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 ROADMAP 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) 302-6713
Facsimile: (626) 302-6693
E-mail: andrea.tozer@sce.com

Dated: **January 3, 2012**

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SUBMETERING PROTOCOL ROADMAP REPORT

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),[1] Southern California Edison Company (U 338-E) submits, on behalf of itself, Pacific Gas and Electric Company (U 39-M), and San Diego Gas & Electric Company (U 902-M) (the Utilities), this Submetering Protocol Roadmap Report (Roadmap Report), attached hereto as Attachment A.

As directed by the Decision, the Utilities formed a working group and collaborated with stakeholders to develop a submeter protocol. The Utilities prepared this Roadmap Report with input from third party participants on key technical issues; however, it has not been reviewed or subject to comment by third parties and reflects primarily the assessment of the Utilities unless otherwise noted. Therefore, the Utilities recommend that the Roadmap Report be subject to review and comment by third parties as part of the collaborative process and anticipate that the

[1] The Utilities requested an extension of time to file this Roadmap Report until December 31, 2011, which was granted by the letter from Executive Director Paul Clanon, dated October 12, 2011. Because December 31, 2011, falls on a Saturday and the following Monday is a holiday, the Utilities submit this compliance filing on January 3, 2012, in accordance with Rule 1.15 of the California Public Utilities Commission Rules of Practice and Procedure.

Roadmap for development of a submeter protocol will evolve as the market for plug-in electric vehicles develops and the Utilities receive additional information from stakeholders.

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

January 3, 2012

ATTACHMENT A

SUBMETERING PROTOCOL ROADMAP REPORT

R.09-08-009 RMD/eam

Submetering Protocol Roadmap 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 Company

San Diego Gas & Electric Company

January 3, 2012

A California Investor-Owned Utilities joint initiative.

Contents

1. Executive Summary [1]

Project Background

The California Public Utilities Commission (CPUC) has directed the California Investor Owned Utilities (IOUs), where possible, to consult with appropriate stakeholders of the Public Electric Vehicles Collaborative and national standards bodies to develop a Submetering Protocol for electric vehicles. These stakeholders include representatives of the Plug-in Electric Vehicle industry, consumer groups, and others as well as the Energy Division of the CPUC. The IOUs consider this Roadmap Report a snapshot of a point in time in the collaborative, with issues and solutions expected to evolve as greater clarity into customer needs, 3rd party products and services, submetering technology and costs, and regulation are achieved.

Project Methodology

To establish the path to identifying the issues and solutions that will lead to the Submetering Protocol, four working teams were formed comprised of more than 100 people from the utilities, State of California, and 3rd party organizations to address the 7 areas specified by the CPUC in its Phase 2 Decision on developing a Submetering Protocol. These teams were:

1. Use Case Identification.
2. Billing and Regulatory.
3. Meter Requirements, Compliance, and Standards.
4. Communication and Security.

Submetering Use Cases

Use cases are the first step in the development of business and functional requirements. Based on a collaborative effort involving utility and other stakeholders, a total of 17 fundamental use cases were identified. The 17 fundamental use cases defined to date will be used to develop tariff and technical requirements based on our current collective understanding of potential submetering impact, feasibility and cost-effectiveness. It is anticipated that additional use cases may be identified as the working group continues to develop the Submetering Protocol.

For each use case, a diagram was produced depicting each scenario and the association between 3rd parties such as data management agents and utility systems. In addition, the IOUs performed a high level implementation analysis listing all perceived advantages and disadvantages.

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[1] Section source: Primarily PG&E, SCE, SDG&E, based on working group team meetings, individual telephone and email communication among utilities and third parties, and inter-utility communication.

Submetering Billing and Regulatory Requirements

The Billing and Regulatory team assessed the potential impact use cases may have on current tariffs to determine the need for potential future tariff refinement and development. Present tariffs for Direct Access (DA) served as a useful base, because through DA, the Commission has previously decided matters of unbundling of utility services, and requirements for third parties to become an integrated component of the utility billing system. The Roadmap Report identifies the billing and regulatory dependencies and issues to be addressed. For example, a key initial conclusion is that, as is the case with DA, split loads should not be allowed.

Submetering Technical Requirements

The Technical Requirements Team identified the technical requirements and standards to establish EV submetering. The team, as is the case with the Billing and Regulatory Team, used the Direct Access Metering and Data Standards (DASMMD) as a starting point, and identified how these standards, which were developed following a very detailed process under Commission direction, could be applied to submetering.

To future-proof submeter designs, the Technical Requirements team concluded that functionality should include bi-directional capabilities enabling vehicle-to-grid functionality; demand response capabilities enabling load control; NEM capabilities enabling the combined measurement of self-generation and battery charging and remote firmware and configuration update capabilities.

Submetering Communications, Security, and Standards Requirements

The Communications team began to identify the requirements and standards necessary to establish data exchange between 3rd party devices and the utility. Among the various topics addressed by the communications team are methods of securing and protecting EV customer data. The team concluded that developing communication functionality for the Submetering Protocol in the short term is best served by leveraging existing standards including NAESB ESPI, OpenSG OpenADE and OAuth as well as benchmarking functionality and security approaches used in other industries such as Health Care (HIPAA) and Credit Cards (PCI). Moving forward into the mid and long-term the availability of future standards such as SmartEnergy 2.0 will give industry an opportunity to adopt more advanced used cases.

Submetering Protocol Policy and Implementation Strategies

The roadmap further defines dependencies and some guiding principles identified by the three IOUs to incorporate into the development of the Submetering Protocol:

- The Submetering protocol will focus on matters within CPUC's policy and regulatory jurisdiction because the CPUC must enforce the protocol and resolve disputes among utilities, EVSPs and customers.

- For example, the protocol will need to focus on how submeters may be used in lieu of IOU separate meters for IOU billing purposes in accordance with similar standards and protocols used for customer-owned separate meters under DA program.
- The protocol will not address EVSP third party business issues, such as the terms and conditions of a third party's sale of electricity for use as EV fuel because the CPUC (in its Phase 1 decision) determined it will not regulate the terms and conditions of third party fuel sales.

- The protocol will address the rights and obligations of IOUs, customers and third parties as to the use of submeters by customers and IOUs for IOU billing purposes.
- The protocol will be documented in CPUC-approved tariffs and associated technical documents.
- The IOUs have an obligation to accurately bill their customers; consequently, the IOUs will continue to separately meter their separate customers.
- For customer-owned submeters used by IOUs for billing, meter reading and/or meter maintenance may be offered by the IOU or by qualified third parties consistent with DA model.
- Billing disputes will continue to be resolved by the CPUC the same as billing disputes generally.
- IOU costs associated with the use of submetering or parallel metering for IOU billing purposes will be subject to review and cost recovery approval by the CPUC, the same as other utility costs of service.

Submetering Roadmap

The Roadmap timeline illustrated on the next page depicts a long-term, multi-phase view of Submetering Protocol planning, development, and implementation.

- Phase 1 represents the definition of a California Submetering Protocol roadmap that has been developed by the project working groups and detailed in this report document.
- Phase 2 consists of the activities required to develop a California Submetering Protocol.
- Phase 3 consists of implementing a Submetering Protocol solution making customer- and 3rd party-owned submetering available to customers in California for billing purposes. During this stage utilities will be able to execute manual, small scale subtractive billing of EV charging loads.
- Phase 4 again enables customer- and 3rd party-owned submetering; however in this phase national standards are complete and implemented, and utilities will be able to execute automated, full-scale subtractive billing of EV charging loads.
- Phase 5 represents long term solutions including—but not limited to—the deployment of Smart Grid field area networks capable of communicating with customer devices.

	Phase 1 **Define / Plan**	Phase 2 **Design / Develop**	Phase 3 **Build Interim Solution**	Phase 4 **Build Scalable Solution**	Phase 5 **Build Smart Grid Solution**
	Current Planning and Development of Submetering Protocol		**Short-Term Implementation**	**Mid-Term Implementation**	**Long-Term Implementation**
DESCRIPTION	**CUSTOMER OR 3RD PARTY-OWNED SUBMETERING IS AVAILABLE TO CUSTOMERS FOR *NON-BILLING* PURPOSES**		**CUSTOMER OR 3RD PARTY-OWNED SUBMETERING IS AVAILABLE TO CUSTOMERS FOR *BILLING* PURPOSES**		**NEXT GENERATION TECHNOLOGY IS AVAILABLE**
	• IOU customers may have the choice of residential and several EV rates • IOU customers can continue to use the utility's single whole house meter, which includes EV charging and billing • IOU customers can add a parallel meter service panel for a dedicated utility-owned and read parallel meter for EV charging and billing • IOU customers can install a submeter, either owned by the customer or a 3rd party, and receive usage data from those (non-utility) sources for energy monitoring		• Submeters for IOU subtractive billing are owned by customers or 3rd parties • Submeter data for IOU subtractive billing to be provided according to protocol (includes submeter ID, premise ID, and date/time stamped interval usage) • Utilities execute manual, small scale subtractive billing of EV charging loads • Full utility cost recovery in place for upgrades to IT/billing systems and related costs	• National Standards are in place • Submeters for subtractive billing are owned by customers or 3rd parties • Submeter data for IOU subtractive billing to be provided according to protocol • Utilities execute automated, full scale subtractive billing • Full utility cost recovery in place for upgrades to IT/billing systems and related costs	• Mobile meters meet technical performance and certification requirements are market available. • Division of Measurement Standards has developed and implemented procedures for certifying mobile meters. • Utilities deploy Smart Grid field area networks capable of communicating with customer devices • National Standards are in place (Power Line Communications) for associating mobile submeters electrically to master meters • NEM meters have the ability to report disaggregated data (load and generation)
ACTIVITIES	• Define a California Submetering Protocol Roadmap - Goals, objectives, scope, guidelines - List of Issues and/or Requirements and Preliminary Recommendations - Key tasks or activities and timing for each - Responsible organizations and individuals for each • Complete and submit the Submetering Roadmap Report	• Develop a California Submetering Protocol - Marketplace understanding - Business requirements and specs for utilities, customers and 3rd party meter service providers - Technical, security, privacy requirements, specs, and standards aligned with national standards - Architectural design for end-to-end systems (including back office integration) - Implementation strategy and plan, schedule, tasks, and deliverables	• Implement a solution - build, test, and refine the necessary processes, systems, and system interfaces • Pursue development of national standards for submeters and subtractive billing • Enable 3-way handshake among the utility, customer, and 3rd party meter service provider • Develop certification process for 3rd party devices, systems, processes • Develop and carry out customer information campaign	• Upgrade utility systems to handle automated, full-scale subtractive billing • National standards are implemented	• Verify that mobile submeters are deployed consistent with all technical and billing requirements • Leverage investments in Smart Grid Technologies by using an advanced field area network to collect customer submeter data • Assess the market value of inter-utility communications to address vehicle "roaming"

Conclusions

Based on the four months of comprehensive analysis of the issues related to submetering, the IOUs reached the following conclusions:

- Submetering for non-billing purposes can be done today under CPUC-approved tariffs and does not involve utilities or require new protocols.
- EV penetration has been limited to date and has not justified the cost of automating IOU subtractive billing to support revenue-grade submetering of EV loads.
- It is critical to better understand what our customers want with respect to sub-metering and other solutions to EV metering, and steps to achieve this understanding have been built into the roadmap.
- The emerging submetering market is expected to grow slowly until technological advances provide customers with low cost, innovative solutions.
- Implementing submetering is dependent on and driven by, at a minimum, the resolution of the following 7 issues identified by the CPUC:
  - Feasible use of submeters in various locations.
  - Technical performance requirements for submeters.
  - Minimum communication functionality and standards to be met.
  - Security and privacy of EV user data collected by utilities and third party entities.
  - Methodology for settling billing disputes and other issues among utilities, 3rd parties, and customers.
  - Compliance with national standards for measurement and communication functions.
  - Rules for incorporating subtractive billing into submetering tariffs.
- In addition to the above 7 issues identified by the CPUC, the IOUs believe there are additional financial and market issues to be considered, including recovery of the costs of upgrading utility advanced metering infrastructure (AMI) and billing systems.
- Therefore, submetering should be implemented through a phased approach described in the roadmap, based on customer demand for submetering, market/technology realities and cost of implementation of various submetering solutions compared to other alternatives, such as parallel metering and non-revenue-grade submetering.
- Based on this phased approach, the IOUs do not anticipate developing and implementing potentially costly IT back-office system solutions until the EV markets develop sufficiently.
- While the teams attempted to address all the issues identified, in the coming months, further work will be required as the roadmap report cannot fully resolve all these issues at this time.

