you start the car. That's our brand. It may be a possibility down the road, but for now it is a challenge to do interchangeable battery systems. It got played out and the market determined that it is not viable. |
| Aaron Johnson | We are not even having that conversation. Timing makes a huge difference. Maybe ten years down the road. I want to look at different trend. We have a new word: The Pro-sumer. People putting up solar and providing their own energy. How does those macro trends square with centralizing grid control of vehicles? |

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| Alex Keros | You have to look at this in context of other offerings and values. Consumers might rather smart-grid their house before you touch my car. |
| | **Panel 3: Utility Role in Addressing Infrastructure Installation Costs** |
| Mark Duvall | *Utility Role In Addressing PEV Infrastructure*<br>EPRI - Duvall CPUC VGI and Financing Wc |
| | Finally joined WWTOU rate. Programmed vehicle to charge off peak.<br><br>Sales are going well. Companies are bringing volume vehicles to market. PEVs can be competitive on TCOE. Re: Adam's chart, scrutinize depreciation assumptions.<br><br>Agencies are marching toward the ZEV Action Plan goals, but this is a big endeavor and infrastructure is important. Certain amount of public infrastructure is needed.<br>Caution about costs of infrastructure…there are ways to get where we need to. Infrastructure is a good use of funds and serves need. Not providing infrastructure is not viable for goals.<br>"Transportation Electrification" (2011) 5 ways for owning infrastructure.<br>No utility in the US has shown an interest in owning infrastructure in a "major way"<br>Understanding and planning charging infrastructure:<br>Residential customers are solving their own problems by using Level 1<br>Workplace- fleet education & cost certainty<br>Public: needs to be accessible. L2 doesn't have a clear business case right now, DC fast charging does.<br>Some infrastructure is used 1x/month, but it is critical to adoption.<br><br>Don't corner the business model, let it develop and continue to explore. Data is needed to make infrastructure decisions.<br>Customers want the utility to provide public and residential infrastructure. It's what they're expecting the utility to do.<br>Range of utility roles. Where utilities are providing infrastructure, it's been adequate.<br>ESB, Ireland: not a utility monopoly: 15 suppliers from 11 countries. Led the market, and ready.<br>CPS San Antonio: Public private partnership, effective and accessible.<br>Lessons learned: more utility involvement.<br>SMUD, LADWP, Hydro Quebec…more…this plays into their strengths<br>Scaling PEV ant work can impact demand charge, with only a few cars. Managed charging mitigates this risk.<br><br>Certain counties are approaching 7%. However, there isn't a network of public charging. The network is necessary to achieve 80% decarbonization. CA is doing well because GO and agencies have roles to fill and there's some infrastructure, |

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| | however, unclear that the existing models can fill gaps. |
| Greg Haddow | *Vehicle-Grid Integration*<br>  <br>SDG&E - VGI Workshop Dec 4 201 |
| | Charging equipment is the image that consumers see, IOUs see complexity.<br>Important to have a grid integration of vehicles to get value. Utilities are responsible to provide as much productivity from their grid.<br>CAISO has no view or transparency of the IOUs' distribution system operations.<br>Be customer centric. The customer should have choice and use enabling technologies to get the most out of the grid.<br>Experimental Rates: randomly assign customers rate, but the customer's in charge…they used a timer with a level 2 charger.<br>Small Variations in price have an effect. Higher difference is important for persistence.<br>Enabling Tech and pricing are important.<br>How to pass along value to customers?<br>SDG&E's seahorse: flat rates would exacerbate. For customers to be price responsive during the day implies workplace charging, rare in San Diego<br>If PHEV10 drive to work, they need workplace charging to double range of ZEV miles.<br>VGI Employee Charging Study<br>Day ahead, time variant pricing plan: optimize to grid conditions, storage, renewable integration. Test functionality of managed charging driven by price preferences. Implement plan that can be implemented by third parties.<br>Constructed and operated by third parties to SDG&E specs.<br>Must accommodate customer preferences. Complex alternative is to have unique price based on ISO conditions. Nominate on a Day-Ahead basis charging preferences to see preference.<br>Storage to integrate RE. Reduce on-peak charging, reduce op costs.<br>Increase adoption and ZE miles<br>Utility Role: All about selling cars: charging should never be a market barrier. Need innovation to keep exploring VGI solutions. Customer education: Plug-In ads tripled electric rates. Proactively support customers and field providers. Support infrastructure but keep prices competitive. Maximize benefit. |
| Damon Franz | *What's the utility role for public infrastructure?* |
| Mark Duvall | Not too eager to get into subsidized public charging. Business case for Level 2 is very difficult, unless it's paired with something else. DC fast charging is more promising to build a business case. DC charging costs is not a huge impact for TCOE since it's used rarely. Regional infrastructure won't be used very often. It's not there because there isn't a business case for it.<br><br>Regional impact is important: if driving EV, even though you don't plug in, you "use it." Additional costs are a small part of the pie. It's critical, essential. Will provide |

