



BEFORE THE PUBLIC UTILITIES COMMISSION OF THE  
STATE OF CALIFORNIA

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Order Instituting Rulemaking on the  
Commission's Own Motion to Consider  
Alternative-Fueled Vehicle Tariffs, Infrastructure  
and Policies to Support California's Greenhouse  
Gas Emissions Reduction Goals.

Rulemaking 09-08-009  
(Filed August 20, 2009)

**SUBMETERING PROTOCOL WORKSHOP REPORT**

JANET S. COMBS  
ANDREA L. TOZER

Attorneys for  
SOUTHERN CALIFORNIA EDISON COMPANY

2244 Walnut Grove Avenue  
Post Office Box 800  
Rosemead, California 91770  
Telephone: (626) 302-1524  
Facsimile: (626) 302-7740  
E-mail: janet.combs@sce.com

Dated: **November 14, 2011**

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Pursuant to *Decision 11-07-029 Phase 2 Decision Establishing Policies to Overcome Barriers to Electric Vehicle Deployment and Complying with Public Utilities Code Section 740.2*, issued July 25, 2011 (Decision), Southern California Edison Company (SCE) submits, on behalf of itself, Pacific Gas and Electric Company, and San Diego Gas & Electric Company (collectively, the Utilities), this Submetering Protocol Workshop Report (Workshop Report), attached as Attachment A.

The Workshop Report, which is not based on a transcript, represents the best effort of the Utilities to capture the positions of the participants presented at the workshop on October 27, 2011, and has not been reviewed or approved by other interested parties.

Respectfully submitted,

JANET S. COMBS  
ANDREA L. TOZER

/s/ Andrea L. Tozer

By: Andrea L. Tozer

Attorneys for  
SOUTHERN CALIFORNIA EDISON COMPANY

2244 Walnut Grove Avenue  
Post Office Box 800  
Rosemead, California 91770  
Telephone: (626) 302-6713  
Facsimile: (626) 302-6693  
E-mail:andrea.tozer@sce.com

November 14, 2011

**Attachment A**

**Submetering Protocol Workshop Report**



# California Public Utilities Commission Submetering Protocol Workshop Report

*As Directed by Alternative-Fueled Vehicle Proceeding R.09-08-009,  
Decision 11-07-029 Ordering Investor-Owned Utilities To Develop Protocols  
Supporting The Use Of Customer-Owned Submeters For Use In Billing EV Load*

Pacific Gas and Electric Company  
Southern California Edison  
San Diego Gas & Electric

**Document Version:** 0.6 – November 14, 2011

*A California Investor-Owned Utilities joint initiative.  
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## Contents

<b>1</b>	<b>Introduction to Workshop Report .....</b>	<b>3</b>
<b>2</b>	<b>Summary of Workshop .....</b>	<b>4</b>
2.1	Executive Summary .....	4
2.2	Workshop Introduction .....	6
2.3	Use of Submeters in Various Locations: Use Cases .....	18
2.4	Submetering Technical Requirements .....	24
2.5	Submetering Administrative and Regulatory Requirements.....	27
2.6	Closing Comments.....	29
	<b>Appendix A – IOU Perspectives on Customer and Market Conditions and Outlook .....</b>	<b>32</b>
	<b>Appendix B – California Department of Food and Agriculture (CDFA) Division of Measurement Standards (DMS) Perspectives on Submetering.....</b>	<b>35</b>
	<b>Appendix C – Better Place Presentation.....</b>	<b>37</b>
	<b>Appendix D – Coulomb Presentation .....</b>	<b>41</b>
	<b>Appendix E – ECOTALITY Presentation .....</b>	<b>46</b>
	<b>Appendix F – General Motors Presentation .....</b>	<b>51</b>
	<b>Appendix G – NRG EV Services / eVgo Presentation.....</b>	<b>55</b>
	<b>Appendix H – IOU Use Case Presentation .....</b>	<b>61</b>
	<b>Appendix I – Submetering Protocol Technical Requirements Presentation .....</b>	<b>69</b>
	<b>Appendix J – Communication Functionality, Standards, and Security Requirements .....</b>	<b>70</b>
	<b>Appendix K – Methodology for Settling Disputes .....</b>	<b>72</b>
	<b>Appendix L– Develop Rules for Incorporating Subtractive Billing into Submetering Tariffs.....</b>	<b>74</b>
	<b>Appendix M – Closing Comments .....</b>	<b>75</b>

## 1 Introduction to Workshop Report

The CPUC hosted a workshop on October 27, 2011 to review the perspectives, findings, and preliminary recommendations resulting from discussions held between August and October Participants in those discussions included the following California state agencies, California utilities, and national automakers, EVSE manufacturers, and EVSPs:

- AeroVironment
- Better Place
- California Public Utilities Commission Energy Division (CPUC)
- California State Department of Food and Agriculture Division of Measurement Standards (DMS)
- Clean Fuel Connections
- Coulomb Technologies
- Ecologic Analytics
- Ecotality
- Ford Motor Company
- General Motors
- Itron
- Mitsubishi Motors
- Pacific Gas & Electric (PG&E)
- San Diego Gas & Electric (SDG&E)
- Southern California Edison (SCE)
- SPX

This report includes the following content:

- A recap prepared by PG&E, SCE, and SDG&E (collectively, the California Investor Owned Utilities, or “IOUs”) of discussion, questions, and responses that took place during the October 27, 2011 workshop
  - Please note that the workshop was not recorded and that this report is not a transcript. The contents were assembled as faithfully as possible from notes contributed by the following participants:
    - Better Place
    - Coulomb Technologies
    - Ecotality
    - General Motors
    - NRG EV Services (eVgo)
    - Pacific Gas & Electric
    - San Diego Gas & Electric
    - Southern California Edison
- An appendix including the presentations delivered during the workshop

## 2 Summary of Workshop

### 2.1 Executive Summary

More than 60 people attended the October 27, 2011 submetering protocol workshop at the California Public Utilities Commission along with several dozen callers & WebEx attendees. Presentations were made by the three California Investor Owned Utilities (IOUs), Better Place, Coulomb, ECotality, GM and eVgo NRG.

The IOUs presented their perspective on the emerging EV market and related submetering use cases, issues and recommendations in response to the CPUC's Decision (D.) 11-07-029, the Phase 2 decision. In general, the joint IOUs' submetering perspective received support from the 3rd parties who presented and spoke at the workshop. Several Electric Vehicle Supply Equipment Manufacturers and Service Providers spoke positively about the pre-workshop discussions they had with the utilities. The 3rd parties actively participated in the workshop asking numerous questions and voicing their opinion on many issues. Specifically, the 3rd parties who spoke at the workshop:

- Agreed that they could be responsible for the management of data produced by their submeters
- Preferred an Internet cloud-based communication interface between the submeter embedded in the 3rd party Electric Vehicle Service Equipment (EVSE) and the utility systems versus utilizing AMI or HAN
- Accepted responsibility for dispute resolution with their EV customers
- Agreed that the initial focus should be on developing the submetering protocol for the fixed submeter use cases.
- Third parties planning to be Energy Service Providers for their submetering customers recommended making use case three the first priority.
- Identified the need to include Demand Response issues in the development of the submetering protocol
- Questioned the IOUs' requirement for a three-way agreement among the utility, the customer charging the EV and the 3rd party and agreed it needed further analysis. In response, the IOUs offered to clarify what was meant by a three-way agreement with a tariff approved by the Commission.

While 3rd parties supported the IOUs general approach, the timeframe for this implementation was not discussed. However, the IOUs did describe the conditions they believed were required to enable submetering. The 3rd parties appeared to be in general agreement with the IOU's guiding principles, including the need for:

- Communication and technical standards that leverage existing national standards whenever possible
- Clear, efficient certification processes,
- Cost effective solutions, particularly related to potential submeter functions required by the California Department of Food & Agriculture, Weights and Measures Division
- Accurate EV usage measurement
- Third party accountability including submeter ownership and responsibility for certification, accounting, and billing.

All participants who presented or spoke during the workshop agreed that the resulting submetering protocol should create a positive customer charging experience and make it as easy and cost effective as possible.

This workshop ended with a discussion of a broader effort by the CPUC, IOUs and 3rd parties to develop a submeter protocol roadmap by December 31, 2011. Next steps discussed included:

- Assessing the issues identified in the workshop
- Develop recommendations
- Identifying the resources and time required to develop the submetering protocol
- Building a roadmap to achieve the CPUC's mandate.

## 2.2 Workshop Introduction

### 2.2.1 Initiative Objectives/Timeline/Schedule

**Presenter:**

- Adam Langton, CPUC Energy Division

**Presentation:**

The CPUC:

- Presented its definition of submetering:
  - Submetering allows you to separately measure EV load, downstream from the primary meter.
- Described AFV OIR Phase 2 deadlines:
  - Utility report due 15 days from October 28, 2011
  - Roadmap report due December 31, 2011
  - Submetering protocol due July 31, 2012
  - Tariff sheets due September 1, 2012
- Described main goals for the day's workshop:
  - Identify implementation issues
  - Discuss proposed use cases and identify additional ones
  - Engage stakeholders and obtain feedback

## 2.2.2 Utility Understanding of Customer and Market Conditions and Outlook

### Presenter:

- Chetna Nanjappa, SCE

### Presentation:

See Appendix A for presentation slides summarized below:

- PG&E, SCE, and SDG&E support CPUC's key policy goals.
- Utility perspectives on submetering were developed through initial discussions with 3rd parties as well as the utilities' analysis. The utilities concluded from that analysis that submetering can provide a variety of important benefits.
- The utilities also concluded that achieving CPUC's policy goals and delivering the desired benefits will require addressing a variety of complexities and unknowns.
- The utilities also found that the number of customers choosing to separately meter their EV charging was low vs. EV customers selecting rates in which a single meter was used to track both home and EV power usage.
- Overall, the utility analysis of submetering determined there was no easy way to provide an accurate and cost-effective submetering solution in the short term.
- Therefore, the utilities concluded that a phased development approach would offer the best strategy for enabling the submetering of EV load while matching development costs with actual, evolving marketplace demand.

### 2.2.3 Audience Q&A

- What is the current number of customers on EV rates?
  - Approximately 900
- What is the cost for a 2nd meter installation?
  - Average \$1500 (paid to electricians/EVSPs) based on information the utilities have been able to gather from electricians, EVSPs, and customers
- Does SCE offer net metering + TOU? (The same question was then put to PG&E.)
  - No reason why not, but not yet established.
  - PG&E can currently bill NEM + TOU with a non-SmartMeter. The billing functionality to bill a NEM + TOU + SmartMeter will be available later this year.
- Is the \$1,500 charged to the customer?
  - Yes. This is money the customer, not the ratepayer, pays in order to upgrade or add a second panel to accommodate a second meter and additional load.
  - SCE clarified that the cost was an average, but can go up to \$10,000 depending on location of the panel, the amount of work required, or sometimes cost less.
  - The \$1,500 charge for a separate panel installed by a contractor is paid by the customer to the electrician, not to the utility.

## 2.2.4 California Department of Food and Agriculture Division of Measurement Standards (CDFA/DMS)

### Presenter:

- David Lazier, California Department of Food and Agriculture (CDFA) Division of Measurement Standards (DMS)

### Presentation:

See Appendix B for presentation slides summarized below.

The DMS representative:

- Presented its definition of a submeter for the workshop
- DMS' and County Weights and Measures' authority for submeter inspection and testing
- Described DMS meter testing specifics

DMS concluded that in its opinion:

- An EVSE submeter had to share all the characteristics of a utility meter, and a customer bill derived from a submeter had to have all the requirements of a regular utility bill. The bill or invoice would be required to match the display and show starting reading or count as well as ending read or count.
- Furthermore, a meter must have a display and it must be visible by the consumer without the use of tools. The display may be viewable intermittently (by website, for instance) but not require a consumer owned computer. Examples were viewable from a public computer or an apartment utility room that has to be made available by management at a reasonable frequency or notice.

## 2.2.5 Audience Q&A

- Is there any intent to have reciprocal licensing/permitting with other states?
  - Right now, only CA is looking at certification of submeters
- Does every submeter need to be tested and certified?
  - There is a one-time testing and certification for the submeter type. Afterwards, all submeters whose type has already been tested and certified will receive a paper seal.