2. Introduction to Roadmap Report

2.1 Roadmap Report Structure

This roadmap report is the result of a process where the IOUs collaborated with 3rd party stakeholders. However, this roadmap report has been prepared solely by the IOUs as a compliance filing pursuant to the Phase 2 Decision. The IOUs consider it a snapshot of a point in time, with understanding, issues, and solutions expected to evolve as greater clarity into customer needs, 3rd party products and services, submetering technology and costs, and regulation is achieved. Primary contributors to each section are identified throughout the report.

The following content is provided:

- **Introduction to Roadmap Report:** Project objectives and background, and Alternative Fueled Vehicles Order Instituting Rulemaking (AFV OIR) requirements.
- **Roadmap Dependencies Evaluation (IOU-Developed)**: IOU assessment of and conclusions regarding unresolved technical, financial and regulatory issues that need to be resolved by further action by the California Public Utilities Commission (CPUC) prior to further development of the Submetering Protocol, including issues relating to CPUC policies and authority over submetering requirements, third party metering service providers, subtractive billing disputes, and related matters; and—based on these unresolved issues—key principles recommended for guiding the resolution of these issues for further development and implementation of EV submetering.
- **Use Case Evaluation (IOU-Developed)**: IOU descriptions of use case purpose, development, and evaluation criteria and detailed technical assessments of 17 use cases.
- **Submetering Implementation Issues and Requirements (Developed by IOUs and 3rd Parties)**: Descriptions of submetering technical requirements; communication functionality, standards, and security; and billing and regulatory requirements and protocols.
- **Roadmap for Development of Submetering Protocol (IOU-Developed)**: Descriptions of feasible multi-stage submetering development and implementation paths based on current understanding of technical feasibility, regulatory and financial issues.
- **Appendices:** Detailed Submetering Requirements Matrices; and Glossary of Abbreviations.

2.2 Project Objectives & Background

2.2.1 AFV OIR Requirements [2]

2011 AFV OIR Phase 2 Decision

The Phase 2 Decision included the following key directives on development of Submetering Protocols:

- "The utilities must cooperate with stakeholders to form a working group to develop an Electric Vehicle submeter protocol that could be adopted by the CPUC.
  - Utilities should provide multiple EV metering options, including single whole house, separate parallel, and submetering at various locations, and
  - EV submeters and EV charging service equipment should be treated consistent with the treatment of any other equipment located on the customer side of the meter."

- The utilities are to include in the working group, at a minimum, Commission Staff, California Department of Food and Agriculture, automakers, and electric vehicle service providers.

- The filed protocol must achieve, at a minimum, the following:
  - Support the use of submeters located in electric vehicle service equipment or on a vehicle, including mobile detachable meters.
  - Determine the technical performance requirements for any submeters.
  - Identify the minimum communication functionality and standards.
  - Describe how submeter data management will support and protect the security and privacy of Electric Vehicle user data collected by utilities and third party entities.
  - Provide a methodology for settling disputes.
  - Identify and adhere to all existing and applicable national standards for measurement and communication functions.
  - Develop rules for incorporating subtractive billing into submetering tariffs.

[2] Section source: California Public Utilities Commission

On July 28, 2011, the Assigned Commissioner's Scoping Memo Ruling – Phase 3 clarified the timing of Phase 2 Decision deliverables. These dates were confirmed in a letter from CPUC Executive Director Paul Clanon dated October 12, 2011:

- Hold public workshop by October 31, 2011 and file a report 15 days later.
- Submit roadmap report by December 31, 2011.
- File a Tier 2 advice letter by July 31, 2012 supporting the implementation of submeter protocol.
- Submit tariff sheets to establish rules for use of customer submeters by September 1, 2012.

2.2.2 Roadmap Report Development Methodology [3]

The IOUs:

- Kept in place the joint IOU project coordination team established in September 2011 to respond to the Submetering Protocol order in the CPUC's Phase 2 Decision.
- Conducted a November 14 Roadmap Report WebEx kickoff meeting to which the entire Alternative Fueled Vehicle - Order Instituting Rulemaking (AFV OIR) Service List and October 27, 2011 Submetering Protocol Workshop attendees were invited.
- Formed use case, technical requirements, billing & regulatory, and communications teams comprised of more than 20 parties representing utility, State of California, and 3rd party organizations to address the 7 areas specified by the CPUC in its Phase 2 Decision on developing a Submetering Protocol.
- Analyzed the feasibility of various use cases identified.
- Facilitated 5 weeks of team meetings spanning over 30 hours of formal discussion, along with numerous email exchanges and individual telephone conversations, to review submetering requirements and open issues within the framework of the 7 guidelines specified by the CPUC.
- Provided weekly status reports to all working group members.
- Completed internal IOU reviews and meetings to assess submetering jurisdictional and consumer protection issues and develop key principles to guide the development of a Submetering Protocol.

[3] Section source: PG&E, SCE, SDG&E

- Conducted an all-hands Roadmap Report Development Team Meeting on December 16 to present draft Roadmap issues and implementation recommendations and receive 3rd party comments.
- Responded to a November 29, 2011 CPUC Data Request for information on how utility AMIs could be leveraged for submetering data communication with their individual submittals on December 20, 2011.
- Drafted, reviewed, and completed this Submetering Protocol Roadmap Report and submitted it to CPUC on January 3, 2012.

2.2.3 Participants

Invitations to participate in the collaborative were sent to all members of the AFV OIR Service List. Participants in the team meetings and WebEx conference calls included representatives of the following organizations:

- AeroVironment
- Alameda County Dept. of Agriculture/Weights & Measures
- Argonne National Laboratory
- Better Place
- California Public Utilities Commission Energy Division
- California Department of Food and Agriculture - Division of Measurement Standards
- Community Renewable Solutions, on behalf of the Green Power Institute and Community Environmental Council
- Coulomb
- Deloitte Consulting
- Division of Ratepayer Advocates
- Digi International
- ECOtality NA
- EV Connect
- Ford Motor Company
- General Electric
- Itron
- Pacific Gas and Electric Company
- Plug Smart
- San Diego Gas & Electric
- Southern California Edison
- Sustainable Unlimited Mobility Group, Project Green On Ramp
- Tendril, Inc.
- ThinkSmartGrid

3. POLICY AND IMPLEMENTATION DEPENDENCIES [4]

3.1.1 Open Issues for Roadmap

- There are uncertainties surrounding the development of third-party EV charging markets and associated willingness of EV customers or EVSPs to pay for costs of submetering for subtractive billing. Development of cost-effectiveness and market assessments are needed to justify automated IOU-third party subtractive billing processes, which are necessary first steps in the evaluation of Submetering Protocols.
  - Mitigation strategy: further assessment of submetering for subtractive billing feasibility and cost-effectiveness compared to alternatives such as separate metering, and phased implementation with manual processes and non-revenue grade submetering for non-billing purposes in near-term until and unless third party- and customer-supported, revenue-grade subtractive billing is feasible and cost-effective in longer-term.
- Communications interface and national standards including HAN implementation not ready yet.
  - Mitigation strategy: Coordinate with and complete HAN implementation and open SEP 2.0 national standards prior to EV Submetering Protocol.
- Enforcement of Submetering Protocol including consumer protections and billing dispute resolution uncertain under Phase 2 decision (CPUC vs. Dept. Food & Agriculture).
  - Mitigation strategy: the CPUC needs to clarify the Phase 2 decision and establish its enforcement authority for the Submetering Protocol, including standards and billing regulation, meter inspection and maintenance and resolving consumer complaints and disputes.

3.1.2 Consumer Protection Questions

- What is the CPUC's jurisdiction over Submetering Protocol and subtractive billing?
  - Phase 2 orders development and adoption of Submetering Protocol by IOUs, but does not assert jurisdiction to enforce it against third-parties or to adjudicate billing disputes among utilities, third parties and customers.
  - Phase 2 decision defers to Dept. Food & Ag to regulate and certify meter accuracy.
- Because the decision is unclear as to the CPUC's jurisdiction, the CPUC should clarify its Phase 2 decision to provide for enforcement authority prior to moving forward with further Submetering Protocol development.

[4] Section source: PG&E, SCE, SDG&E

3.1.3 Guiding Principles for Resolving Dependencies Relating to EV Submetering Protocol Development

- Submetering protocol will focus on matters within CPUC jurisdiction because the CPUC must enforce the protocol and resolve disputes among utilities, EVSPs and customers.
  - For example, the protocol will focus on how submeters may be used in lieu of IOU separate meters for IOU billing purposes in accordance with similar standards and protocols used for customer-owned separate meters under the Direct Access (DA) program.
  - The protocol will not address EVSP third party business issues, such as the terms and conditions of a third party's sale of electricity for use as EV fuel because the CPUC (in its Phase 1 decision) determined it will not regulate the terms and conditions of third party fuel sales.
- The protocol will address the rights and obligations of IOUs, customers and third parties as to the use of submeters by customers and IOUs for IOU billing purposes.
- The protocol will be documented in CPUC-approved tariffs, associated technical documents, and cost recovery decisions.
- The IOUs have an obligation to accurately bill their customers; consequently, the IOUs will continue to separately meter their separate customers.
- For customer-owned submeters used by IOUs for billing, meter reading and/or meter maintenance may be offered by the IOU or by qualified third parties consistent with DA model.
- Billing disputes will continue to be resolved by the CPUC the same as billing disputes generally.
- IOU costs associated with the use of submetering or parallel metering for IOU billing purposes will be subject to review and cost recovery approval by the CPUC, the same as other utility costs of service.

4. USE CASE EVALUATION [5]

4.1 Background

4.1.1 Purpose and Application of Use Cases

A Use Case is a structured scenario developed for discussion purposes to aid in the selection and planning of complex technical projects. Use Cases enable the evaluation of how various solutions are likely to affect customers, systems, and project stakeholders. As a consequence, Use Cases help project decision-makers determine which approaches are not feasible and which, among approaches that are feasible, have the greatest likelihood of success for all stakeholders. Use Cases are generally one of the first steps in developing business and functional requirements for complex projects.

Objectivity is key to the effective development and review of Use Cases. The preliminary development of the Use Cases in this roadmap does not mean any of the Use Cases are currently feasible, cost-effective, desirable, or preferred by customers or stakeholders. The sole assessment included in these Use Cases to date is an assessment of technology feasibility without regard to cost-effectiveness, market conditions, or customer demand. The listing of the Use Cases does not indicate a consensus or preference among the IOUs or other stakeholders at this stage of Submetering Protocol development.

4.1.2 Use Case Development Process

The IOUs initially created a list of Use Cases representing several applications of submetering. For completeness, the list was presented to 3rd Parties and the CPUC; thereupon, more Use Cases were added. The collective effort, through discussions among these participants, helped define and clarify the identified set of Use Cases. Each use case assumes original vehicle, charging equipment, submeter owner, and customer at original location. Use Case variations involving resale or movement of equipment and/or customers add complexity the IOUs are not prepared to address at this time. Additional variations of these Use Cases could also potentially be developed for fixed, mobile, single, and multiple submeter scenarios, based on further 3rd Party recommendations.