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| | answers, but so far, it has to be out there. Who owns it is up to stakeholders.<br>Smart EVSE charging: charge during the day for solar at multi EVSE locations.<br>Scale problem: a good problem to have. But it adds up to the load of the facility…counter that through managed or L1 charging. 7kW charging is overkill.<br>Solar charging needs to march at the same drum. |
| Greg Haddow | L2 charging is a rapid "must-take" energy resource. |
| Dean Taylor | *How to deal with different types of EVMT range cars? How to not cut out a business model?* |
| Mark Duvall | PHEV 20 is a sweet spot of cost and benefit. Public infrastructure should primarily focus on BEVs and serving those without residential infrastructure. |
| Greg Haddow | So early in market. Let's expand business models. Site acquisition is a huge issue. Costs: equipment, network, O&M, back office, replacement costs. How to attack those costs to get the most out of the assets that are there. Cost control. |
| Mark Duvall | We need data on installation costs. States' pilots are important to analyze. Need a rigorous assessment of what's been done and how to move forward. |
| Greg Haddow | Get out of hypothesis mode. |
| Damon Franz | In 2007-8 the solar market also seemed to be struggling, but out of pilots industry came up with something that worked. |
| Colleen Quinn | *What's the role of the third party in working with the utility, or simultaneously with the utility?* |
| Greg Haddow | RFP build, install, operate system per our specifications. Who picks up what costs? Does that model work? How many people showed up? |
| Chris Warner | Confused if issue is whether or not the utility can provide enough infrastructure for service? Utilities have never been involved with drug stores, banking…What's the existing utility role? Obligated to move and provide service.<br><br>Third parties made the case that they should be the ones that are competitive and go Beyond the Meter and provide infrastructure. I'm hearing there's a problem. Should utilities be lenders to EVSE? The traditional utility role ends at the meter, and does not include lending to third parties. |
| Greg Haddow | Similar unfamiliar situation as conservation in the 1970's…if it weren't the utilities' strength and enabling policy, efficiency would have never taken off. Out of our comfort zone, but we need to make the market. Need to accelerate to ZEV goals. |
| Mark | A variety of roles for the utility. A new world—transportation electricity is a new class. Societal benefit is higher than other electric technologies. California has dedicated itself to PEVs, reaching CA's objectives appear more likely than in the past. What's to be done, who does it? There's no one way to make this work? The private market won't fill that gap unless someone provides incentive. |
| Damon | *How to fill in the gap? Example: I won't buy an EV because I can't get to Tahoe.* |
| Mark Duvall | EPRI has models for what infrastructure is needed to fill the gaps. |
| Dean Taylor | PHEVs are getting more EVMT than BEVs. More societal benefits from PHEVs. |
| Mark Duvall | Agree, however: 200EV vs 80PHEV. Does the BMW i3 change things? Look at National Academies (conservative) study. By 2040: upfront cost of a PEV will = ICE. Probably sooner. There'll be a mix going forward. Product offering very rich. |
| Sven Thesen | When is a 200 mi BEV that's not 70k? It's the BEV that's favorite. |

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| Mark Duvall | Around 2020? Technically feasible…perhaps in next Tesla generation. |
| Sven Thesen | *What's the utility role: are utilities allowed to operate on the other side of the meter? Could the utilities install EVSE on a residential site…Is that a doable option?* |
| Mark Duvall | DTE & Consumer's energy in Michigan: built as a research program. |
| Greg Haddow | High concentration, underserved Grid Integrated Charging. 50% of our customers are MF. By not serving, we're hurting adoption. |
| Mark Duvall | Be able to make one call and make it happen. Eliminate the barrier in adoption. |
| Andrew Levitt | *Low financing costs are important. NRG challenges the idea that little-used infrastructure could not be viable, through a subscription model.* |
| Mark Duvall | Membership model is promising, but can they get enough members? Seems to be where Montreal is going with Quebec's one membership model. Do policy changes that require you to offer single payment options (onsite) dilute the biz model? |
| Andrew Levitt | It's hard to compete with utility rates of return as private companies. |
| Mark Duvall | Question is: Do we have an active competitive environment to foster enough infrastructure? We can't wait for 5 years to see that not enough has happened. |

| | **Additional Questions** |
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| Janice Lin | How can utilities provide long term contracts to BTM resources like PEVs, DR, and stationary storage? |
| Jeremy Waen | How to incorporate with Low Carbon Fuel Standard rules? |

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* This is a partial attendance list which did not capture all remote participants or those that did not log in onsite.

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