- Do you allow a 3rd party to perform certification/self-certification or must it be performed at the DMS?
  - It must be performed at DMS.
- Is certification permitted at UL Labs?
  - No, must be done at a county Department of Weights and Measures lab and every submeter must be inspect every 10 years at the lab.
- Does sealing (to prevent tampering) happen at the DMS lab?
  - It could be performed at the DMS lab or by a Dept of Weights & Measures inspector at the county level.
- Do all meters need to be brought in every 10 years?
  - Yes, usually done in rotation by owner
- How many meters are tested every year in CA?
  - About 3,000-3,300
  - Audience member noted we're talking about 3 million EV submeters
- How often are taxi meters tested?
  - Done every year, and some cities have the ability to certify/inspect
- How big is the team that does the testing/certification at the DMS?
  - There have been recent staff cuts. 2 people at state level
  - There are 55 departments at the county level that actually handle the certification and testing
- Does DMS oversee testing of flat rate submeters?
  - DMS only governs submeters that charge based on kwh or hourly rate
  - Adam to raise this issue with CPUC legal
- Does the DMS have jurisdiction of submetering communications?
  - Not sure—have not yet looked at this space
- Some states don't regulate or have a similar state funded department for regulating submeters. What do these states do instead?
  - Most states have a department that doesn't work at the county level OR they don't govern submeters at all

- Who handles consumer complaints?
  - CDFA/DMS is responsible for complaints such as taxi meters, gas pumps at gas stations.
- It seems like the DMS has archaic methods; is there a possibility of an electronic monitoring system, etc.?
  - Too early to tell what resources or process the DMS will have or use

### 2.2.6 Third Party Presentations

#### **Presenter:**

- Ted Bohn, Argonne National Labs

#### **Presentation:**

Briefly presented:

- Government research on submeters
- Low cost \$5-\$10 materials to construct charging devices

#### **Presenters:**

Better Place, Coulomb, and ECOTality presented as an EVSP coalition.

- Ann Bordetsky, Better Place
- Richard Lowenthal, Coulomb Technologies
- Adrene Briones, ECOTality

## Presentation:

See Appendix C for presentation slides summarized below:

- The Better Place representative presented:
  - Basic assumptions
  - Key objectives for submetering implementation
  - Specific recommendations:
    - EVSE manufacturers should own and self-certify submeters built into EVSEs, although EVSE manufacturers are open to 3rd party certification by organizations such as UL
    - The submetering protocol needs to balance feature requirements and cost-effectiveness
    - Utility roles in submetering should include enabling billing true-up of EVSE power consumption, establish a billing process that can enable EV service providers to credit or add to utility customer bills the EV power cost through a line item on the customer's bill, and aggregate EVSE submeter billing for EV service providers
    - Role of the utilities in submetering is largely to enable billing true-up of EVSE electricity consumption
    - The third party provider, not the utility, is responsible for billing disputes with the customer through contractual agreement.

See Appendix D for presentation slides summarized below:

- The Coulomb Technologies representative:
  - Presented the EVSP coalition's understanding of the term "submetering"
  - Expressed optimism about the submetering protocol proceedings
  - Stated that requiring an EVSE owner to have a dedicated C12 ANSI meter—in either parallel or submeter configurations—in order to get EV rates is an obstacle to EV adoption and that this practice should be disallowed
  - Expressed approval of the IOUs for their direction in pursuing Subtractive Billing as opposed to using the AMI infrastructure to read EVSE submeters
  - Presented a series of illustrations emphasizing its positions on various metering strategies
  - Coulomb concluded its portion of the EVSP coalition presentation with three final recommendations on submetering:
    - Should not require visual reading
    - Should not require field removal
    - Certification should be by a third party

See Appendix E for presentation slides summarized below:

- The ECotality representative delivered the final segment of the EVSP coalition presentation:
  - Describing EV Project deployment locations, the blink EVSE, and installation configurations
  - Presenting the benefits of having a submeter in the EVSE:
  - Presenting diagrams and descriptions of three main data communication options
    - The EVSP Coalition and members of the workshop audience (who voiced an opinion) were united in preferring the first option:
      - Submeter embedded in EVSE communicates securely with 3rd party EVSP cloud-based system. EVSP system in turn communicates securely with utility MDMS

### 2.2.7 Audience Q&A

- Can utility AMI networks be used for submetering data communication?
  - Coulomb - The performance characteristics of AMI network works well to measure energy usage every 15 minutes. If a customer swipes a credit card, that credit information needs to be sent to the credit card companies and back to the charging station within a few seconds.
  - ECotality: It's theoretically possible as the AMI it is already there; however, it is probably not the most cost effective. Furthermore, we wouldn't recommend the AMI for general use as communications could be slow and problematic for EVSE providers.
- What is the feedback on the recommended communication method presented by the IOUs?
  - GM – The “cloud-to-cloud” option makes the most sense to us because the AMI is not a “real-time” system.
  - PG&E – it's viable, faster, and more transparent than use of the AMI network
  - Coulomb – Many of the utilities prefer not to use the AMI network method
  - Itron and GM – Yes, the utility-recommended communication sounds like the way to go

**Presenter:** George Bellino, General Motors

**Presentation:**

See Appendix F for presentation slides summarized below:

- The GM presenter:
  - Described GM’s recommendations for the required attributes, capabilities, and technical requirements of an effective submetering system, including:
    - Communications
    - Association (of submeter to main meter)
    - Certification
    - Standardization
    - Accountability
    - Cost Effectiveness
  - GM concluded its presentation by itemizing the basic advantages of its submetering recommendations

**2.2.8 Audience Q&A**

- What is the scheduled timeline of the SAE standards completion:
  - Hopefully, the standards will be complete by the end of 2012. 2847-1 has already been released.
- Who owns the on-board meter on a leased vehicle:
  - The meter would be the responsibility of the lessee
- Are there any other methodologies aside from the on-board meter that could not be solved by any other means:
  - We’re focused on roaming. It’s the best solution that we know of today. There may be other methods.
- How would the “location/roaming” factor of submetering, be done?
  - The GPS would be identified by the vehicle. It works for single family dwelling and work solutions. However, it might not work at a multiple family dwelling; it would not be very reliable.
- Are there any international lessons learned?
  - Not really—utility relationships are different in other countries

- How does GM recommend handling the location & time stamp association? What data is it based on?
  - GPS, which works for mostly residential use, but has limitations still, like MDUs
- What happens if customer does not have broadband internet?
  - Cellular communication is available

**Presenter:**

- Terry O'Day, NRG EV Services (eVgo)

**Presentation:**

See Appendix G for presentation slides summarized below:

The NRG EV Services presenter:

- Provided background on NRG—a national wholesale and retail power company—and eVgo—NRG's comprehensive electric vehicle charging ecosystem for subscribers
- Described eVgo's UL-listed charging stations in Texas and stated that the company doesn't operate in California today for business reasons and because of complications in the California market
- Described several obstacles to EV ownership:
  - Range
  - Initial cost
  - Cost of Ownership (energy usage/complicated rates)
- Explained that NRG's eVgo products and services are intended to mitigate the upfront cost of EV charging (avoid \$2000+ upfront costs of buying/installing)
  - NRG research has shown that its programs generated an estimated 162% increase in consideration of EV purchase
- Its business model is built on providing low cost and simple solutions. eVgo offers flat pricing as part of the customer offering which includes the charging unit. The customer participates in a subscription plan – membership.

- NRG offers 3 Subscription plans
  - Home Plan
  - Mobile Plan
  - Complete Plan (combination of both)
- As part of these subscription plans, eVgo:
  - Pays for energy usage by the vehicle; however, eVgo does not pay for energy used by the vehicle on peak
  - Does not allow customers that are not subscribers to use their chargers. We use RFID to verify customer subscriptions
- NRG eVgo described a number of opportunities germane to the submetering workshop:
  - Fixed submeter with 3rd party service provider (Use Case 3)
  - AMS/ZigBee compatible/certified meter embedded in EVSE
  - Utility reads AMS/ZigBee submeter

### 2.2.9 Audience Q&A

- What happens in the back office billing?
  - It depends on the service territory. We will either directly take off the bill, or a 3rd party will take it off the bill. A customer will see a net subtraction performed at the end of the month.
- Would the option of crediting a customer's bill be an option?
  - PG&E – It is not easy to do; we need to discuss this further in the future. Once we discuss the use cases, we can bring this up then.
- Is there a standard mechanism for delivering data to small utilities as well as large?
  - It depends on the agreement we have between a utility and us. The dollar amount is displayed on the customer's bill.
- How does data get transferred if no broadband connection is available?
  - ECotality – We can communicate through cellular
- What is being developed for submeters part of closed loop control?
  - CPUC – That is not part of the scope of this workshop; however, it is a good thing to keep in mind, and it is important for submeters to be able to do other things.



## 2.3 Use of Submeters in Various Locations: Use Cases

### Presenter:

- Belvin Louie, PG&E, represented the IOUs for this portion of the workshop

### Presentation:

See Appendix H for presentation slides summarized below:

#### 2.3.1 Use Cases Overview

The IOUs introduced the use of submeters in various locations (use cases):

- Providing the definition and purpose of use cases
- Describing current single- and dual-meter options provided by the IOUs
- Describing a 3rd option—and what is under consideration in the workshop—the submetering of EV loads and the subtraction of this EV charging load from the main premise meter so that the EV submeter can be treated as if it were a separate, parallel meter
- Contrasting how data is handled in submetering scenarios vs. other standard EV load metering methods, and emphasizing that EV submetering and subtractive billing scenario is not yet an option today
- Defining key terms used in evaluating use cases
- Describing the four use cases to be presented in the workshop as representative examples of the use cases assessed by the IOU teams
- Defining the “key actors” appearing throughout the use cases
- The IOUs completed their overview and introduction to the EV load submetering use cases by describing assumptions applying to all use cases:
  - Fixed Submeter(s) (FSub) are associated with a single premise
  - Mobile Submeter(s) (MSub) can be associated with multiple premises
  - There can be no duplication of submeters per branch circuit
  - A 3-way agreement/association must exist in advance of any subtractive billing arrangement

- EVSPs may purchase electricity at retail directly from the load serving entity for EV charging and then bill for electricity and additional value-added services; however, EVSPs are not required to bill for either electricity or value-added services, and whatever they charge is entirely up to them; the utilities have no role in how EVSPs handle these transactions
- The EVSP is the default EV Submeter reader
- EV Submeters will not directly integrate with the utility master meter; e.g., no AMI connection

### 2.3.2 Use Case 1: Fixed Submeter

- The IOUs presented several assumptions, requirements, and implications for the first use case, in which the utility is the electric commodity provider, and the customer of record for the fixed submeter is also the customer of record for the master meter.

### 2.3.3 Use Case 2: Fixed Submeter

- The IOUs described a second use case, in which the utility is the electric commodity provider to multiple EVSP customers, and the customer of record for the fixed submeter is also the customer of record for the master meter.

### 2.3.4 Audience Q&A

- Under Use Case 2 with multiple submeters and EVSPs, what are the thoughts on dividing the main power demand into the different meters? How will the premises owner assign the demand charges?
  - IOUs – It gets back to the specific terms and conditions of the three-way agreement. If the submeters are capable of providing 15 minute interval data, the 15 minute KW demand can be calculated using the KWH interval usage data. The demand charges could be distributed only. The theory is that the power would be derogated based on what meters were charging. It really depends on what demand rate the premises have. Some plans look at the greatest demand for the whole month and other plans look at the demand between certain hours of the day. You could have two intervals that have the same demand. In one situation, you could have a peak be as a result of a vehicle, and another peak could be the result of the main premise itself.
- If there is a billing dispute between one of the EVSPs and the main meter, then how would you handle the situation as you cannot share information between other EVSPs? Would we need an 8 way agreement?
  - IOUs – Essentially, yes. We would need to have a series of three-way agreements.