[5] Section source: Primarily PG&E, SCE, SDG&E, based on working group team meetings, individual telephone and email communication among utilities and third parties, and inter-utility communication.

4.1.3 Use Case Application to Submetering Protocol Roadmap

The Use Cases were then evaluated by the IOUs using a set of criteria to determine aspects of the actual implementation that could aid in the development of the roadmap. However, many of the responses to the evaluation criteria, which in turn affect the implementation, proved to be difficult to define and ultimately became subjective. Because submetering is still being conceptualized, there are a number of assumptions that were made that are either currently uncertain or have not been finalized, one example being the OpenEV standard. Because most, if not all, of the evaluation criteria to some extent depend on these details, it was difficult to clearly respond to each evaluation criteria.

4.1.4 Overview of fundamental use cases to be addressed

USE CASE NUMBER * and NAME	DESCRIPTION
0: Baseline: Parallel Metering	Premises usage and EV usage are metered separately using two Master Meters. Subtractive billing is not required.
1: Residential (Basic)	A 3rd Party sends fixed submeter data to the utility, who then calculated Premises usage through subtractive billing. Premises is billed both EV and premises usage.
2: Residential (Multiple EVs)	Variant of Use Case 1, with the exception that there are multiple fixed submeters on one premises.
3: Small Multi-Dwelling Unit (MDU)	Variant of Use Case 1, with the exception that there are multiple Master Meters on one premises.
4: Large Multiple Meter / Commercial Use	Variant of Use Case 1, with the exception that there are multiple fixed submeters on one premises and multiple 3rd Parties sending data to the utility.
5: No 3rd Party Involvement	The utility collects fixed submeter data through a utility-specified solution such as a Field Area Network and calculates Premises usage through subtractive billing.
6: Residential (Basic) w/ EVSP	A 3rd Party sends fixed submeter data to the utility, who then calculated Premises usage through subtractive billing. Premises is billed premises usage, and 3rd party is billed EV usage.
7: Residential (Multiple EVs) w/ EVSP	Variant of Use Case 6, with the exception that there are multiple fixed submeters on one premises.
8: Small Multi-Dwelling Unit (MDU) w/ EVSP	Variant of Use Case 6, with the exception that there are multiple Master Meters on one premises.
9: Large MDU (Garage) w/ EVSP	Variant of Use Case 6, with the exception that there are multiple fixed submeters on one premises and multiple 3rd Parties sending data to the utility.
10: Standard (MSub)	A 3rd Party sends mobile submeter data to the utility, who then calculated Premises usage through subtractive billing. Premises is billed both EV and premises usage.
11: In Parallel (FSub + MSub)	Combination of Use Case 1 and Use Case 10, where submeters are in parallel.
12: In-Series w/o Cross Talk (FSub + MSub)	Combination of Use Case 1 and Use Case 10, where submeters are in series. Mobile submeter communicates correctly.
13: In-Series w/ Cross Talk (FSub + MSub)	Combination of Use Case 1 and Use Case 10, where submeters are in series. Mobile submeter communicates incorrectly.
14: In-Series (2 MSubs)	Two mobile submeters are in series. Mobile submeters communicate incorrectly.
15: AMI	Variant of Use Case 5, with the exception that the solution is the utility's existing AMI Network.
16: Direct OpenEV	Variant of Use Case 1, with the exception that the customer sends fixed submeter data to the utility.
17: Net Energy Metering	Submetering is used on a premises configured for Net Energy Metering

* Please note that Use Case numbering has changed since the October 27, 2011 CPUC workshop.

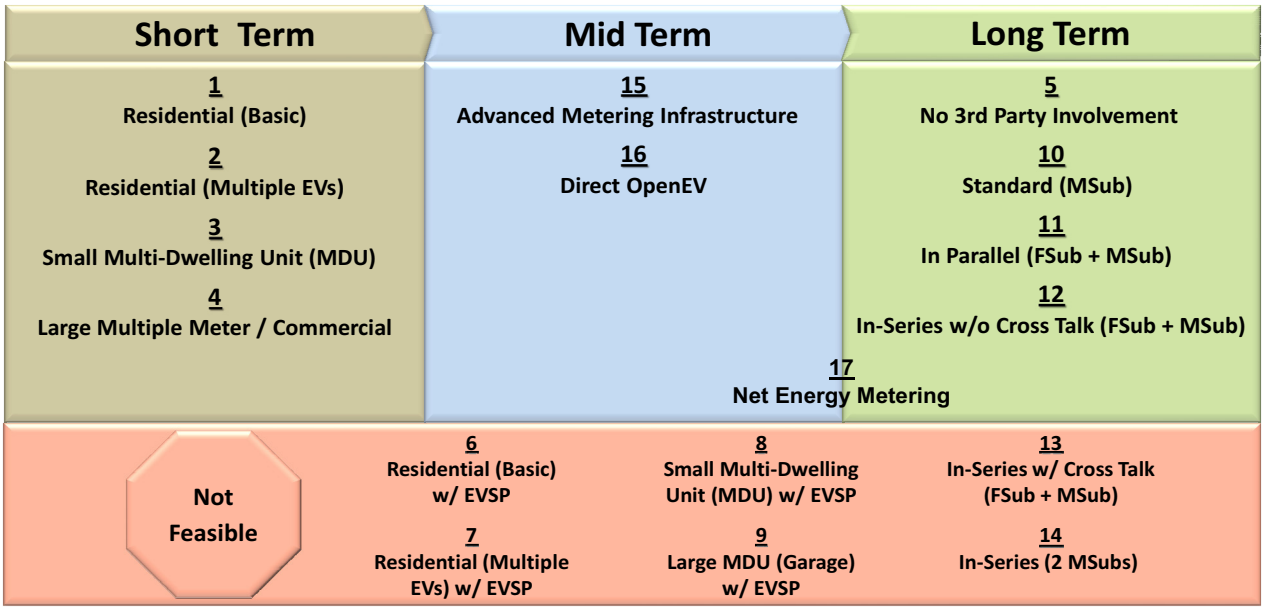
4.2 Use Case Evaluation

4.2.1 Summary

The Use Case preliminary analysis performed by the IOUs has identified which use cases can be implemented in the short-, mid-, and long term, and which cannot be implemented. The IOUs recognize there are technological developments, CPUC direction and funding approvals, and market factors that will affect the time periods described below:

Period / Use Cases *	Timing	Rationale
Short-Term	1-3 years from the CPUC's approval of the Submetering Protocol.	Assumes at this point in time that use case implementation may require only moderate investment and limited 3rd party integration.
Mid-Term	2-4 years from approval of the Submetering Protocol and approval of funding for back-office system upgrades.	Use Cases implemented in the mid-term are those requiring investment of time and funding in OpenEV and/or AMI.
Long-Term	Beyond mid-term.	Use Cases to be implemented in the long-term are based on next-generation technology such as mobile meters and smart grid field area networks.

* Actual short, medium, and long term timing could differ among utilities, based on different systems, technology, and smart grid roll-out plans.



4.2.2 Detailed evaluation of individual use cases

Each use case evaluation consists of four sections:

- Description.
- Diagram.
- Evaluation Criteria (detailed definitions below).
- Key Conclusions.

The criteria used for the implementation analysis of each Use Case are as follows:

- **Technological Characteristics**
  - Describes the technical characteristics of the devices needed to realize a particular scenario. These devices could include the master meter, submeter, premises identifier, communication network and/or any other hardware needed to achieve desired functionality.
- **Technical Availability**
  - Describes the availability of hardware supporting use case functionality in the current market environment. These criteria identify devices that are currently not available and those devices that can be leveraged today.
- **Utility Integration**
  - Summarizes an analysis of the relative ease or complexity by which submetering devices and/or hardware could be integrated with current and planned utility systems for the purpose of billing submetered EV charging.
- **National Standards**
  - Identifies the availability and/or lack of national standards necessary to achieve use case functionality.
- **Billing & Regulatory**
  - Identifies the possible positive or negative impacts each use case can have on utility billing systems and/or regulatory policy.

- **Utility Cost of Integration**
  - Evaluates the various scenarios from the perspective of the utilities' cost to implement the proposed use case.
- **Customer Experience (To be developed.)**
  - Describes the possible experiences customers may encounter when applying a particular use case.
  - As part of protocol development, the IOU's will seek further input from 3rd parties and customers for each use case.
- **Customer Cost Factors (To be developed.)**
  - Describes the possible cost impacts on a customer when applying a particular use case.
  - As part of protocol development, the IOU's will seek further input from 3rd parties and customers for each use case.

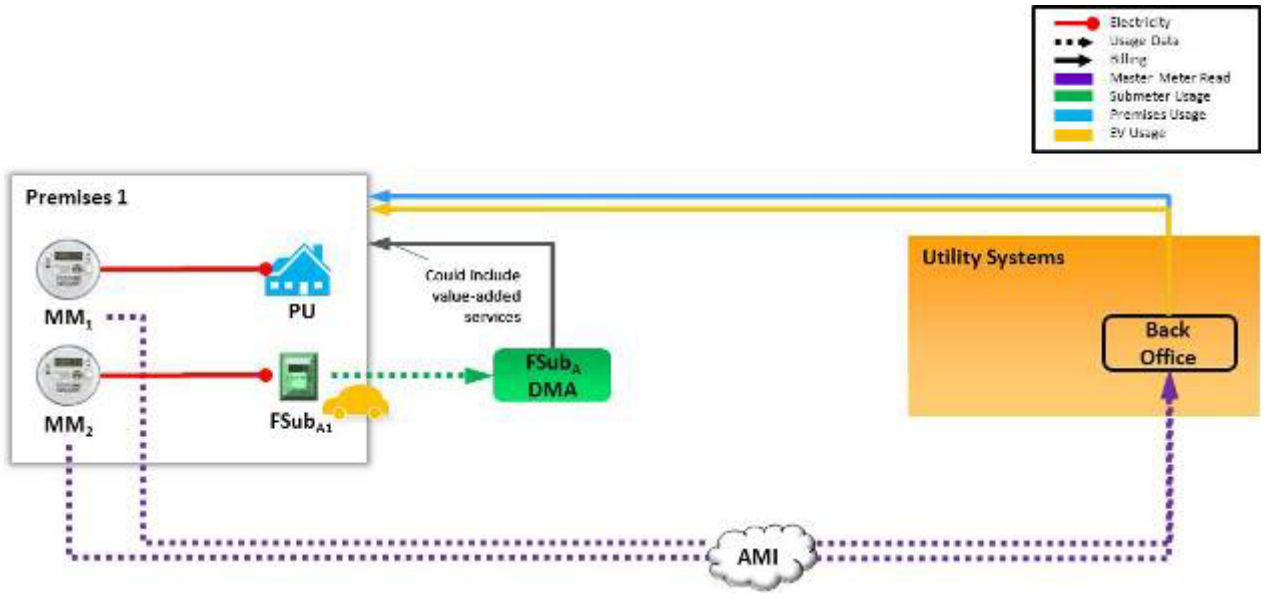
Use Case 0: Baseline Parallel Metering [6]

Parallel metering is presented here as the first Use Case because it is available currently and because it provides a basis for comparison with the Use Cases developed in the working groups.

Description

- Parallel submetering consists of two Master Meters on a single Premises.
- Customer of Record is:
  - The Premises Owner (for Premises Usage).
  - Either the Premises Owner or a 3rd Party (for EV Usage).
- Submeter reading services are performed by a 3rd Party or the utility, which reads the FSub and transfers usage data to its Data Management System (DMA).
- Premises Usage and EV Usage are measured separately. Subtractive billing does not occur.