### 2.3.5 Use Case 3: Fixed Submeter

- The IOUs described a third, fixed submeter use case, in which the EVSP resells electricity to the consumer, and the customer of record for the submeter is the EVSP

### 2.3.6 Use Case 4: Mobile Submeter

- The IOUs presented a fourth use case in which the submeter is mobile (in a cordset or vehicle), the EVSP resells electricity to the consumer, and the customer of record can be either the EVSP or consumer, explaining that:
  - Beyond the previously noted similarities with fixed submeter scenarios, multiple submeters charging at multiple premises creates additional complexity
  - Mobile submetering relies on the same OpenEV interface to collect usage data. But since the EV can charge at a different premises each day it must keep track of which premises, mobile submeter, and the date/time stamped interval usage of that particular premises.
  - The submeter association is with a premises identification device rather than the master meter due to the fact that a master meter exchange would trigger charges to many possible 3-way agreements.
  - Mobile submeter in the cordset can be shared amongst multiple vehicles and introduces additional complexities requiring further discussion
  - Mobile submeters may be associated with multiple premises, but may charge to only a few premises per billing cycle. This has major data process implications if the number of 3-way associations per mobile submeter are large
  - For each mobile submeter the EVSE must be responsible for subtracting any charging usage occurring without the 3-way association, or when it charges through a fixed submeter

### 2.3.7 Use Case Summary and Recommendations

#### Presenter:

- Belvin Louie, PG&E, represented for the IOUs for this portion of the workshop

#### Presentation:

- The IOUs summarized their use case presentation as follows:
  - The submetering protocol development is complex; issues need to be identified and analyzed prior to any implementation
  - EV charging can still occur at any location, but without a 3-way agreement, subtractive billing cannot occur

- Based on their use case assessments, the IOUs made several recommendations with respect to submetering protocol development:
  - The initial focus should be on fixed submeter use cases
    - Fixed submetering is less complex than mobile submetering and requires less time to develop and implement new processes and systems
    - Allows more time to learn and understand the mobile use cases as the EV charging market matures while still allowing us to move forward with submetering
    - Enables more thorough testing of EV data cloud, certification process, and other aspects of submetering and subtractive billing
    - Industry stakeholders need to be on board with solution

### 2.3.8 Audience Q&A

- You did not include the vehicle owner as an actor. If you have a submeter in a cord-set/vehicle at an outlet in the house, does an EVSP exist in this scenario?
  - That is Use Case #4. The EVSP will be more responsible for the meter than the customer.
- Is there any overlap of the SAE standards mentioned in GM's presentation and OpenADE/OpenEV?
  - We will answer that question when we get to the technical specifications section
- Is there any thought as to the number of maximum number of associations that could be made?
  - We have not gone that far yet to determine the level of details. But it makes sense to agree on a practical limit.
- How do you deal with the situation of people wanting to roam between utilities?
  - This is another use case that we did not list in this presentation.
- Do we have any analogous situations in the DA/DR world as far as associating different accounts?
  - Let's hold this for discussion.
- When you say initial focus, do you mean for the July 2012 protocol or before that?
  - I really don't know.
- Are you suggesting that we defer mobile issues until after the first protocol comes out?
  - I don't think we want to defer anything. But attempting to focus on the complications of mobile submetering may mean spending less time on developing and implementing the fixed cases. We are proposing that we put something in place now, based on what we can.

- CPUC representatives at the workshop recommended five topics for general discussion:
  1. Why is a 3-way agreement/association necessary?
  2. Why is using the utility AMI network not an option?
  3. What are the cost implications of requiring a data management agent to process the EV data?
  4. Expand on the OpenEV interface being proposed
  5. Are the challenges with submeter data communication administrative or technical in nature?
- CPUC - Please elaborate on the need to have a contract between the 3 entities, how it impacts costs, and whether it will impact submetering for customers.
  - IOUs - We are using the association agreement in multiple ways. The agreement talks about the terms and conditions of this process. We're using the submeter as a meter (dispute handling, tariffs, measures energy, etc.). There is an association between the 3 parties. We are sharing data, customer data, and charge locations.
- Better Place – Why do we need to add another 3 way agreement?
  - IOUs - This three-way agreement is not necessarily a new agreement, but it is like an amendment to the existing agreement.
  - IOUs - The customer and the 3rd party data have an agreement to share data. There needs to be an agreement between customers that informs them that the 3rd party will share this data with the utility. Hence, the three-way agreement.
  - Better Place – It seems like there needs to be a new contract. We're saying that there shouldn't be a new contract. It should be already in the initial contracts.
  - Think SmartGrid – The agreements need to be less burdensome and less onerous. This agreement can be portrayed as protection. We're being too ambiguous with the term “association”
- Regarding the contract, would it be something like a contract required in Direct Access? Hasn't that been a really difficult process?
  - IOUs – Yes, the DA process is a long drawn out process.
- There was no use case scenario using AMI despite the fact that utilities and third parties agreed AMI was not the most viable solution. Do we need a data management system?
  - IOUs - Initially, when we advocated AMI, we were under the impression that we would own the submeter [and it was under the utility's jurisdiction and responsibility]. We are still going with a Smart Grid. To have a submetering protocol by July 2012, we need to have a short term solution. We then can look at a long term effort of supporting a Field Area Network (FAN).

- IOUs – It is theoretically possible to use the Utility AMI network? As engineers, architects, or designers, we can make it work technically. But this is not a purely technical problem. It's currently not in the Utility's jurisdiction to do so. Third parties are asking us to support their business models by creating a network that will support their submeters. We are not sure if we modified the AMI network to support this, would we be over stepping our bounds as a utility providing this service? Importantly, if utilities are to do so, the commissioners would have to change current regulations and the cost implications.
- It seems there could be costs to the utilities based on the OpenEV methodologies. What are your thoughts on that?
  - IOUs – Yes we are proposing the use of a new CIM-compliant (common information model), services-based, national standard interface. We'd be leveraging the work already completed in a national standard, OpenADE, so that EVSPs will not have to establish a custom interface for every utility in California or throughout the USA, and each IOU would not have to establish a customer interface to every ESVP.
- If we have multiple meters in series, is this more of an administrative issue than a technical issue? What do you think? (Open question to participants.)
  - Ecologic – If you took an OpenEV format where you're identifying a submeter and a master meter, if you had chained submeters, if you always associate a submeter with its immediate master meter, then the math comes out easier.
  - IOUs - Again, it's an issue of who has permission and who is associated with whose meter. At present, we are only looking at main meter/submeter associations, not submeter/submeter associations. We are willing to entertain it once a viable solution arises. It is both a technical and administrative.
  - Department of Food and Agriculture - Another consideration is that the more submeters you have in series, the more energy is going to be "wasted" by running each of those meters.
  - IOUs – Meter inaccuracies also grow with each association.
- The utilities sell more than just energy. They will be selling billing services to third parties. Have you considered charging for those services?
  - IOUs – Billing 3<sup>rd</sup> parties (EVSPs) if they are the EV submeter customer of record is something we could do once we make the necessary changes to our billing processes and systems to accommodate subtractive billing arrangements. But billing for (i.e., on behalf of) 3<sup>rd</sup> parties is something different. That issue is left open and will be discussed and considered at some future time. We will get into this issue in more detail as time progresses.

## 2.4 Submetering Technical Requirements

### 2.4.1 Submeter Technical Requirements and Standards

#### Presenters:

- Jose Salazar, SCE
- Joshua McDonald, SCE

#### Presentation:

See Appendix I for presentation slides summarized below:

- The IOUs stated that they support the advanced use cases and that they were at the SAE J2836 meeting? for the advanced use cases. The messages that the automakers have developed are in line with the CIM model. Due to the complexities of the use cases, we have to look at the task at hand. The decision we have requires us to have a roadmap by the end of the year. The protocol must be developed by July 2012. The standards for the advanced use cases may not be available by then. We have to look at what we know we can do today. Last week, a standard was made official that allows utilities to create a staging network to interchange data between utilities and third parties.
- The IOUs then presented the following submetering technical requirements and standards issues, recommendations, and rationales:
  - Issue 1: Technical performance and functional design requirements and standards
  - Issue 2: Certification and audit of submeters and submetering equipment/sites
  - Issue 3: Requirements for installation, maintenance, and testing of submeter and related equipment
  - Issue 4: Energy usage data compatible with the utility meter usage data
  - Issue 5: Certification of submeter workers/providers, data management agents
  - Issue 6: Safety risk
  - Issue 7: Accurate billing
  - Issue 8: Reliable submeter

## 2.4.2 Audience Q&A

- GM - You've set up a whole set of standards just for establishing and certifying submeters outside of the utility's responsibility. Is this an enterprise for an open market?
  - IOUs – OpenADE has been available for some time. This is CIM based. This is in line with the ESPI standard. The responsibility and method for submitting data to our back office was different.
  - GM – The responsibility of collecting the data based on the guidelines is potentially a business enterprise regardless of the submeter location.
  - IOUs – We are setting guidelines so that any party that may develop submeters can provide data to us as long as they meet said guidelines.
  - GM – Would I be a retailer?
  - IOUs – Phase I ruling states that a 3rd party can purchase energy at a utility's retail rates. The Commission has decided on the Rule 18 matter of charging for electricity used as motor fuel in a PEV.
  - GM – If I am responsible for the data, and I collect the data, and I sending that energy to you, am I charging the customer and you're charging me?
  - IOUs – There is a special case in the Phase I decision that a customer can resell the electricity for the sole purpose of providing energy as fuel.
  - GM – So I would be an EVSP?
  - IOUs – No. Not necessarily. It depends if you get your energy rates wholesale or retail. You might be an ESP or an EVSP or both.
  - IOUs– This workshop is to give you what the IOUs have been thinking; it is not necessarily what we're going to do. We encourage your feedback.
- Siemens – When we talk about providing electric services, most of the charging will be at home. I think the each use cases should have been their own workshop. I think that would have made this more productive.
  - IOUs – It is really difficult to divide the use cases in to “residential” and “business”. We are cramped for time. We tried to cover as much as we could in the time frame.
- GM – One of the stakeholders in this whole ordeal is the customer. Making a customer get a dedicated rate through a 3rd party just gives them an extra hurdle that may deter them from switching the rate.
  - IOUs – We are trying to come up with options. We are still going to offer whole house rates. A complaint to the utilities is that we are not taking advantage of on board meters, and we should take advantage of them.
  - GM – The major complaint of Volt users is the complications of the rates and installing EVSEs.

### 2.4.3 Communication Functionality, Standards, and Security

#### Presenters:

- Jerry Pilger, SCE
- Jose Salazar, SCE

#### Presentation:

See Appendix J for presentation slides summarized below:

- The IOUs presented the following submetering communication functionality, standards, and security issues, recommendations, and rationales:
  - Issue 1: Establish an interface between 3rd parties and utilities to share 3rd party submetering data for billing purposes
  - Issue 2: 3rd parties must be certified to communicate through the interface
  - Issue 3: Privacy and Security of the customer and energy consumption data
  - Issue 4: Communication standards for submeters

### 2.4.4 Audience Q&A

- AeroVironment – On the technical requirements, were there specific standards as far as what is being planned for metering requirements of accuracy? Would we be using the ANSI C12 standards? Is there any document that we can look at?
  - IOUs – Standards have developed over decades. Depending on what manufacturers and utilities have been able to do. ANSI specs cover a lot of different things including how the meter should be tested. This may not be practical for submeters as the market is so small. We're thinking that we'll be using the DWM.

## 2.5 Submetering Administrative and Regulatory Requirements

### 2.5.1 Methodology for Settling Disputes

**Presenters:**

- Robert Craig, PG&E

**Presentation:**

See Appendix K for presentation slides summarized below:

- The IOUs presented the following methodology for settling disputes issues, recommendations, and rationales:
  - Issue 1: Establishment of the Customer / EVSP / Utility relationship introduces substantial complexity to utility billing and service delivery, and this more complex relationship has higher potential for dispute
  - Issue 2: Utilities will need to recoup costs for billing and related services rendered to EVSP
  - Issue 3: Utility credit and collection procedures, including service disconnects, will impact EVSP's service delivery in a submetered configuration
  - Issue 4: The possible combination of Direct Access and EVSP submetered services will add further complexity to the overall utility / customer relationship, and billing systems and processes in particular
  - Issue 5: Utilities and customers will need ability to contact EVSPs in the event of billing issues or other disputes

### 2.5.2 Audience Q&A

- There were no audience questions or comments following this presentation.

### 2.5.3 Develop Rules for Incorporating Subtractive Billing into Submetering Tariffs

#### Presenters:

- Elaine Wong, PG&E

#### Presentation:

See Appendix L for presentation slides summarized below:

- The IOUs presented the following rules for incorporating subtractive billing into submetering tariffs issues, recommendations, and rationales:
  - Issue 1: Amend tariffs or develop new rule(s)
  - Issue 2: Complexity and additional cost of multiple ESPs providing DA power at the master meter and multiple submeters
  - Issue 3: We anticipate the need for subtractive billing for future products and services
  - Issue 4: Utilities will need to recoup costs due to data collection, assembly, and QC services provided to ESPs
  - Issue 5: How we extend demand response controls to EVSPs
  - Issue 6: Impact on utility business processes

### 2.5.4 Audience Q&A

- With respect to Demand Response, there are a lot of complications in the IOU market. You might want to have a separate group to talk about DR for EVs and what would be required to do that.
  - CPUC – That is a good point. There are things that we can do now, things that we can do soon, and things that we can't do until the long run.

## 2.6 Closing Comments

### 2.6.1 Summary of Utility Perspectives, Recommendations, and Next Steps

#### Presenters:

- J.C. Martin, SDG&E

#### Presentation:

See Appendix M for presentation slides summarized below:

- PG&E, SCE, and SDG&E:
  - Expressed their support of key CPUC policy goals
  - Presented joint recommendations based on their initial analysis:
    - The IOUs concluded that given the complexities and uncertainties of developing a submetering protocol as well as the current low adoption rates of 2nd meters by EV customers that a phased approach offers the best strategy for enabling the submetering of EV load while matching development costs with actual, evolving marketplace demand.
    - The IOUs presented an approach to enabling submetering in the manner directed by the CPUC in which the IOUs, consumers, and 3rd party stakeholders learn and collaborate on building a submetering protocol for California. The approach would be split into four phases:
      - Phase 1: Define / Plan (in progress)
      - Phase 2: Design / Develop (in progress)
      - Phase 3: Build Interim Solution
      - Phase 4: Build Scalable Solution
  - The IOUs presented next steps in developing a submetering protocol development and implementation roadmap (report due 12.31.2011):
    - Prepare workshop summary report (due 15 days after workshop)
    - Continue roadmap development
    - Establish four work teams (consisting of 3rd parties, IOUs, Division of Measurement Standards, MSPs, etc.); expected to begin work in November 2011
    - Start developing submeter protocol roadmap report (due December 31, 2011)

## 2.6.2 Audience Q&A

- CPUC – You’re proposing that we create four teams. These groups would be made up of stakeholder groups and utilities. Third party’s participation would be made available via conference calls on a periodic basis. What do you people think about these groups? Is this a good approach as we go forward?
  - IOUs – The 12/31/11 deadline is a deadline for the IOUs. We’d like the 3rd parties’ help. We have to meet CPUC guidelines. We need to work together on this.
- AeroVironment – The four groups is fine, but how do you bring them all together to bring the roadmap together?
  - CPUC – I would assume that the Use Case Team will drive the other teams and be responsible to keep everything coordinated. If we pick which use cases will be able to be completed first, then the other groups can follow.
  - IOUs – My proposal is to be able to include more 3rd parties. Right now, we have 9 subgroups. These 4 would help things out by keeping things more organized.
- CPUC – There needs to be a way to prioritize use cases. The roadmap should address when these use cases will be addressed.
  - IOUs – We should discuss Barbara’s DR comments.
  - IOUs – DR could probably be lumped into the Billing and Regulatory Requirements Team.
- Are CCAs (Community Choice Aggregators) going to be the recipients of this process so it promotes roaming?
  - IOUs – The teams are open to any participants.
  - CPUC – There needs to be more discussion as far as including demand response.
- A lot of questions have been discussed with ISO about using of modulated charging and a greater participation for EV charging. We should consider the ISOs certification processes. It would be a good idea for everyone to be on this same page.
  - JC Martin – ISO needs to be in the loop, especially in DR. We are dancing around this issue of wholesale markets. There are real issues of Direct Access pricing through the aggregator. One of the potential value propositions is access to negative pricing. The question is whether an ESP can be an EVSP.

### 2.6.3 Summary CPUC Perspectives

**Presenters:**

- Adam Langton, CPUC Energy Division

**Presentation:**

- The CPUC
  - Reaffirmed the goals of and next steps for the AFV OIR Phase 2 Decision
  - Thanked attendees for their participation
  - Described how the workshop presentation and report would be posted on the CPUC website

**(END OF CALIFORNIA PUBLIC UTILITIES  
COMMISSION SUB-METERING PROTOCOL  
WORKSHOP – OCTOBER 27, 2011)**

## Appendix A – IOU Perspectives on Customer and Market Conditions and Outlook

# California Public Utilities Commission Sub-Metering Protocol Workshop

October 27, 2011 – San Francisco, California

Final

As Directed by Alternative-Fueled Vehicle Proceeding R.09-08-009, Decision 11-07-029  
Ordering Investor-Owned Utilities To Develop Protocols  
To Support The Use Of Customer-Owned Submeters  
For Use In Billing EV Load



### Utility Perspectives on Submetering

**Introduction**

- **PG&E, SCE, and SDG&E support CPUC's key policy goals of:**
  - Facilitating EV market expansion
  - Enabling customers to identify options best serving their needs
  - Ensuring consumer experiences with charging EVs are positive
  - Supporting the on-going development of metering technology and services to improve EV charging
  - Supporting the environmental benefits of EV
- **IOU interpretation of pertinent AFV OIR Decisions and Rulings:**
  - CPUC has directed the IOUs to enable 3<sup>rd</sup> party submetering of EV loads and subtractive billing detailing for customers separate power usage for their residences and plug-in EVs

A Joint CA IOU Initiative  
As Directed by CPUC  
AFV OIR Proceeding R.09-08-009  
Decision 11-07-029



## Utility Perspectives on Submetering

Utility perspectives on submetering were developed through initial discussions with 3<sup>rd</sup> parties\* as well as the utilities' analysis

**In our analysis, we have concluded that submetering can provide a variety of important benefits:**

- Provide customers charging installation alternatives
- Reduce customer installation cost, time and complexity
- Support future EV rate options and business models
- Provide 2<sup>nd</sup> meter options in space-constrained situations such as apartments, public garages etc.
- Provide submetering EV charging data to customer

\* Discussions between the utilities and 3<sup>rd</sup> parties included: AeroVironment, Better Place, Clean Fuel Connection, Coulomb, Ecotality, Ecologic Analytics, Ford, GE, GM, Itron, Mitsubishi and SPX.

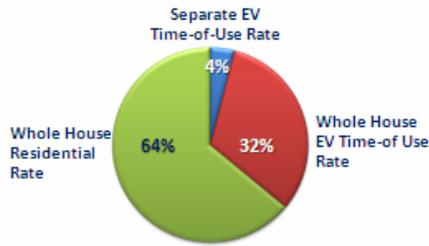
## Submetering Uncertainties and Complexities

We also concluded that achieving CPUC's policy goals and delivering the desired benefits will require addressing a variety of complexities and unknowns



## Current Adoption Rate for EV 2nd Meter

The number of customers choosing to separately meter their EV charging is low vs. EV customers selecting the Whole House EV rate



- Less than 5% of EV customers are choosing separate EV Time-of-Use rates
- Submetering adoption rate estimated to be similar until low cost solution available

**Rate Choice For EV Customers**  
2011 YTD

## Initial Assessment

There is no easy way to provide an accurate and cost-effective submetering solution in the short term

- Pursuing submetering solutions to support EV deployment at this time may provide benefits
- However, many uncertainties and complexities will need to be overcome to develop and implement a submetering protocol
- The emerging submetering market will grow slowly until technological advances provide customers with low cost, innovative solutions
- IOUs have some experience with Direct Access and the California Solar Initiative—each complicated—that can be used as a starting point

A phased development approach offers the best strategy for enabling the submetering of EV load while matching development costs with actual, evolving marketplace demand

## Appendix B – California Department of Food and Agriculture (CDFA) Division of Measurement Standards (DMS) Perspectives on Submetering

### CPUC Sub-Metering Protocol Workshop

California Department of Food and Agriculture  
(CDFA)  
Division of Measurement Standards  
(DMS)

San Francisco, CA  
October 27, 2011

**Sub-meter** – a meter furnished, owned, installed, and maintained by the customer who is served through a utility owned master meter (CCR Title 4, Division 9, Article 2.2, §4027.1 D)



Plug in Mechanical Meter

Current Transformer Meter  
(CT Meter)



## DMS and County Weights and Measures Authority for Sub-meter Inspection and Testing

- California Business and Professions Code, Division 5
  - CDFD/DMS – Legal requirement to establish specifications and tolerances for all commercial devices
  - Approve all commercially used devices before sale and use
  - Inspect, test and “seal” as accurate and correct
  - Prohibit use of unapproved and inaccurate commercial devices
  - Establish testing frequency and testing procedures
- California Code of Regulations, Title 4, Division 9
  - Specifications and tolerances provided

## Other Points

- Meters found at parking garages, parking lots, service stations, etc. where fee for use is based on kW or time
- Meters typically taken to county offices of weights and measures for required testing
- More than 318,000 electric measuring devices tested annually.
- Define electricity used to charge batteries for EVs as a motor vehicle fuel – allows DMS to regulate the advertising and posting of the price (not the amount per unit) like other fuels



# Questions

David Lazier  
Assistant Director  
CDFA - Division of Measurement Standards  
[dlazier@cdfa.ca.gov](mailto:dlazier@cdfa.ca.gov)  
916 229-3000

## Appendix C – Better Place Presentation

**CPUC Submetering Workshop**  
EVSP Coalition Recommendations

October 27, 2011

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**Basic assumptions** 

- Submeters will be on customer side of the main meter – in most cases the customer or the EV service provider will own them
- We focus on embedded meters in the EVSE and use case #3
- Embedded submeters can be highly cost-effective, reducing the overall cost to consumers compared to parallel metering while providing the same billing and load management function

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## Objectives for submetering implementation



1. Consumer choice in EV services and metering solutions that support access to those services
2. Cost-effective metering solutions that do not unnecessarily increase consumer costs of EVSE purchase and installation
3. Ease of implementation to speed availability of submetering option for consumers
4. Accurate and reliable measurement of EV load for billing purposes
5. Billing enablement for submetered EVSE load in residential and commercial locations in order to facilitate EVSP business models for load management and non-utility EV services

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## Recommendation #1: Third party ownership and third party certification of submeters in EVSE



- Customers and EV service providers (who are also customers of the utility) will own the submeter
- Submeters will be certified by third parties
- Consider the benefits of third party certification by UL or other labs. It might be faster and easier to certify the meter as part of overall UL certification process for EVSE
- Self-certification should be established as a process, allowing entities to more quickly to adopt upgrades or changes to metering technology within EVSE, as specified by the Department of Food and Agriculture
- Submeters are not under the jurisdiction of utilities or PUC

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## Recommendation #2: Protocol needs to balance feature requirements and cost-effectiveness

- We believe the right trade-off is:
  - Submeter certified to meter accuracy standard equivalent to ANSI C-12 meter standard. This will deliver the same level of accuracy as today's AMI meters for billing and energy consumption measurement reliability.
  - EVSE meters do not need to be visible from outside the home or removable from the EVSE. The residential EVSE can be removed for required calibration.
  - Other feature and functionality for the submeter, including communication protocols, should be defined and selected by the EVSE manufacturers or providers as needed in accordance with their business processes and requirements.

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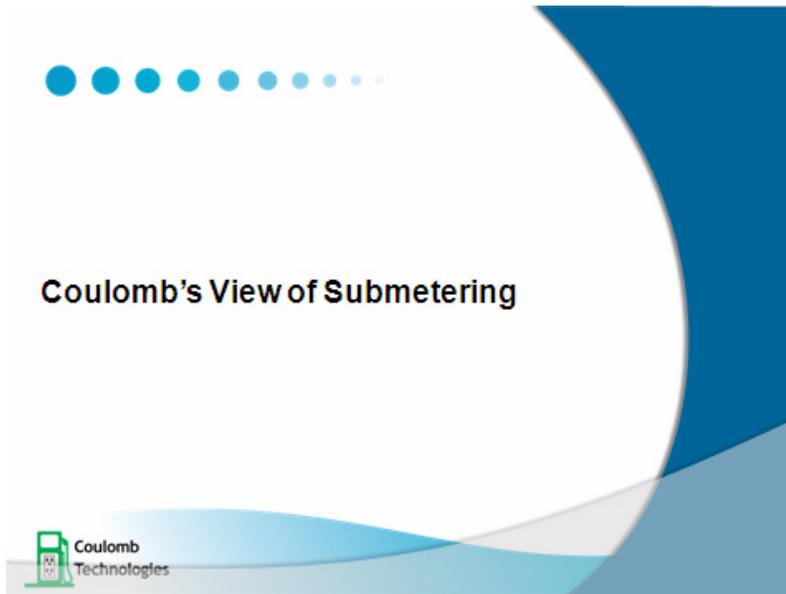
## Recommendation #3: Enabling subtractive billing with EVSE submetering

- Role of the utilities in submetering is largely to enable billing true-up of EVSE electricity consumption
- In the case that the EVSE is either owned or operated by a third party providers, the utility should establish a business process for billing that will achieve the following:
  - (1) Allow EV service providers to credit or add to utility customers' bills the EV electricity cost through a line item on the customer's bill. The EVSP is responsible for reimbursing the customer for the monthly EV electricity usage.
  - (2) Aggregate EVSE submeter billing for EV service providers
- The third party provider, not the utility, is responsible for billing disputes with the customer through contractual agreement.