Diagrams



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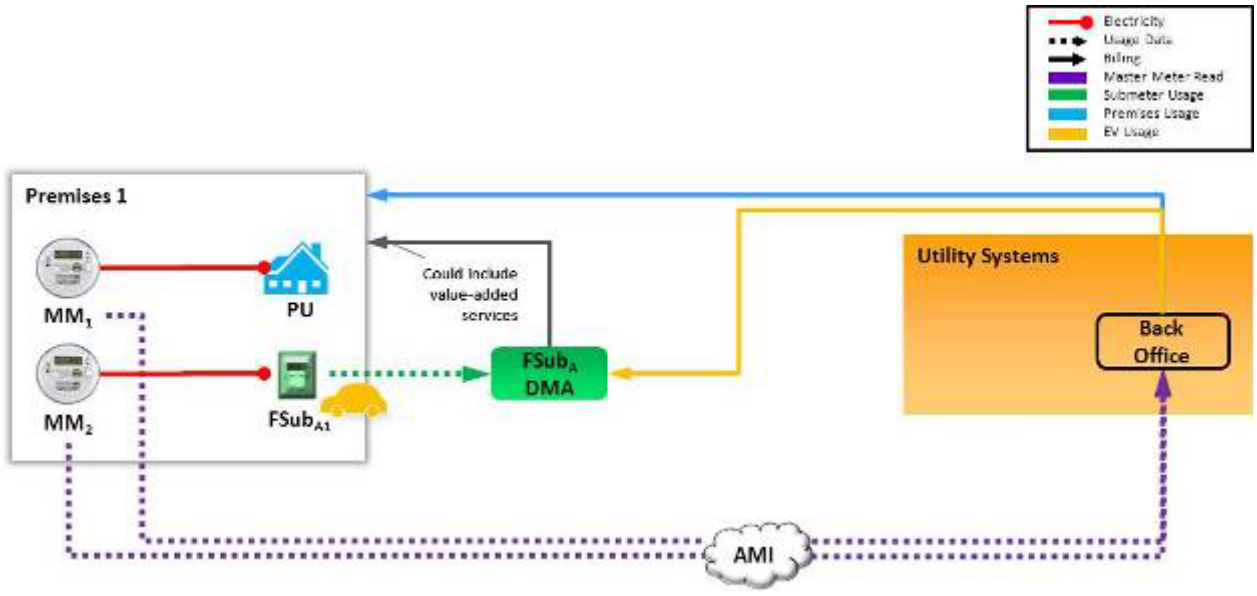


Use Case 0: Baseline Parallel Metering Implementation Analysis

CRITERIA	DESCRIPTION
Technological Characteristics	• Master Meters are utility-owned fixed devices that measure usage independently and use the utility AMI Network. • The Customer of Record for each Master Meter is billed its respective usage. • Parallel metering uses existing utility network infrastructure.
Technical Availability	• Parallel metering is available today. • Non-revenue grade submeters are available today.
Utility Integration	• Parallel metering uses existing utility network infrastructure.
National Standards	• No national standards are required to perform separate billing.
Billing & Regulatory	• Uses existing billing processes and regulation.
Utility Cost of Integration	• None.
Customer Cost	• To be developed.
Customer Experience	• To be developed.

Use Case 0: Baseline Parallel Metering Key Conclusions

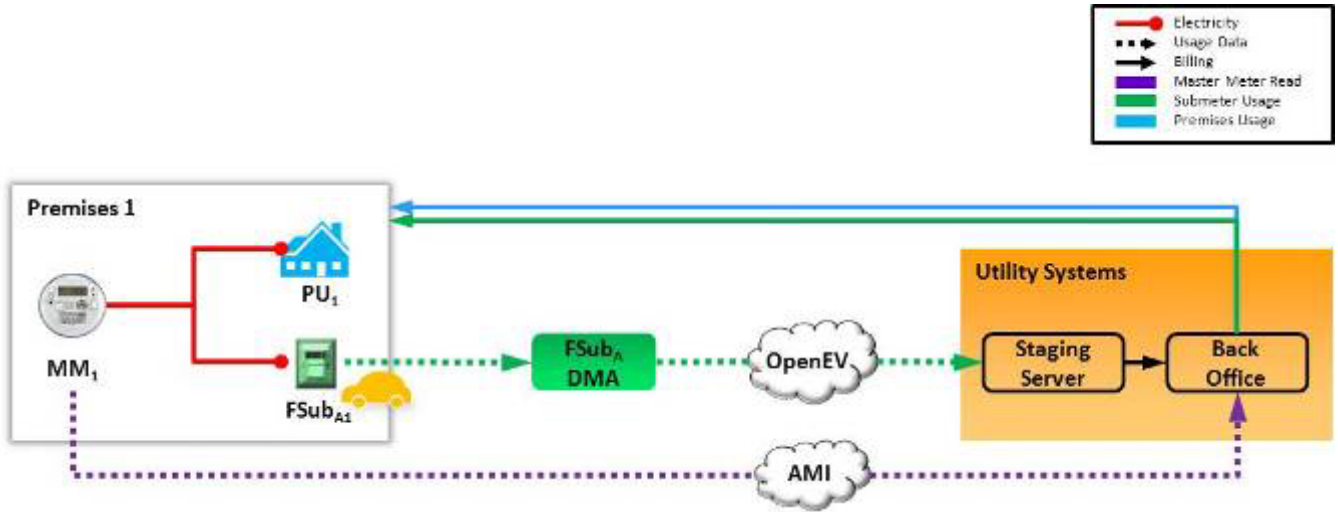
This use case is already available because parallel metering is currently offered. This Use Case serves as a baseline for comparison to all submetering scenarios.

Use Case 1: Residential Use Case (Basic) [7]

Description

- This use case consists of one submeter (FSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.

Diagram



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Use Case 1: Residential Use Case (Basic) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (I.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown).
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 1: Residential Use Case (Basic) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as technically implementable in the short term, because:

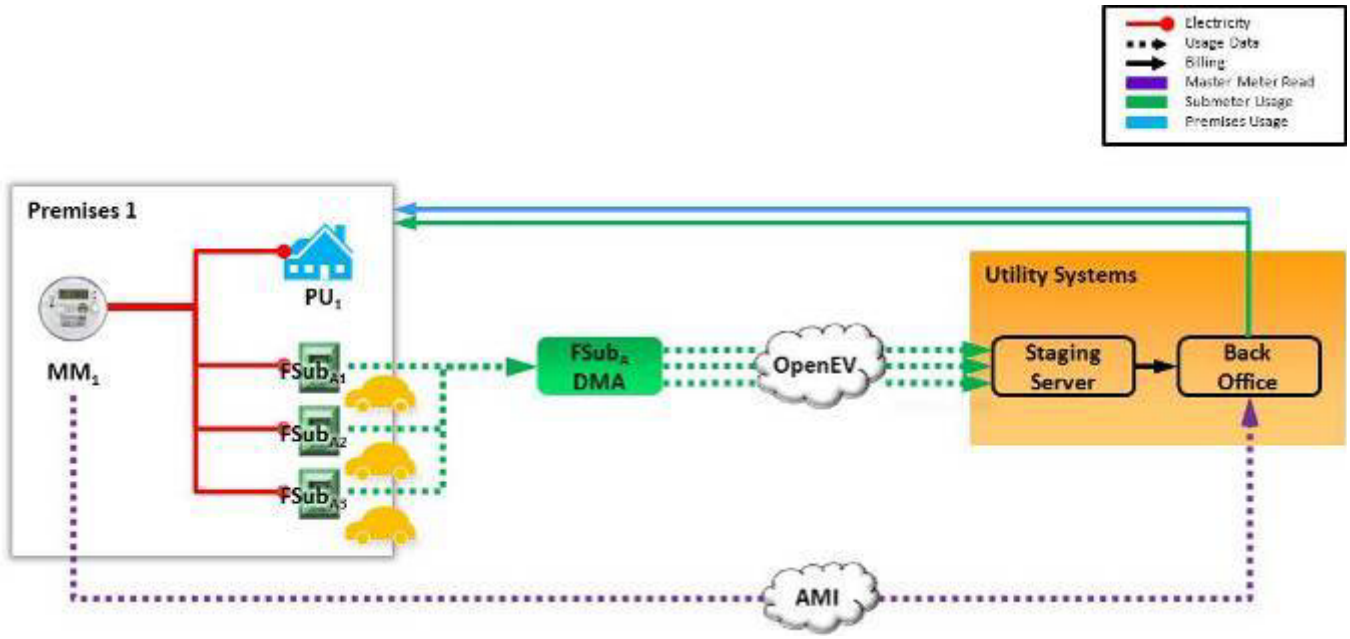
- The newly ratified NAESB ESPI standard allows utilities to establish Utility-3rd Party data exchange using a standardized method.
- A utility staging server allows utilities to bypass complex back-office systems in order to offer a short-term manual submetering process.
- Upgrading to provide a utility-owned 3rd party staging server may be less costly than upgrading AMI back-office systems.
- This use case allows utilities a phased scalable solution, with the ability to transition to automated back office system processing when (and if) it becomes available.
- This use case could also transition to use case #16 ("Direct OpenEV") and allow direct consumer-utility communications.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to separate metering and other non-subtractive billing options.

Use Case 2: Residential Use Case (Multiple EVs) [8]

Description

- This use case consists of multiple FSubs on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads each FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 2: Residential Use Case (Multiple EVs) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (I.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still affects utility enterprise systems. (Effects are still unknown.). • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • Multiple data feeds from multiple submeters create order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on systems.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 2: Residential Use Case (Multiple EVs) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the short term, because:

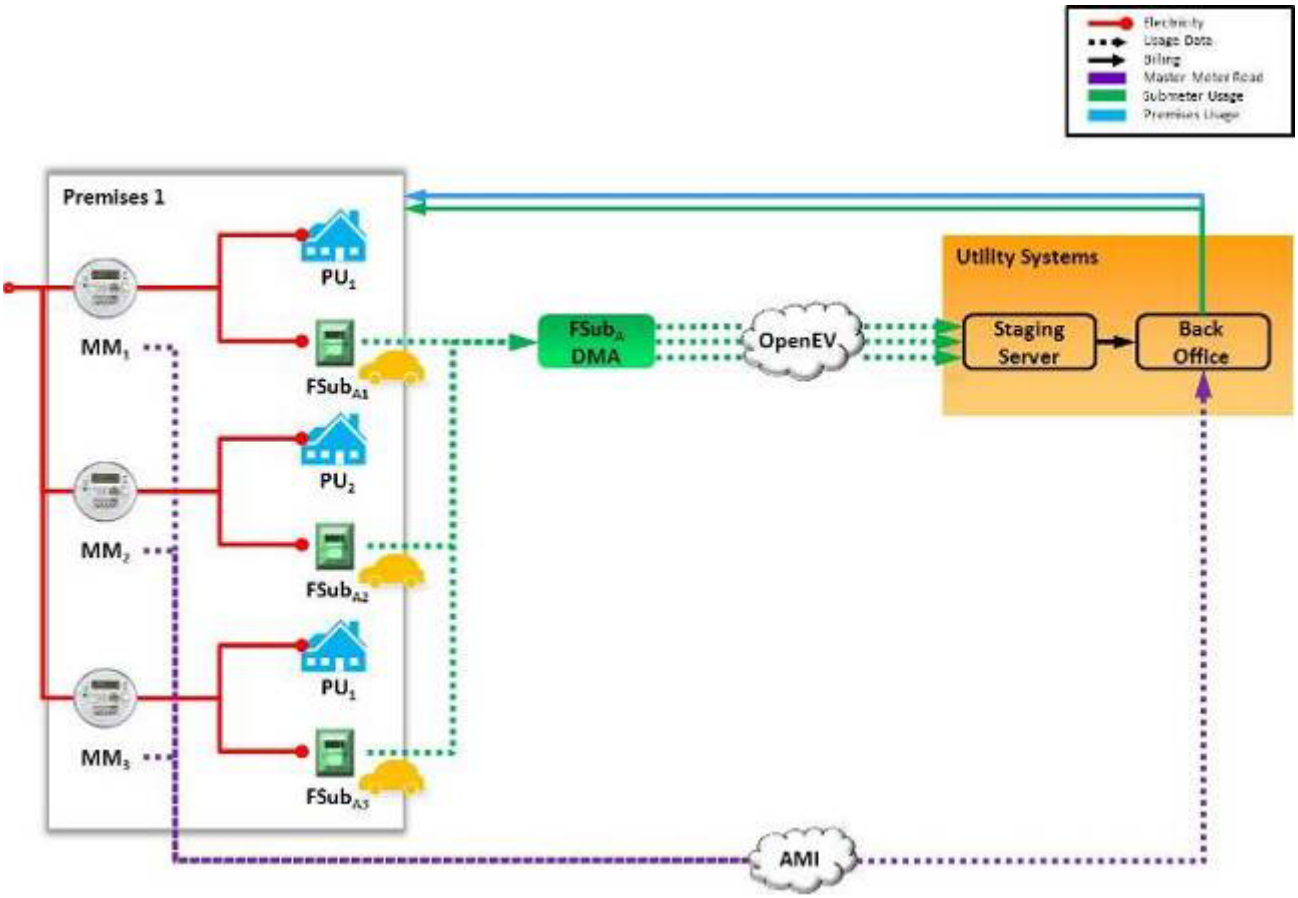
- The newly ratified NAESB ESPI standard allows utilities to establish Utility-3rd Party data exchange using a standardized method.
- A utility staging server allows utilities to bypass complex back-office systems in order to offer a short-term manual submetering process.
- Upgrading to provide a utility-owned 3rd party staging server may be less costly than upgrading AMI back-office systems.
- This use case allows utilities a phased scalable solution, with the ability to transition to automated back office system processing when (and if) it becomes available.
- This use case could also transition to use case #16 ("Direct OpenEV") and allow direct consumer-utility communications.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to separate metering and other non-subtractive billing options.

Use Case 3: Small Multi-Dwelling Unit (MDU) Use Case [9]

Description

- This use case consists of multiple Master Meters (MM) on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads each FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 3: Small Multi-Dwelling Unit (MDU) Use Case Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (I.e. can be in many shapes and sizes as long as it only measures the EV load.)	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.). • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load). • Added complexity in having to associate multiple submeters to multiple master meters
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • Critical dependence on associating the correct submeter to the correct master meter on multi-meter premises. • Multiple data feeds from multiple submeters creates order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on back-office systems. • Associating multiple submeters to multiple master meters will increase processing time and burden on back-office systems.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 3: Small Multi-Dwelling Unit (MDU) Use Case Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the short term, because:

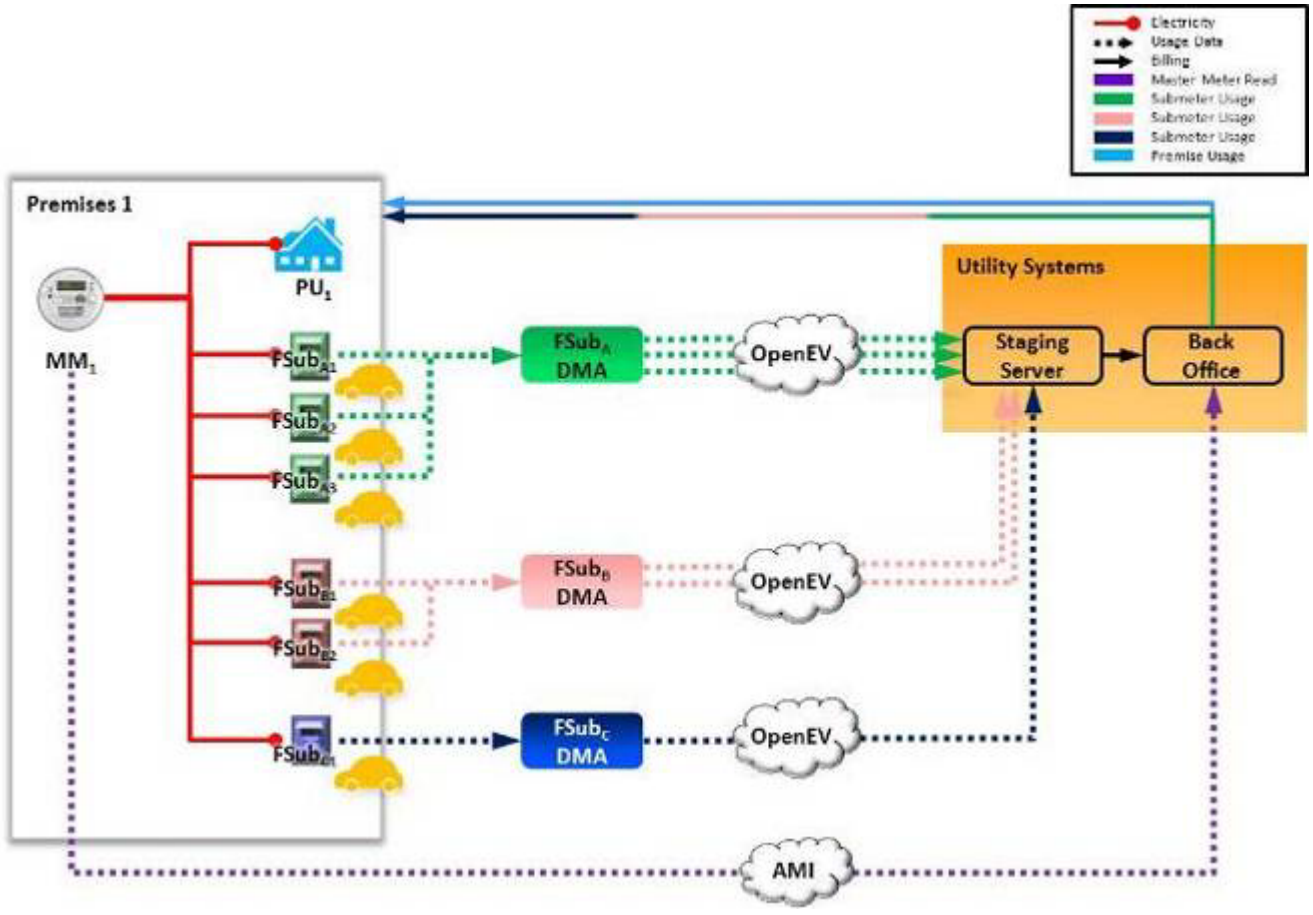
- The newly ratified NAESB ESPI standard allows utilities to establish Utility-3rd Party data exchange using a standardized method.
- A utility staging server allows utilities to bypass complex back-office systems in order to offer a short-term manual submetering process.
- Upgrading to provide a utility-owned 3rd party staging server may be less costly than upgrading AMI back-office systems.
- This use case allows utilities a phased scalable solution, with the ability to transition to automated back office system processing when (and if) it becomes available.
- This use case could also transition to use case #16 ("Direct OpenEV") and allow direct consumer-utility communications.
- The cost-effectiveness and timing for technical implementation of this use case, compared to separate metering and other non-subtractive billing options, is still to be determined.

Use Case 4: Large Multiple Meter / Commercial Use Case [10]

Description

- This use case consists of multiple FSubs on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by one of many 3rd Parties or utility, which read each FSub and transfers usage data from their DMA to the Utility.
- No 3rd Party Fuel Supplier (Bundled Service Customer).

Diagram



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Use Case 4: Large Multiple Meter / Commercial Use Case Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.)., • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of multiple 3rd party data management agents for utility to be able to bill single premise. • Will require manual calculation and/or adjustment to automated IOU billing process. • Critical dependence on associating the correct submeter to the correct master meter on multi-meter premises. • Multiple data feeds from multiple submeters creates order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on systems.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 4: Large Multiple Meter / Commercial Use Case Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the short term, because:

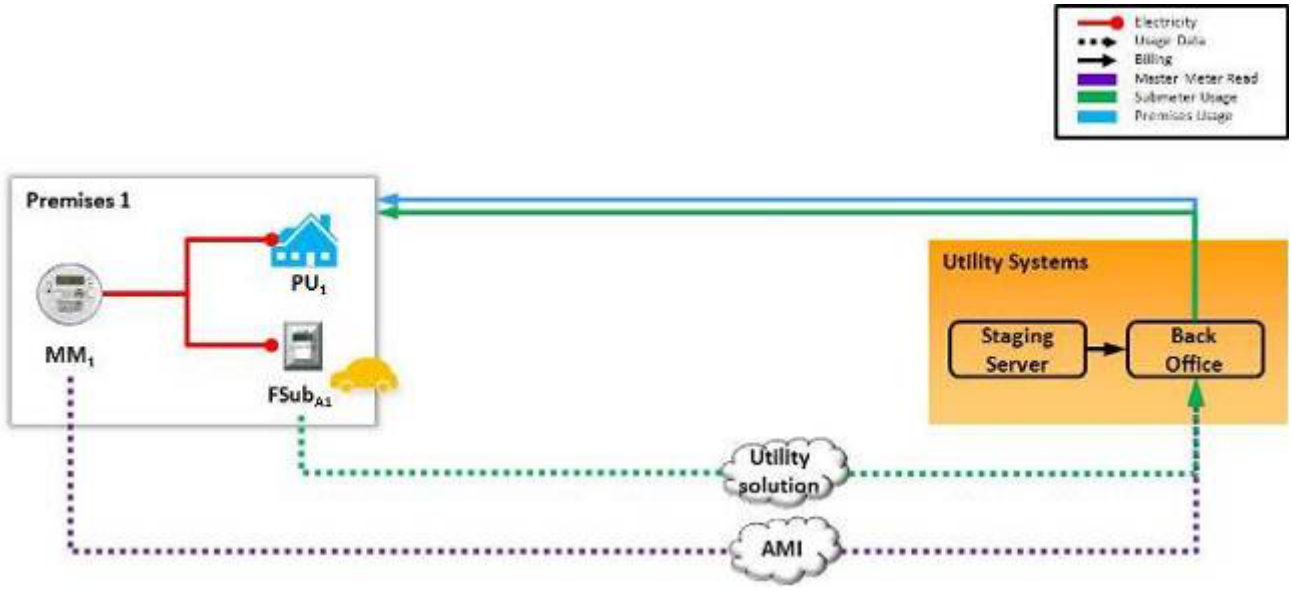
- The newly ratified NAESB ESPI standard allows utilities to establish Utility-3rd Party data exchange using a standardized method.
- A utility staging server allows utilities to bypass complex back-office systems in order to offer a short-term manual submetering process.
- Upgrading to provide a utility-owned 3rd party staging server may be less costly than upgrading AMI back-office systems.
- This use case allows utilities a phased scalable solution, with the ability to transition to automated back office system processing when (and if) it becomes available.
- This use case could also transition to use case #16 ("Direct OpenEV") and allow direct consumer-utility communications.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to separate metering and other non-subtractive billing options.

Use Case 5: No 3rd Party Involvement (Field Area Network)[11]

Description

- This use case consists of one FSub on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are not performed by a 3rd Party. Instead, the Utility reads the FSub using a utility-defined solution.