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6

## Appendix D – Coulomb Presentation



**Our Understanding of the term "Submetering"**

- 1) "Submetering" in the context of this workshop is about dividing a Utility Master Meter KWH reading into categories for different rate treatment on the IOU bill
- 2) When an EVSE meter is downstream from a utility meter and the EVSE owner pays utility standard retail rates, the EVSE owner can use the EVSE meter as it wishes to determine its pricing to drivers and neither the PUC nor the utility regulates. **This is not considered submetering** and is not germane to this workshop.
- 3) Consolidate Billing is of interest to Coulomb for a future workshop but is not considered submetering
- 4) Enabling Net Metering with TOU metering is a very important topic for a future workshop

 Coulomb Technologies 1  
Coulomb Technologies, Inc.

### Coulomb is Optimistic about these Proceedings



1. The Pre-workshop discussion between the IOUs and Coulomb was very positive
2. We think the IOU-proposed architectures are well thought-out. We are particularly in favor of their "Use Case 3"
3. We believe that an extension to "Use Case 3" should be made to allow multiple submeters. This would be useful for the "shared EVSE" situation



3

Coulomb Technologies, Inc.

### A Second Utility Meter is an Obstacle



Coulomb believes that requiring an EVSE owner to have a dedicated C12 ANSI meter in order to get EV rates is an obstacle to EV adoption and that this practice should be disallowed.

- A. The cost of the meter will deter EV purchase
- B. The logistics of installation will deter EV purchase
- C. In the case of a shared EVSE, like in the multiple-dwelling unit, the utility-style meter is inadequate because it can't determine who the consumer is

These problems are present in both the submeter case and the parallel meter case



4

Coulomb Technologies, Inc.

## Utility MDMS Architecture

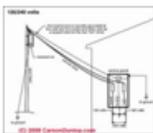


We applaud the IOUs for their direction to use Subtractive Billing and to not use the AMI infrastructure to read EVSE submeters

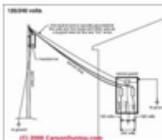
- A. We agree that "Subtractive Billing" is superior to "Subtractive Metering"
- B. We think the AMI network will likely have inadequate performance for this application
- C. We think that the Master Meter meter data management system should be isolated from the submeter Data Management Agent in order to keep both simple
- D. We think that the operator of the submeter DMA should be responsible for submetering disputes



## Metering Strategies



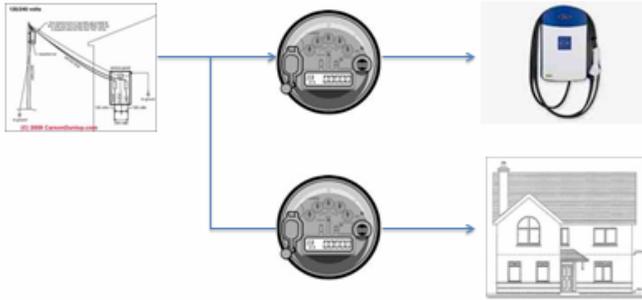
Whole house meter, no Time of Use metering – expensive per month



Whole house Time of Use meter – cheaper to charge off peak  
E9A - This works very well



### Metering Strategies



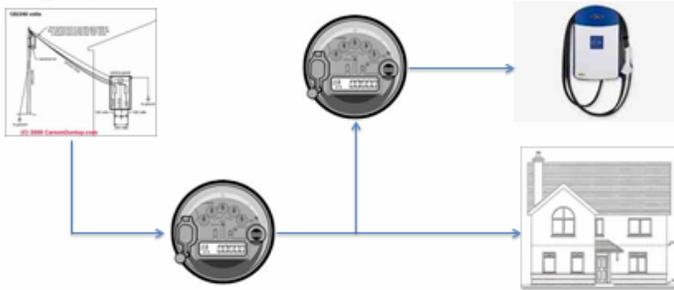
Parallel Service Meters – Special EV rates  
Too expensive, and inadequate



7

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### Metering Strategies



C12 submeters – Special EV rates  
Too expensive, and inadequate



8

Coulomb Technologies, Inc.

## Metering Strategies

Meter integrated in EVSE – Tells you which car used how much energy when, and gets EV rates – Inexpensive and flexible

**Coulomb Technologies**

9  
Coulomb Technologies, Inc.

## Submeter Hardware

1. Should not require visual reading
2. Should not require field removal
3. Certification should be by a third party

**Coulomb Technologies**

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## Appendix E – ECOTality Presentation



### CPUC OIR R09-08-009 Submeter Protocol Public Workshop

Adrene Briones  
ECOTality North America  
October 27, 2011

## EV Project Deployment



# blink Smart EVSE



# blink Network and Mobile



## Current Installs



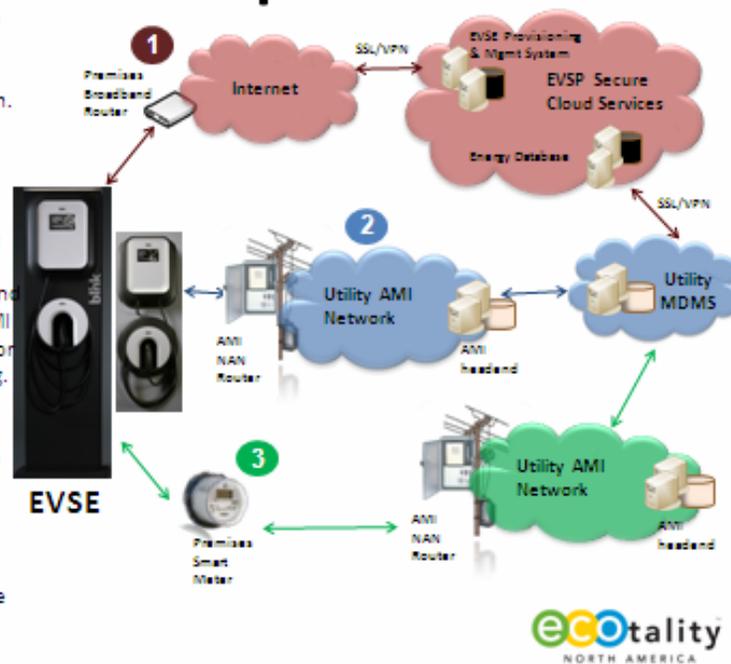
## Benefits of Submeter in EVSE

1. Minimize Cost
2. Ease of Installation
3. Reduce Power Diversion
4. Aesthetics
5. Differentiate Electricity for Transportation
6. Enables Rate Design

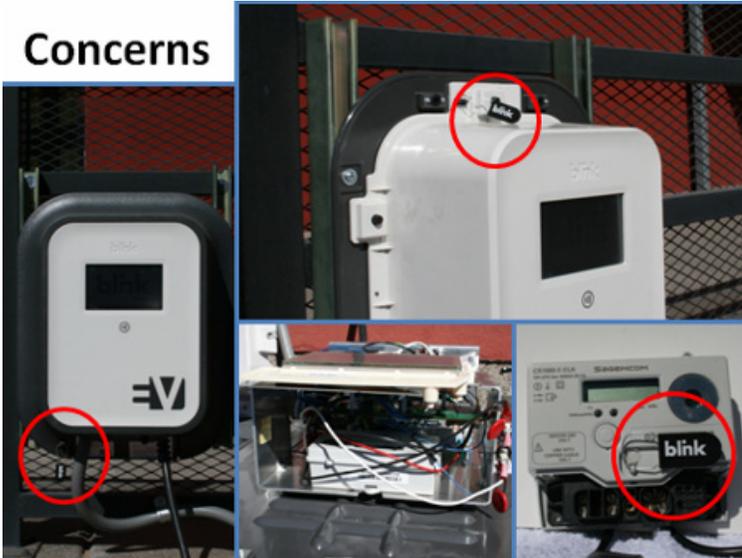


# Communication Options

- 1** Sub-meter embedded in EVSE communicates securely with 3<sup>rd</sup> party EVSP cloud based system. EVSP system in turn communicates securely with Utility MDMS
- 2** Sub-meter embedded in EVSE communicates securely with utility as end node attached to the AMI edge router (using vendor specific AMI protocols e.g. SSN's 802.15.4 mesh)
- 3** Sub-meter embedded in EVSE communicates securely with utility via premises smart meter using utility controlled HAN network e.g. ZigBee SEP



## Concerns



## Contact Info



Adrene Briones

Los Angeles, CA

P: 424-400-4646

abriones@ecotality.com



[www.ECOtality.com](http://www.ECOtality.com) • [www.theEVproject.com](http://www.theEVproject.com) • [www.blinknetwork.com](http://www.blinknetwork.com)

## Appendix F – General Motors Presentation

### California Public Utilities Commission Sub Meter Protocol Workshop

George Bellino  
Project Engineer  
Infrastructure Commercialization  
27 Oct 2011



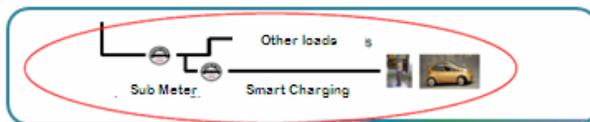
#### Optimal Use Case Scenario

The Customer plugs in anywhere to charge (120V Outlet/240V EVSE/DCFC) – at home, friends home, public, workplace, commercial, etc.

The Utility is able to identify the PEV load associated to the Vehicle ID which is associated to a Utility customer account which is associated to the location's Primary Meter.

The PEV electricity consumption is separately measured using a sub meter which provides a recording of the total kWh usage measurement with time stamps (TOU).

The Utility receives the sub meter electricity usage data with the association information - bills the customer account associated to the Vehicle ID at the appropriate EV rate; and subtracts the kWh usage from the associated Primary Meter owner's account.



## Attributes

- **Communications** – standards based ability to collect energy consumption data and convey data to Utility accounting back office –
- **Association** – ability to connect sub meter to primary meter for subtractive billing
- **Certification** – ability to verify accuracy of sub meter measurements
- **Standardization** – prescribed national standards specifying requirements, technology implementation, and certification process
- **Accountability** – ownership and responsibility for certification, accounting, billing, data processing, aggregation services, etc.
- **Cost Effective** – least cost impact to consumer, utility, and providers

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## On Vehicle Sub Metering

- **Communications**
  - SAE J2836/J2847/J2931 addressing PEV-Utility bi-directional communications messaging and protocols (PLC, Telematics, WiFi, etc.)
  - Capability to receive and respond to DR, load management, and Pricing signals – addresses Association (SEP2.0 Application Layer Standard)
  - Will support energy consumption TOU data collection and communications
- **Association**
  - Standards are implementing function as part of communications initialization process
    - Vehicle ID associated to EUMD (Energy Unit Measurement Device/Sub Meter) and authentication/registration to the Premise Meter
  - On Vehicle Sub Meter permanently associated to PEV

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## On Vehicle Sub Metering

- **Certification**
  - Based on technology implementation – removable hardware device versus embedded software and microchip
  - Embedded software and microchip preferred for On Vehicle sub metering
  - OEMs are experts at vehicle certification processes - example: can be calibrated and certified using Service Technician Software Diagnostics tools.
- **Standardization**
  - Solution needs to be nationally standardized - commonized compatible solution for component/software technology, communications, and certification – standardized communications interfaces and data format
  - May require modifications (paradigm shifts) in policy and regulation as well as existing standards – example: revenue grade accuracy for sub meters versus utility owned primary meters/direct access
  - Single standard solution for PEV sub metering desired – avoid potential complexities with cascading sub meters

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## On Vehicle Sub Metering

- **Accountability**
  - Ownership and responsibility for certification, accounting, billing
    - On Vehicle Sub Meter owned by the customer – responsible for vehicle sub meter calibration and certification – analogy: smog checks/regular maintenance checks
    - OEM responsibility and Warranty implications TBD
    - Who does billing – Aggregator/3<sup>rd</sup> Party Clearing House Or Utility
      - Inter Utility accounting and billing processes a potential issue
      - Revenue stream for Aggregator/3<sup>rd</sup> Party Clearing House
      - Variability in billing models – subscriber fee and time based – middle man between customer and Utility
- **Cost Effectiveness**
  - No out of pocket installation cost and external product price impact
  - No rate basing issues
  - Alleviates product variability potentially affecting compatibility
  - OEM challenge are the integration costs dependent on technology and certification requirements

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## On Vehicle Sub Metering

- **Basic Advantages**
  - Meter permanently associated to vehicle
    - Supports potential roaming issues
  - Meters all levels of charging PEV energy consumption
    - Supports requirement for validating and allocating LCFS credits
  - Potentially least cost impact
    - Alleviates cost/price impacts for externalities
  - OEM telematics service providers can provide aggregator services through back office server cloud
    - API to utility, HAN, 3<sup>rd</sup> Party Energy Suppliers undergoing standardization
  - PEV-Utility Communications standards processes are in place
  - Less susceptible to tampering and vandalism



## Appendix G – NRG EV Services / eVgo Presentation



This presentation contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934. Forward-looking statements are subject to certain risks, uncertainties and assumptions and typically can be identified by the use of words such as "expect," "estimate," "should," "anticipate," "forecast," "plan," "guidance," "believe" and similar terms. Such forward-looking statements include NRG's electric vehicle ecosystem developments. Although NRG believes that its expectations are reasonable, it can give no assurance that these expectations will prove to have been correct, and actual results may vary materially. Factors that could cause actual results to differ materially from those contemplated above include, among others, general economic conditions, hazards customary in the power industry, receipt of federal loan guarantees, additional partnering relationships, competition electric vehicle markets, the volatility of energy and fuel prices, failure of customers to perform under contracts, changes in the wholesale power markets, changes in government regulation of markets and of environmental emissions, the condition of capital markets generally, and our ability to access capital markets.

NRG undertakes no obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise. The foregoing review of factors that could cause NRG's actual results to differ materially from those contemplated in the forward-looking statements included in this Investor Presentation should be considered in connection with information regarding risks and uncertainties that may affect NRG's future results included in NRG's filings with the Securities and Exchange Commission at [www.secd.gov](http://www.secd.gov).



## NRG Overview

NRG TODAY AND TOMORROW



### Company Facts:

- > Fortune 500 Company
- > Generating assets in Texas, Northeast, Southwest and California
- > Generating power from sun, wind, gas, coal, nuclear
- > Largest committed solar power investor / developer globally (\$1.5B)
- > Retail consumers in Northeast and Texas
- > Thermal and CHP services in operations across U.S., and SF, S.D.
- > New clean energy businesses lines in EV and Smart energy

**NRG is a national wholesale and retail power company**



## The Customer Need

NRG TODAY AND TOMORROW

Customer Need	Ownership Barrier
Range	Pragmatic drivers need a safety net for everyday range confidence and range extension for the unexpected day
Initial Cost	Up-front premiums for the battery and home equipment create barriers to adoption
Cost of Ownership	KWh rates priced by day/night and home/public create uncertainty in the EV value proposition

**Large scale adoption of EVs requires more than just an outlet – Customers need confidence in range and cost**



## eVgo Business Model

NRG TODAY AND TOMORROW



**A comprehensive electric vehicle charging ecosystem for subscribers**

- Provide range confidence**
- DC fast chargers allow unlimited “top-offs”
- Mitigate the upfront cost of charger**
- Allow consumers to avoid \$2,000+ upfront cost of buying and installing own home charging stations
- Provide price certainty**
- Fixed fueling cost at much less than gasoline

## eVgo Business Model

NRG TODAY AND TOMORROW

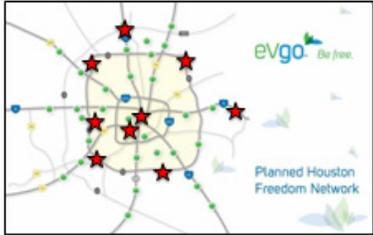
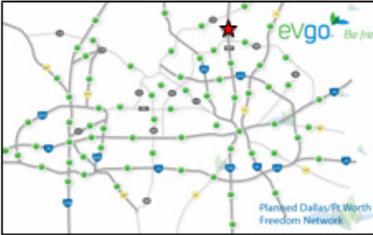


**A comprehensive electric vehicle charging ecosystem for subscribers**

- Provide range confidence**
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- Provide price certainty**
- Fixed fueling cost at much less than gasoline

## Pathway Fueling - Freedom Network

NRG TODAY AND TOMORROW

★ Indicates Freedom Station complete or under construction

**Sample Retail Host Partners**

*Walgreens*

**H-E-B** **BEST BUY** **Walmart** **Old Country Store**

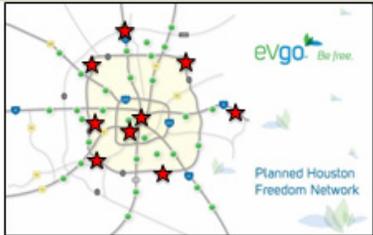
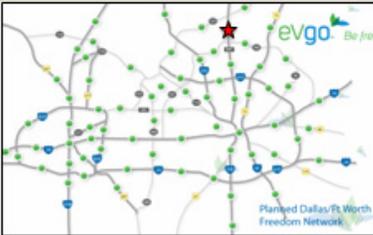


First station opened in 2011 at Walgreens in North Texas

GENERATION 7

## Pathway Fueling - Freedom Network

NRG TODAY AND TOMORROW

★ Indicates Freedom Station complete or under construction

**Sample Retail Host Partners**

*Walgreens*

**H-E-B** **BEST BUY** **Walmart** **Old Country Store**



First station opened in 2011 at Walgreens in North Texas

GENERATION 7

## EV Driver Subscription Packages

NRG TODAY AND TOMORROW

**3 Plans to Choose From**

Home Plan	Mobile Plan	Complete Plan
Standard: Installation of a charger at your home	Standard: Installation of a charger at your home	Standard: Installation of a charger at your home
Service and maintenance of the charger at your home	Service and maintenance of the charger at your home	Service and maintenance of the charger at your home
	eVgo pays for all of your charging at eVgo public chargers	eVgo pays for all of your charging at eVgo public chargers eVgo pays for all charging at your home charger
<b>\$49/month (36mo)</b>	<b>\$79/month (36 mo)</b>	<b>\$89/month (36 mo)</b>

\* Payments may be linked to off-peak billing, only depending on regional power plans.

**Other plans under development:**

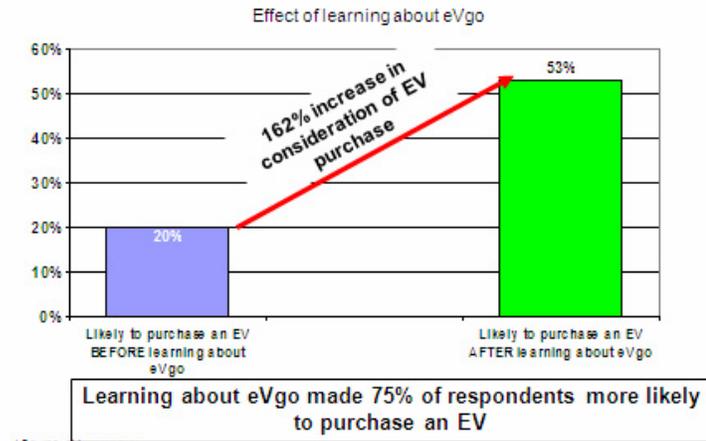
- "On The Go" plan – 12 mo Network access only (no home EVSE)
- PHEV plans - Options of Network access, off-peak power, and home EVSE
- Commercial Fleet plans – sold separately or via fleet mgmt companies

\*\*\* Texas market pricing information only \*\*\*



## Market Building Effect

NRG TODAY AND TOMORROW





#### Improvement Opportunities

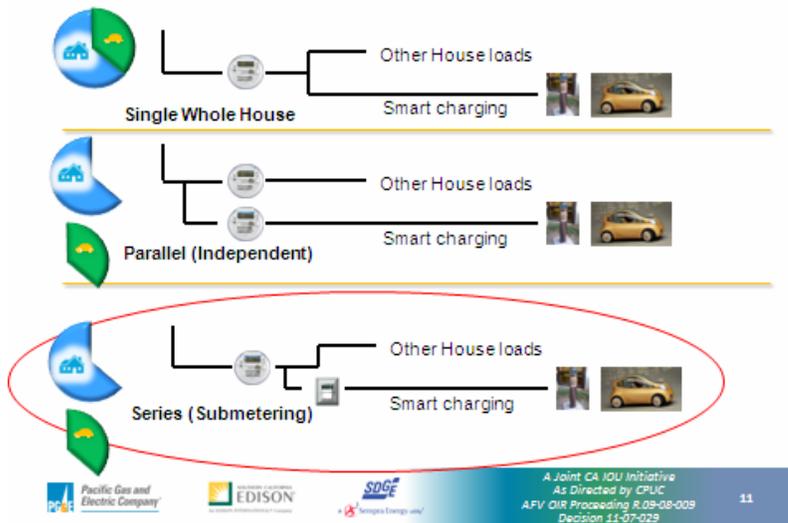
- Simplify the EV service offerings by segregating use
  - Application-specific utility rates to drive charging behavior
  - Lower the cost to access application-specific rates
  - Expand workplace and multi-family charging
- 
- Solution Opportunity
    - Fixed sub-meter with 3<sup>rd</sup> Party Service Provider (Use Case 3)
    - AMS/ZigBee compatible/certified meter embedded in EVSE
    - Utility reads AMS/ZigBee sub-meter
    - Subtractive billing on application rate using sub-meter data
    - Stations behind commercial meters have equal access to application rates
    - Service provider is electric service customer of utility on fixed submeter
    - Resident/host is electric service customer of utility on primary meter

## Appendix H – IOU Use Case Presentation

### Use Cases

- **What is a use case?**
  - A use case is a structured approach to define a process for system development
  - First step in the development of business and functional requirements
- **Why write them?**
  - Focuses scope
  - Gain understanding of impact on customers, “actors,” and systems
  - Helps define solution requirements

### Submetering Protocol Scope



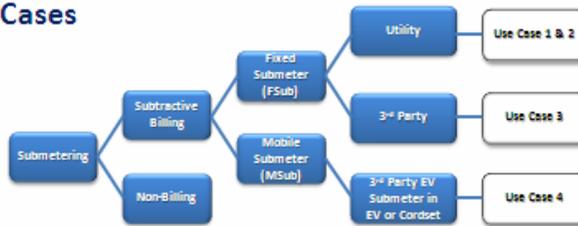
## Subtractive Billing Arrangement



## Definition of Key Terms in Use Cases

Term	Definition	Examples
Submetering	Measurement of specific end use loads, physically and electrically downstream of the master meter	<ul style="list-style-type: none"> <li>Mobile home parks</li> </ul>
Subtractive Billing Arrangements	Mathematical relationship between independent entities, associated by a contractual agreement. (Note: A billing arrangement can be additive OR subtractive.)	<ul style="list-style-type: none"> <li>Multi-specification commercial buildings – with master meter for total load, including the common, shared loads and individual tenant meters</li> <li>Virtual NEMs (Net Energy Metering)</li> </ul>
Subtractive Metering	Measurement of actual power flows in real time. Power flows can be “in” or “out”. Typically, the result is “NET” energy only on a single meter	<ul style="list-style-type: none"> <li>Solar NEMs</li> <li>CT secondary’s in subtractive association</li> </ul>

## Use Cases



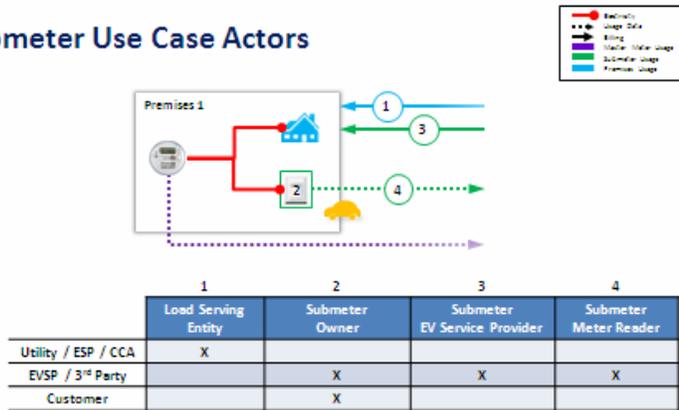
- Submetering in these use cases assumes the use of subtractive billing; Submetering for non-billing purposes is out of scope, but can exist
- A written agreement (aka “3-way association”) exists among the premise’s customer, the 3rd Party and the utility on the terms and conditions of the service in advance of any submetering subtractive billing use cases