Diagram



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Use Case 5: No 3rd Party Involvement Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration and verification procedure. • Submeter manufacturer must adopt technology to be compatible with utility solution; limits submeter use to a single utility service territory.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• Does not require the use of an additional staging server. • Submeter data is associated to only one master meter. • Potentially could leverage a smart grid utility field area network.	• May require 3rd Party to manufacture hardware specific to each utility. • Requires the utility to establish connections with potentially thousands of 3rd party owned devices. • Added infrastructure is required to support utility solution, assuming AMI is not used.
National Standards	• None required.	• Requires 3rd Party to manufacture hardware according to national standards followed by the utility, which may be unique to each utility.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering. • Utility as DMA removes dependence on 3rd party to supply submeter data.	• Will require manual calculation and/or adjustment to automated IOU billing process. • Will require IOU to operate submeter data retrieval system/network, and assume primary responsibility for data integrity, storage, security, and distribution to 3rd parties.
Utility Cost of Integration	• Utility costs for implementing this use case are unknown as a utility solution has not been defined.	• Utilities are expected to seek additional funding for implementation of a 3rd party interface (costs are currently unknown). • Utility would develop infrastructure for utility solution, adding considerable cost.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 5: No 3rd Party Involvement Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the long term, because:

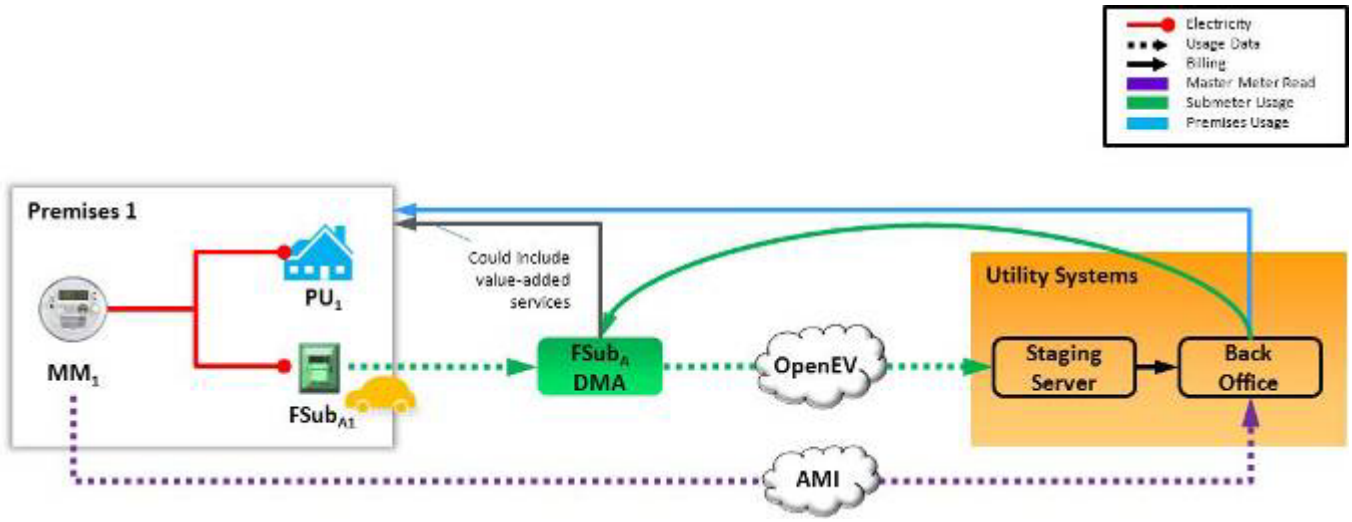
- This use case requires the development of a utility owned (Independent from the AMI system) field area network.
- This network is unlikely until long term smart grid systems are implemented.
- Technical specifications of a field area network are unknown.

Use Case 6: Residential Use Case (Basic) w/ EVSP [12]

Description

- This use case consists of one FSub on one Premises.
- The EVSP, a 3rd Party fuel supplier, is a Customer of Record and the domestic customer is a separate Customer of Record.
- Submeter reading services may be performed by a 3rd Party or Utility, which reads the FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 6: Residential Use Case (Basic) w/ EVSP Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (I.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown).
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 6: Residential Use Case (Basic) w/ EVSP Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable:

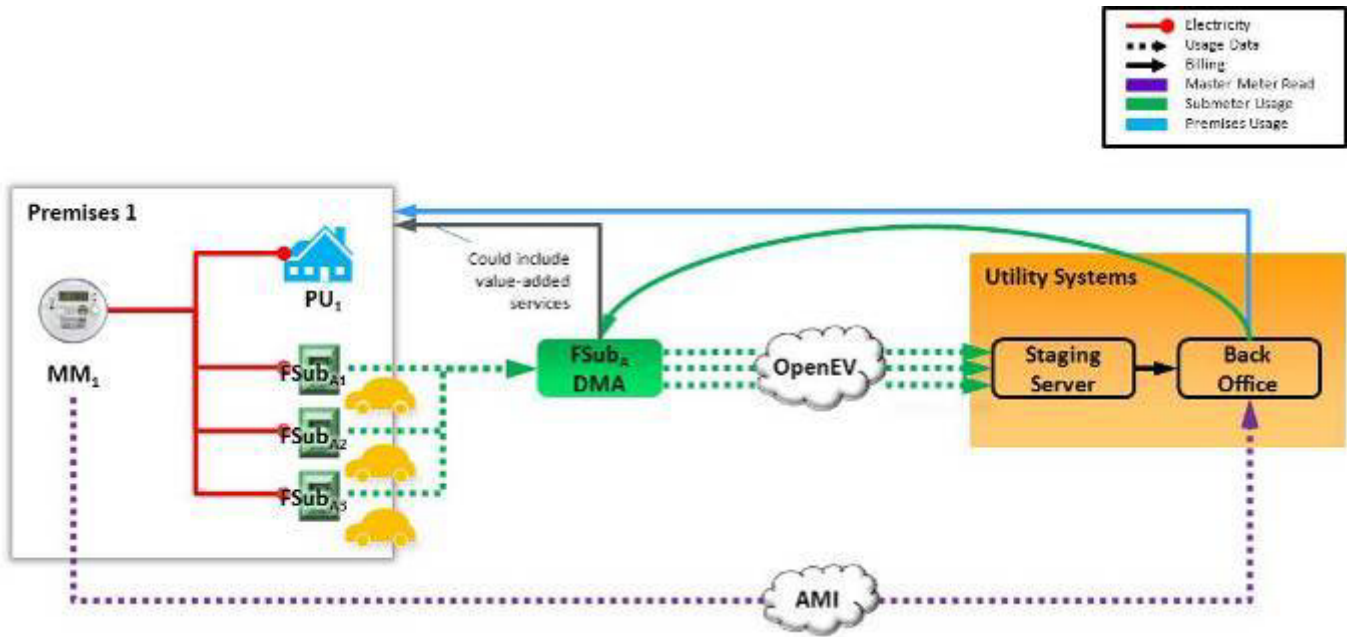
- Because the IOUs have an obligation to accurately bill their customers, the IOUs will continue to separately meter their separate customers.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering, and other non-subtractive billing options.

Use Case 7: Residential Use Case (Multiple EVs) w/ EVSP [13]

Description

- This use case consists of multiple FSubs on one Premises.
- The EVSP, a 3rd Party fuel supplier, is a Customer of Record and the domestic customer is a separate Customer of Record.
- Submeter reading services may be performed by a 3rd Party or Utility, which reads the FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 7: Residential Use Case (Multiple EVs) w/ EVSP Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.). • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • Multiple data feeds from multiple submeters creates order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on systems.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 7: Residential Use Case (Multiple EVs) w/ EVSP Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable:

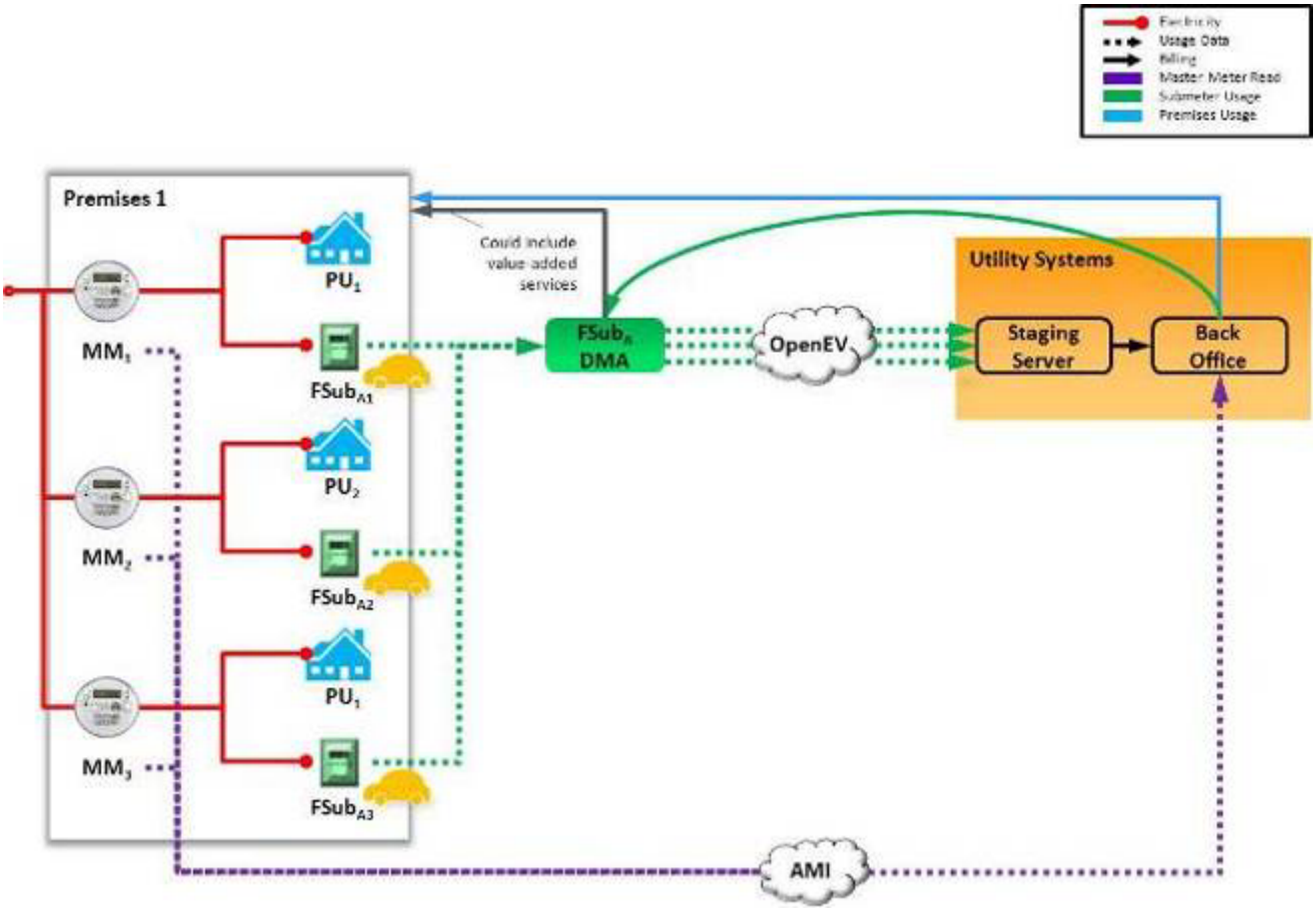
- Because the IOUs have an obligation to accurately bill their customers, the IOUs will continue to separately meter their separate customers.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering, and other non-subtractive billing options.