These assumptions apply to ALL Use Cases

## Key Actors in Use Cases

Actor	Definition	Examples
<b>Electric Vehicle Charging Service Provider (EVSP)</b> aka 3 <sup>rd</sup> Party	Supplier of EV charging services to the consumer The EVSP* purchases electricity from a load serving entity at RETAIL rates for resale to the consumer. As such, an EVSP is not a public utility. * EVSP ≠ ESP	<ul style="list-style-type: none"> <li>• EVSE Manufacturers</li> <li>• Automakers</li> <li>• Smart Grid Equipment Providers</li> <li>• Other Service Providers</li> </ul>
<b>Load Serving Entity</b>	Supplier of energy to the electric vehicle charging service provider (and the premise owner)	<ul style="list-style-type: none"> <li>• Investor Owned Utility</li> <li>• Energy Service Providers</li> <li>• Community Choice Aggregators</li> </ul>
<b>Premise Owner</b>	The consumer, the owner of the main premise where the EV charging equipment is located	<ul style="list-style-type: none"> <li>• Homeowners</li> <li>• Residential/ commercial landlords</li> <li>• Condominium Associations</li> <li>• Employers</li> </ul>
<b>Data Management Agent (DMA)</b>	A DMA is functionally similar to the MDMA (Meter Data Management Agent) in the Direct Access (DA) world	<ul style="list-style-type: none"> <li>• TBD</li> </ul>

## Submeter Use Case Actors



The protocol impact for each relationship requires careful analysis

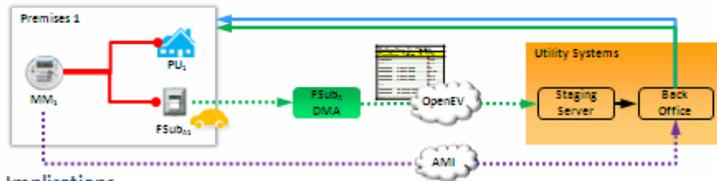
## Submeter Assumptions

- Fixed Submeter(s) (FSub) are associated with a single premise
- Mobile Submeter(s) (MSub) can be associated with multiple premises
- There can be no duplication of submeters per branch circuit
- A 3-way agreement/association must exist in advance of any subtractive billing arrangement
  - EV charging can still occur at any location without a 3-way agreement, but subtractive billing is not possible
- The EVSP may:
  - Purchase electricity directly from the load serving entity at retail for EV charging,
  - Bill for electricity and additional value-added services to the premise owner
- The EVSP is the default EV Submeter reader
- EV Submeters will not directly integrate with the utility master meter; e.g., no AMI connection

These assumptions apply to ALL Use Cases

### Use Case 1: Fixed Submeter

Utility = Electric Commodity Provider (One to One EVSP)  
Customer of Record for Fixed Submeter is the Same as for Master Meter



#### Implications

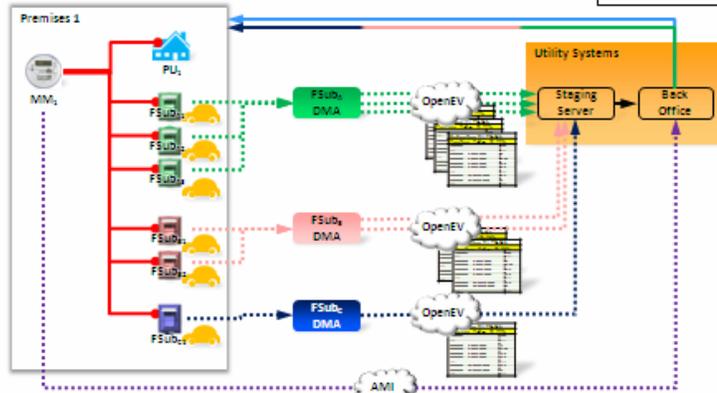
- Assumes 3rd Party sends data from their Data Management Agent (DMA) to the utility via the OpenEV interface
- Requires 3-way association among customer, 3rd party, and utility prior to accurate subtractive billing (i.e. no ad-hoc associations)
- Submeter adheres to the same certification and requirements as a utility master meter based on national standards
- OpenEV standard must be established, and 3rd Party DMA is certified to it
- AMI network is not used to transport submeter data

OpenEV

Submeter #	Master Meter #	Usage
FSub01	MM1	Usage
FSub02	MM1	Usage
FSub03	MM1	Usage
FSub04	MM1	Usage
FSub05	MM1	Usage
FSub06	MM1	Usage
FSub07	MM1	Usage
FSub08	MM1	Usage
FSub09	MM1	Usage
FSub10	MM1	Usage

### Use Case 2: Fixed Submeter

Utility = Electric Commodity Provider (One to Many EVSPs)  
Customer of Record for Fixed Submeter is the Same as for Master Meter



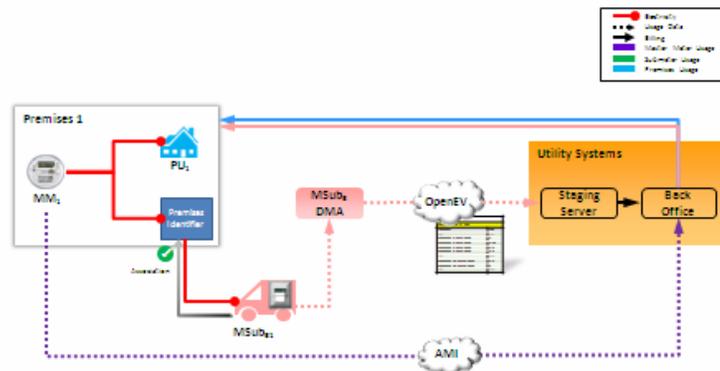
Example: shopping center garage with multiple vendors with multiple submetered charging points.  
NOTE: Submeter data is not aggregated.



## Use Case 4: Mobile Submeter

Submeter in EV/Cordset (One to One EVSP)

Customer of Record for Mobile Submeter is Customer or EVSP



## Mobile Submeters – Additional Assumptions/Implications

- All implications from fixed submeter use cases carry over to mobile submeter use cases
- As in the fixed submeter use cases, the 3-way association is required for subtractive billing to occur
  - Creating this agreement on-the-fly may prove to be challenging
  - Mobile submeter use cases involve multiple mobile submeters charging at multiple premises. Therefore, establishing the association between MSubs and premises IDs are more complicated. (In fixed submeter use cases, multiple submeters can be associated with a single premises.)
- Association with the premises is with the premises account and not the master meter in case we change out the master meter
  - A premises identifier device may solve the physical relationship issue (but this device does not necessarily mean 3-way agreement exists)

## Mobile Submeters – Additional Assumptions/Implications

(continued)

- **Mobile submeters can be located in either the EV or a cordset**
  - A mobile submeter is associated with a single vehicle
  - Mobile submeter in the cordset can be shared amongst multiple vehicles and introduces additional complexities requiring further discussion
- **Mobile submeters may be associated with multiple premises, but may charge to only a few premises per billing cycle**
  - This has major data process implications if the number of 3-way associations per mobile submeter are large
- **For each MSub, the EVSE is responsible for subtracting any charging usage occurring without the 3-way association, or when it charges through a fixed submeter (MM – FSub – MSub)**

## Use Case Summary / Recommendation

- **The submetering protocol development is complex; issues need to be identified and analyzed prior to any implementation**
  - There are new relationships and requirements
  - Feasibility, timing, and cost impacts must be evaluated
  - We're not just dealing with submeters, but also with the collection, integration, and processing of large volumes of EV data for accurate billing
- **EV charging can still occur at any location, but without a 3-way agreement, subtractive billing cannot occur**

### RECOMMENDATION

#### Our initial focus should be on fixed submeter use cases

- Fixed submetering is less complex than mobile submetering and requires less time to develop and implement new processes and systems
- Allows more time to learn and understand the mobile use cases as the EV charging market matures while still allowing us to move forward with submetering
- Enables more thorough testing of EV data cloud, certification process, and other aspects of submetering and subtractive billing
- Industry stakeholders need to be on board with solution

## Appendix I – Submetering Protocol Technical Requirements Presentation

### Submeter Technical Requirements and Standards

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Technical performance and functional design requirements and standards</li> </ul>	<ul style="list-style-type: none"> <li>EV participants jointly develop these, using DASMMMD (Direct Access Standards for Metering and Meter Data) as baseline</li> </ul>	<ul style="list-style-type: none"> <li>Ensure safety, accuracy and reliability of sub-meters</li> </ul>
<ul style="list-style-type: none"> <li>Certification and audit of sub-meters and sub-metering equipment/sites</li> </ul>	<ul style="list-style-type: none"> <li>Dept. of Food &amp; Agriculture (Division of Measurement Standards) oversees certification process (reference: DASMMMD)</li> </ul>	<ul style="list-style-type: none"> <li>The California government entity with jurisdiction for certifying sub-metering beyond utilities</li> <li>Ensure safety, accuracy and reliability of sub-meters</li> </ul>
<ul style="list-style-type: none"> <li>Requirements for installation, maintenance, and testing of sub-meter and related equipment</li> </ul>	<ul style="list-style-type: none"> <li>EV participants jointly develop these, using DASMMMD (Direct Access Standards for Metering and Meter Data) as baseline</li> </ul>	<ul style="list-style-type: none"> <li>Facilitates consistent, effective and efficient process</li> <li>Ensure safety, accuracy and reliability of sub-meters and equipment</li> </ul>

### Submeter Technical Requirements and Standards

(continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Energy usage data compatible with the utility meter usage data</li> </ul>	<ul style="list-style-type: none"> <li>Sub-meter is capable of providing interval data (e.g. 15 minute interval data configuration)</li> </ul>	<ul style="list-style-type: none"> <li>Ensure data compatibility with master AMI meters</li> <li>Ensure accurate subtractive billing using interval data from sub-meters and master AMI meters</li> </ul>
<ul style="list-style-type: none"> <li>Certification of sub-meter workers/providers, data management agents</li> </ul>	<ul style="list-style-type: none"> <li>EV participants jointly develop these, using DASMMMD (Direct Access Standards for Metering and Meter Data) as baseline</li> </ul>	<ul style="list-style-type: none"> <li>Facilitates consistent, effective and efficient process</li> <li>Ensure safety, accuracy and reliability of sub-meters and equipment</li> </ul>

## Submeter Technical Requirements and Standards (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Safety risk</li> </ul>	<ul style="list-style-type: none"> <li>Use applicable and existing national and state standards &amp; requirements (e.g. UL, NEC, FCC, ANSI, DASMMMD)</li> </ul>	<ul style="list-style-type: none"> <li>Ensure customer, service worker and public safety on the use of sub-meters, sub-metering site along with installation, maintenance and testing</li> </ul>
<ul style="list-style-type: none"> <li>Accurate billing</li> </ul>	<ul style="list-style-type: none"> <li>Use applicable and existing national and state standards &amp; requirements (e.g. ANSI, DASMMMD)</li> </ul>	<ul style="list-style-type: none"> <li>Ensure accurate billing to EV customers</li> </ul>
<ul style="list-style-type: none"> <li>Reliable submeter</li> </ul>	<ul style="list-style-type: none"> <li>Use applicable and existing national and state standards &amp; requirements (e.g. ANSI, DASMMMD)</li> </ul>	<ul style="list-style-type: none"> <li>Ensure reliable EV sub-meters and related products</li> </ul>

## Appendix J – Communication Functionality, Standards, and Security Requirements

### Communication Functionality, Standards, Security

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Establish an interface between 3<sup>rd</sup> parties and utilities to share 3<sup>rd</sup> party sub-metering data for billing purposes</li> </ul>	<ul style="list-style-type: none"> <li>Utilize existing utility systems to implement interface standard</li> <li>Utilize the NAESB Energy Services Provider Interface (ESPI) standard</li> <li>Leverage the OpenSG OpenADE working group to create an ESPI profile or necessary document modifications to align with proposed sub-metering phased approach</li> </ul>	<ul style="list-style-type: none"> <li>Allows for broader participation from interested stakeholders including other utilities</li> <li>ESPI standard consists of 3<sup>rd</sup> party/utility interface for customer energy usage including data model, 3 way agreement, and data security</li> <li>Harmonized with NAESB / NIST PAP10 Energy Usage Information Model and the IEC TC57 CIM Model.</li> </ul>

### Communication Functionality, Standards, Security (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>3<sup>rd</sup> parties must be certified to communicate through the interface</li> </ul>	<ul style="list-style-type: none"> <li>Use the certification authority and processes in development by OpenSG OpenADE</li> </ul>	<ul style="list-style-type: none"> <li>OpenSG OpenADE is developing a test plan and certification authority for ESPI</li> <li>Certification a costly and time-consuming process</li> </ul>
<ul style="list-style-type: none"> <li>Privacy and Security of the customer and energy consumption data</li> </ul>	<ul style="list-style-type: none"> <li>Common security and privacy requirements for customer and energy information (at rest and in transit)</li> <li>Included as part of the contractual relationship between customers, 3<sup>rd</sup> parties, and utilities (Terms and Conditions)</li> </ul>	<ul style="list-style-type: none"> <li>Ensure customer privacy and data security</li> <li>Comply with CPUC decision 11-07-056 (July 28, 2011)</li> </ul>

### Communication Functionality, Standards, Security (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Communication standards for sub-meters</li> </ul>	<ul style="list-style-type: none"> <li>3<sup>rd</sup> party communication complies with defined requirements identified in contractual relationship between customers, 3<sup>rd</sup> parties, and utilities</li> </ul>	<ul style="list-style-type: none"> <li>3<sup>rd</sup> party communication of customer data will most likely use proprietary systems based on market decisions</li> </ul>

## Appendix K – Methodology for Settling Disputes

### Methodology for Settling Disputes

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Establishment of the Customer / EVSP / Utility relationship introduces substantial complexity to utility billing and service delivery, and this more complex relationship has higher potential for dispute</li> </ul>	<ul style="list-style-type: none"> <li>Adopt, in concert with market participants, appropriate rules, procedures, prerequisites, and fees to mitigate conditions likely to generate disputes</li> </ul>	<ul style="list-style-type: none"> <li>Current DA rules, procedures, and fees provide precedent for the adoption of similar infrastructure in the EV market                             <ul style="list-style-type: none"> <li>The new concepts of submetering and partial 3<sup>rd</sup> party loads dictate development of additional rules specific to EV</li> </ul> </li> </ul>

### Methodology for Settling Disputes (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Utilities will need to recoup costs for billing and related services rendered to EVSP</li> </ul>	<ul style="list-style-type: none"> <li>Leverage current DA discretionary and non-discretionary fee structure, and/or build costs into EV rates</li> </ul>	<ul style="list-style-type: none"> <li>Prevent ratepayers from subsidizing EV customers</li> <li>Reduce cost and time of modification</li> </ul>
<ul style="list-style-type: none"> <li>Utility credit and collection procedures, including service disconnects, will impact EVSP's service delivery in a submetered configuration</li> </ul>	<ul style="list-style-type: none"> <li>Utility is not intending to modify or deviate from its standard collection cycle practices. Rather, we would look for the EVSPs to adopt policy and practices consistent with the utility's</li> </ul>	<ul style="list-style-type: none"> <li>Current DA rules, procedures, and fees specific to credit policy and UDC consolidated billing provide precedent for the adoption of similar infrastructure in the EV market</li> </ul>

## Methodology for Settling Disputes (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>The possible combination of Direct Access and EVSP submetered services will add further complexity to the overall utility / customer relationship, and billing systems and processes in particular</li> </ul>	<ul style="list-style-type: none"> <li>Current DA rules were not designed to address this new decision, and will require significant restructuring to properly facilitate EV submetering</li> </ul>	<ul style="list-style-type: none"> <li>Potential changes to Rule 22 and overall DA to accommodate multiple service providers (at a single premise)                             <ul style="list-style-type: none"> <li>Rule 22 (sec b.9) guidelines specifically prevent the splitting of DA loads</li> </ul> </li> </ul>

## Methodology for Settling Disputes (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Utilities and customers will need ability to contact EVSPs in the event of billing issues or other disputes</li> </ul>	<ul style="list-style-type: none"> <li>Put rules and protocols in place to assure appropriate customer service contact for customers and utilities, such as availability during CA business hours</li> </ul>	<ul style="list-style-type: none"> <li>Since the EVSP owns and/or reads the submeter, disputes involving the accuracy of that data, or other billing concerns, will involve timely customer and/or utility communication with the EVSP</li> </ul>

## Appendix L- Develop Rules for Incorporating Subtractive Billing into Submetering Tariffs

### Develop Rules for Incorporating Subtractive Billing into Submetering Tariffs

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>Amend tariffs or develop new rule(s)</li> </ul>	<ul style="list-style-type: none"> <li>Look at existing rates and rules to determine which areas will require new language or modifications                             <ul style="list-style-type: none"> <li>Relationships with ESPs</li> <li>Direct Access rules (where applicable)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Existing tariffs appear sufficient with some modification</li> <li>Avoid duplication in tariffs</li> <li>Reduce cost and time of modification</li> </ul>
<ul style="list-style-type: none"> <li>Complexity and additional cost of multiple ESPs providing DA power at the master meter <u>and</u> multiple submeters</li> </ul>	<ul style="list-style-type: none"> <li>Maintain existing rules that load cannot be split (you can have only one generation supplier)</li> </ul>	<ul style="list-style-type: none"> <li>Splitting DA load complexity, cost, and technical challenges for customers, 3<sup>rd</sup> parties, and utilities</li> </ul>

### Develop Rules for Incorporating Subtractive Billing into Submetering Tariffs (continued)

ISSUES	RECOMMENDATIONS	RATIONALE
<ul style="list-style-type: none"> <li>We anticipate the need for subtractive billing for future products and services</li> </ul>	<ul style="list-style-type: none"> <li>Develop solutions applicable on a broad basis</li> </ul>	<ul style="list-style-type: none"> <li>Avoid creating a new solution for every new product or service</li> </ul>
<ul style="list-style-type: none"> <li>Utilities will need to recoup costs due to data collection, assembly, and QC services provided to ESPs</li> </ul>	<ul style="list-style-type: none"> <li>Leverage current approach to DA discretionary and non-discretionary fees and/or build cost into EV rates</li> </ul>	<ul style="list-style-type: none"> <li>Prevent unintended subsidies of EV rates</li> <li>Reduce cost and time of modification</li> </ul>
<ul style="list-style-type: none"> <li>How we extend demand response controls to EVSPs</li> </ul>	<ul style="list-style-type: none"> <li>There should be interval usage measurement</li> <li>The EV service should have some capacity for demand response load control</li> </ul>	<ul style="list-style-type: none"> <li>Customers should have this option</li> <li>Load is significant enough to warrant DR approach</li> </ul>
<ul style="list-style-type: none"> <li>Impact on utility business processes</li> </ul>	<ul style="list-style-type: none"> <li>Fixed and mobile submeters in a variety of scenarios will require different enrollment, tracking, and QA processes</li> </ul>	<ul style="list-style-type: none"> <li>Experience with DA and other programs</li> </ul>

## Appendix M – Closing Comments

### Summary of Utility Perspectives

- **PG&E, SCE, and SDG&E support CPUC's key policy goals of:**
  - Facilitating the expansion of the EV market
  - Enabling customers to identify options best serving their needs
  - Ensuring consumer experiences with charging EV are positive
  - Supporting the on-going development of metering technology and services to improve EV charging
  - Supporting the environmental benefits of EV

### Summary of Utility Perspectives (continued)

- **PG&E, SCE, and SDG&E's initial analysis has produced the following recommendations:**
  - **Submeter Technical Performance Requirements and Standards**
    - Use modular submeters to facilitate required installation and maintenance, as well as certification and accuracy testing
    - Require submeter kWh usage data to be compatible with utility meter data formats to ensure data subtraction accuracy and reliability
    - Use DASMMD as the baseline for documenting standards assuring utility-quality data handling
    - Use appropriate national standards to assure load measurement and management safety, accuracy, reliability, and data security
    - Use national standards relevant to products installed in residences and/or commercial properties (e.g., NEC, NEMA, UL) to assure safety

## Summary of Utility Perspectives (continued)

- **PG&E, SCE, and SDG&E's initial analysis has produced the following recommendations:**
  - **Communication Functionality, Standards, and Security**
    - Define 3-way contractual relationships needed between customers, utilities, and 3rd parties to ensure data privacy and security
    - Use NAESB ESPI standard for 3rd party/utility data interfaces
    - Use existing certification authorities and processes currently in development by OpenSG OpenADE to certify 3rd parties to communicate through the data interfaces

## Summary of Utility Perspectives (continued)

- **PG&E, SCE, and SDG&E's initial analysis has produced the following recommendations:**
  - **Methodology for Settling Disputes**
    - First, establish mechanisms to mitigate conditions likely to generate disputes involving multiple parties involved in installation, billing, service delivery, and special programs
    - Leverage current approach to DA discretionary and non-discretionary fees (and/or build cost into EV rates) to recoup the start-up and ongoing costs enabling subtractive billing
    - Integrate utility and 3rd party credit, collection, and disconnection policies and processes so as to avoid one party negatively affecting the customer relationship of the other
    - Leverage DA rules to mitigate customer dissatisfaction when EV submeter, NEM, and/or DA programs produce complex customer service relationships and billing arrangements
    - Put rules and protocols in place to assure appropriate customer service contact for customers and utilities, such as availability during CA business hours

## Summary of Utility Perspectives (continued)

- **PG&E, SCE, and SDG&E's initial analysis has produced the following recommendations:**
  - **Rules for Incorporating Subtractive Billing into Submetering Tariffs**
    - IOUs will evaluate existing rates and rules to determine which areas will require new language or modifications
    - IOUs recommend maintaining rules that loads cannot be split in order to avoid unnecessary complexity, cost, and technical challenges for customers, utilities, and 3<sup>rd</sup> parties
    - Develop rule and tariff solutions applicable not only for EV load but for possible additional uses of submetering in the future
    - The EV service should have some capacity for demand response load control
    - Enhance utility business processes to accommodate the variety of enrollment, charging, tracking, billing, and QA scenarios expected for fixed and mobile submeters

## Summary of Utility Perspectives (continued)

- **The IOUs have also concluded that given the complexities and uncertainties of developing a submetering protocol as well as the current low adoption rates of 2<sup>nd</sup> meters by EV customers:**
  - A phased approach offers the best strategy for enabling the submetering of EV load while matching development costs with actual, evolving marketplace demand
  - The approach would be split into four phases:
    - Define / Plan
    - Design / Develop
    - Build Interim Solution
    - Build Scalable Solution

## Summary of Utility Perspectives (continued)

We are considering an approach to submetering in which the IOUs, consumers, and 3rd party stakeholders learn and collaborate on building a submetering protocol for California

- **Phase 1: Define / Plan (in progress)**

- Define the CA submetering protocol roadmap
- Conduct market assessment
- Maintain regulatory communications

- **Phase 2: Design / Develop (in progress)**

- Develop the California submetering protocol
- File Tier 2 advice letter
- Maintain regulatory communications

## Summary of Utility Perspectives (continued)

We are considering an approach to submetering in which the IOUs, consumers, and 3rd party stakeholders learn and collaborate on building a submetering protocol for California

- **Phase 3: Build Interim Solution**

- Implementation - build, test, and refine the necessary processes, systems, and system interfaces
- Pursue development of national standards for submeters and subtractive billing arrangements
- Enable 3-way handshake among the utility, customer, and 3rd party
- Develop 3rd Party certifications – for devices, systems, and processes
- Develop and carry out a customer information campaign

## Summary of Utility Perspectives (continued)

We are considering an approach to submetering in which the IOUs, consumers, and 3rd party stakeholders learn and collaborate on building a submetering protocol for California

### • Phase 4: Build Scalable Solution

- Upgrade utility systems to handle automated, full-scale subtractive billing
- Leverage utility investments in Smart Grid technologies and standards



## Submetering Protocol Next Steps

- Prepare workshop summary report (due 15 days after workshop)
- Continue roadmap development
- Proposed work teams (3rd parties, IOUs, Division of Measurement Standards); expected to begin in November 2011:
  1. Use Case Team
  2. Technical Performance Requirements Team
  3. Communications & Security Team
  4. Billing and Regulatory Requirements Team
- Start developing submeter protocol roadmap report (due December 31, 2011)



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