Use Case 8: Small Multi-Dwelling Unit (MDU) Use Case w/ EVSP [14]

Description

- This use case consists of multiple Master Meters (MM) on one Premises
- The EVSP, a 3rd Party fuel supplier, is a separate Customer of Record.
- Submeter reading services may be performed by a 3rd Party or utility, which reads each FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 8: Small Multi-Dwelling Unit (MDU) Use Case w/ EVSP Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (I.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.). • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load). • Added complexity in having to associate multiple submeters to multiple master meters.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • Critical dependence on associating the correct submeter to the correct master meter on multi-meter premises • Multiple data feeds from multiple submeters create order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on back-office systems. • Associating multiple submeters to multiple master meters will increase processing time and burden on back-office systems.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 8: Small Multi-Dwelling Unit (MDU) Use Case w/ EVSP Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable:

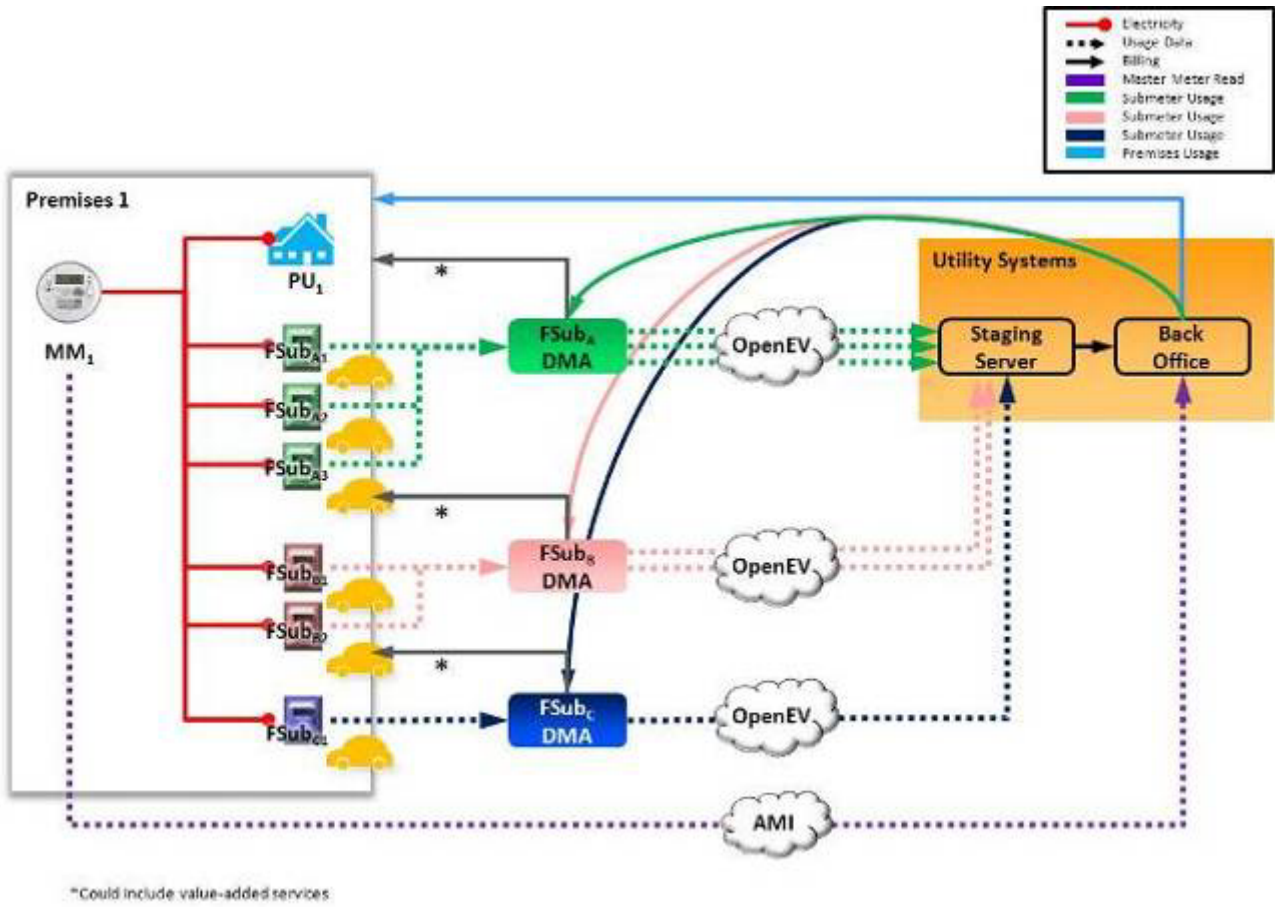
- Because the IOUs have an obligation to accurately bill their customers, the IOUs will continue to separately meter their separate customers.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering, and other non-subtractive billing options.

Use Case 9: Large MDU Use Case (Garage) w/ EVSP [15]

Description

- This use case consists of multiple FSubs on one Premises.
- The EVSP, a 3rd Party fuel supplier, is a separate Customer of Record.
- One of many 3rd Parties performs submeter reading services, i.e., reads the FSub and transfers usage data from its DMA to the Utility.

Diagram



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Use Case 9: Large MDU Use Case (Garage) w/ EVSP Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load.	• Embedded submeters pose potentially complex calibration, verification, and security procedures.
Technical Availability	• Standard utility meters and boxes can be used. • Some EVSP have included embedded submeters in their basic EVSE designs.	• Added infrastructure (meter box) may be needed to install a socket-based meter. • Not all EVSEs include embedded submeters. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices. • Submeter data is associated to only one master meter.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.). • Multiple submeters add a layer of complexity; new processes must be established to identify each submeter. • Utilities will require meter data tables for each submeter (not aggregate load).
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed.
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• Dependence on timing and accuracy of multiple 3rd party data management agents for utility to be able to bill single premise. • Will require manual calculation and/or adjustment to automated IOU billing process. • Critical dependence on associating the correct submeter to the correct master meter on multi-meter premises. • Multiple data feeds from multiple submeters creates order of magnitude increase in data processing and bill calculation functions.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Increased submeters at a premises will increase processing time and burden on systems.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 9: Large MDU Use Case (Garage) w/ EVSP Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable:

- Because the IOUs have an obligation to accurately bill their customers, the IOUs will continue to separately meter their separate customers.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering, and other non-subtractive billing options.

Use Case 10: Standard Mobile Submeter Use Case [16]

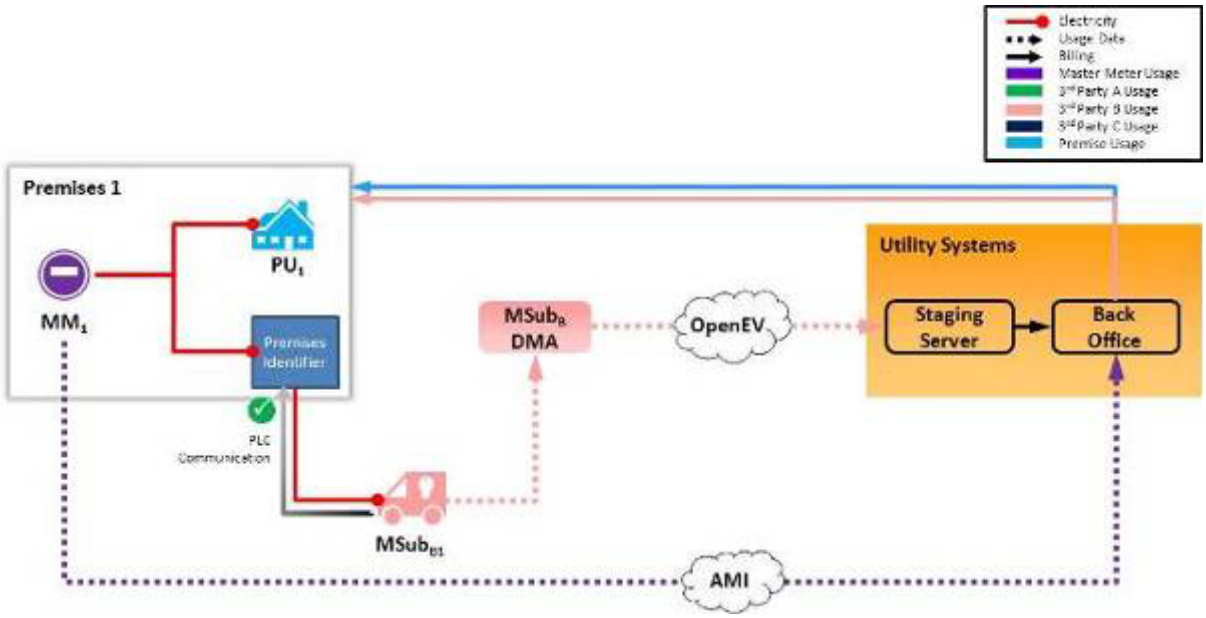
Description

- This use case consists of one submeter (FSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Mobile Submeter (MSubB1) is associated with Premises 1 Account and is properly attached to the fixed premise identification device. No other submeters are present.

Additional Assumptions

- All data and documents received from the third party must be accurate, which would require significant security testing (including negative testing) to ensure the integrity of the data received from these mobile submeters.
- Premises identifier must be capable of verifying correct electrical connectivity and sensing whether vehicle is charging at designated location.

Diagram



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Use Case 10: Standard Mobile Submeter Use Case Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • It is conceivable that there may be in the near term a mobile meter standard and automakers would be able to place such a submeter in a car as long as it meets protocol requirements.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • Requires undetermined communication between submeter and Premises Identifier. • Submeter is associated to multiple master meters, creating complexity in registration and association. • Currently there is no method for associating a mobile submeter to a master meter. • Currently there is no system available for inter-utility data exchange for a "roaming" scenario.
Technical Availability	• Standard utility meters and boxes can be used. • EVSPs have developed submeters in cordsets.	• Premises Identifier and communication with it has not been defined yet. • Possible infrastructure must be built to install Premises Identifier. • Not all EVs and cordsets include submeters. • Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) will continue to be unavailable until a 3rd party develops a ubiquitous clearinghouse for charging data aggregation. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Due to different additions and exemptions of associations between submeter and master meter, this use case heavily impacts utility enterprise systems. (Effects are still unknown.). • Mobile submeters are difficult to electrically associate with a master meter. • Submeter data may be associated to many master meters, although customers may not necessarily charge at all of them.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use. • It is conceivable that there may be a mobile meter standard in the near term. • SAE is currently working on the testing and evaluation of PLC technology for electrical association.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed. • Mobile submeters may require a different set of standards due to rugged environment. • Premises Identifier may require development of a national standard.
Billing & Regulatory	• None identified	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • If EV charges at multiple premises during single billing period, creates order of magnitude increase in data processing and bill calculation functions. • Mobile submeter charging in different municipality jurisdictions creates Utility User tax and Franchise tax allocation issues. • Mobile submeter charging in different IOU service territories creates bill allocation and tax allocation issues.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Utility Cost of Integration	• Utility costs for implementing hardware for this use case are expected to be lower than using the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Due to heavily affected utility enterprise systems, costs are assumed to be very high (Effects are still unknown.).
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 10: Standard Mobile Submeter Use Case Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the long-term, because:

- It is conceivable that there may be a mobile meter standard in the near term and automakers may be able to place such a mobile submeter in a car as long as it meets protocol requirements.
- In addition to meeting technical performance requirements, mobile submeters would need to develop a method for associating to master meters.
- Until performance and association issues are resolved, utilities find that mobile submetering is not technically feasible.
- Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) is not feasible until a ubiquitous clearing house for revenue-grade billing data aggregation is developed and available and other issues resolved.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering and other non-subtractive billing options.

Use Case 11: In Parallel Use Case (FSub + MSub) [17]

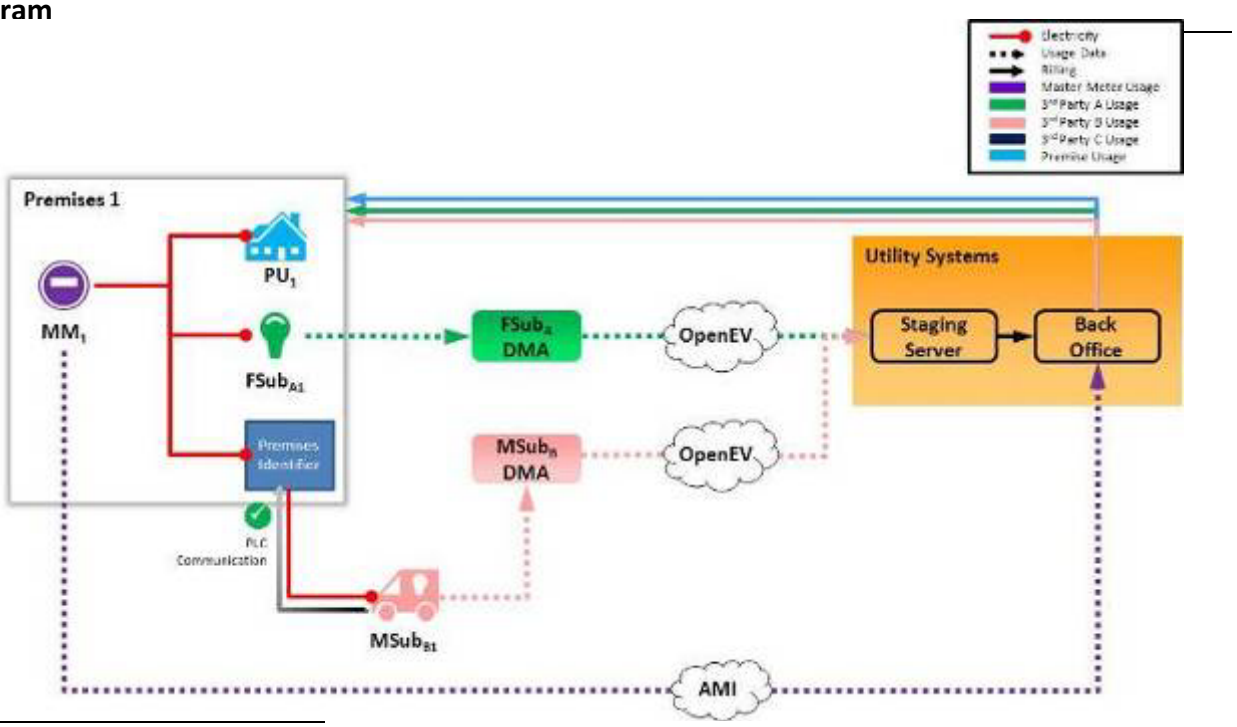
Description

- This use case consists of one mobile submeter (MSub) and one fixed submeter on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Mobile submeter (MSubB1) is associated with Premises 1 Account. FSubA1 is present. Mobile submeter (MSubB1) is properly attached to the fixed premise identification device. Both submeters provide information to the utility.

Additional Assumptions

- All data and documents received from the third party must be accurate, which would require significant security testing (including negative testing) to ensure the integrity of the data received from these mobile submeters.
- Premises identifier would have to be capable of verifying correct electrical connectivity and sensing whether vehicle is charging at designated location.

Diagram



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Use Case 11: In Parallel Use Case (FSub + MSub) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • It is conceivable that there may be in the near term a mobile meter standard and automakers would be able to place such a submeter in a car as long as it meets protocol requirements.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • Requires undetermined communication between submeter and Premises Identifier. • Submeter is associated to multiple master meters, creating complexity in registration and association. • Currently there is no method for associating a mobile submeter to a master meter. • Currently there is no system available for inter-utility data exchange for a "roaming" scenario.
Technical Availability	• Standard utility meters and boxes can be used. • EVSPs have developed submeters in cordsets.	• Premises Identifier and communication with it has not been defined yet. • Possible infrastructure must be built to install Premises Identifier. • Not all EVs and cordsets include submeters • Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) will continue to be unavailable until a 3rd party develops a ubiquitous clearinghouse for charging data aggregation. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Due to different additions and exemptions of associations between submeter and master meter, this use case heavily impacts utility enterprise systems. (Effects are still unknown.) • Mobile submeters are difficult to electrically associate with a master meter. • Submeter data may be associated to many master meters, and may not necessarily charge at all of them.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use. • It is conceivable that there may be a mobile meter standard in the near term. • SAE is currently working on the testing and evaluation of PLC technology for electrical association.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed. • Mobile submeters may require a different set of standards due to rugged environment. • Premises Identifier may require development of a national standard.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Billing & Regulatory	• None identified.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • Multiple data feeds from multiple submeters / DMAs creates order of magnitude increase in data processing and bill calculation functions. • If Mobile EV submeter charges at multiple premises during single billing period, creates order of magnitude increase in data processing and bill calculation functions. • Mobile submeter charging in different municipality jurisdictions creates Utility User tax and Franchise tax allocation issue. • Mobile submeter charging in different IOU service territories creates bill allocation and tax allocation issues.
Utility Cost of Integration	• Utility costs for implementing hardware for this use case are expected to be lower than using the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Due to heavily impacted utility enterprise systems, costs are assumed to be very high (Effects are still unknown.).
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 11: In Parallel Use Case (FSub + MSub) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the long-term, because:

- It is conceivable that in near term there may be a mobile meter standard and automakers may be able to place submeters in the car as long as they meet protocol requirements.
- In addition to meeting technical performance requirements, a method would need To be developed. for associating mobile submeters to master meters.
- Until performance and association issues are resolved, utilities find that mobile submetering is not technically feasible.
- Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) is not feasible until a ubiquitous clearing house for revenue-grade billing data aggregation is developed and available and other issues resolved.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering and other non-subtractive billing options.

Use Case 12: In-Series Use Case w/o Cross Talk (FSub + MSub) [18]

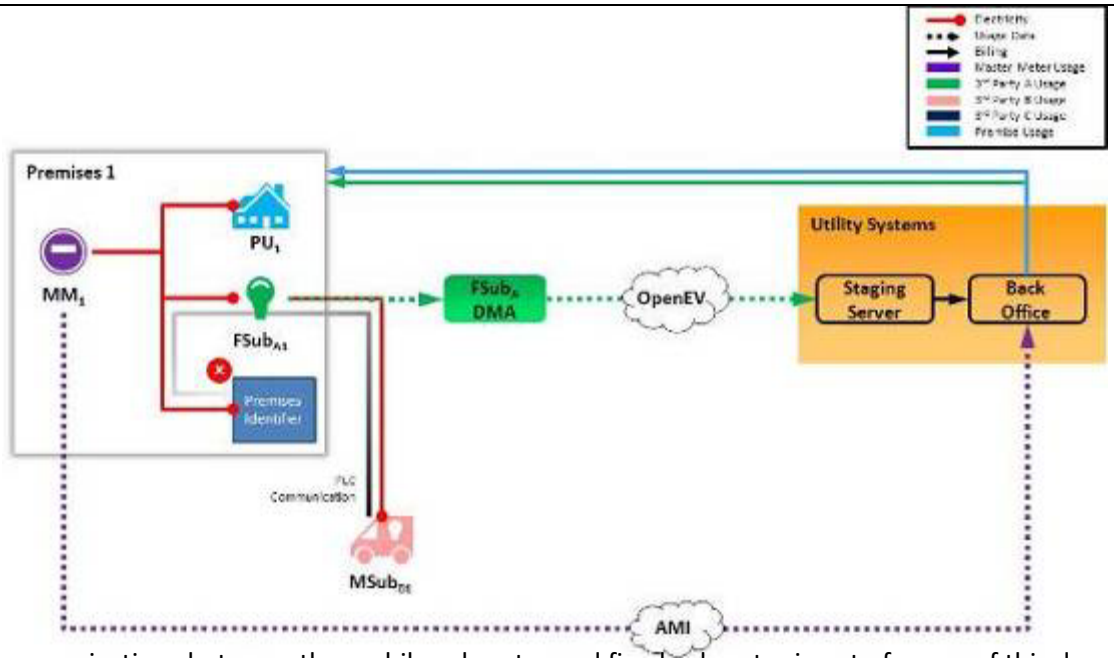
Description

- This use case consists of one mobile submeter (MSub) and one fixed submeter on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Mobile submeter (MSubB1) is not associated with Premises 1 Account. FSubA1 is present. MSubB1 charges at FSubA1 instead of charging at its designated location. Cross Talk Not Present.

Additional Assumptions

- All data and documents received from the third party must be accurate, which would require significant security testing (including negative testing) to be performed to ensure the integrity of the data received from these mobile submeters.
- Premises identifier must either capable be verifying correct electrical connectivity and sensing whether vehicle is charging at designated location or due to attenuation never receives the signal from mobile submeter.

Diagram



Note: Communications between the mobile submeter and fixed submeter is out of scope of this document.

Use Case 12: In-Series Use Case w/o Cross Talk (FSub + MSub) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • It is conceivable that there may be in the near term a mobile meter standard and automakers would be able to place such a submeter in a car as long as it meets protocol requirements.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • Requires undetermined communication between submeter and Premises Identifier. • Submeter is associated to multiple master meters, creating complexity in registration and association. • Currently there is no method for associating a mobile submeter to a master meter. • Currently there is no system available for inter-utility data exchange for a "roaming" scenario.
Technical Availability	• Standard utility meters and boxes can be used. • EVSPs have developed submeters in cordsets.	• Premises Identifier and communication with it has not been defined yet. • Possible infrastructure must be built to install Premises Identifier. • Not all EVs and cordsets include submeters. • Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) will continue to be unavailable until a 3rd party develops a ubiquitous clearinghouse for charging data aggregation. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Due to different additions and exemptions of associations between submeter and master meter, this use case heavily impacts utility enterprise systems. (Effects are still unknown.) • Mobile submeters are difficult to electrically associate with a master meter. • Submeter data may be associated to many master meters, and may not necessarily charge at all of them.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use. • It is conceivable that there may be a mobile meter standard in the near term. • SAE is currently working on the testing and evaluation of PLC technology for electrical association.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed. • Mobile submeters may require a different set of standards due to rugged environment. • Premises Identifier may require development of a national standard.
Billing & Regulatory	• Assuming fixed submeter is accurately associated with premises, utility is agnostic to mobile submeter and will accurately charge premises 1 customer for EV service. However, utility will have no capability to distinguish between customer of record EV and any other EV that charges at premises, and will assume all EV charging is responsibly of customer of record.	• Dependence on timing and accuracy of 3rd party supplied data. • Will require manual calculation and/or adjustment to automated IOU billing process. • If Mobile EV submeter charges at multiple premises during single billing period, creates order of magnitude increase in data processing and bill calculation functions. • Mobile submeter charging in different municipality jurisdictions creates Utility User tax and Franchise tax allocation issues. • Mobile submeter charging in different IOU service territories creates bill allocation and tax allocation issues. • 3rd Parties would need to ensure that there is no cross talk and duplication of data for the same charging event due to submeter redundancy.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Utility Cost of Integration	• Utility costs for implementing hardware for this use case are expected to be lower than using the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Due to heavily impacted utility enterprise systems, costs are assumed to be very high. (Effects are still unknown.)
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 12: In-Series Use Case w/o Cross Talk (FSub + MSub) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable in the long-term, because:

- It is conceivable that there may be a mobile meter standard in the near term and automakers may be able to place in the car as long as it meets protocol requirements.
- In addition to meeting technical performance requirements, mobile submeters would need to develop a method for associating to master meters.
- Until performance and association issues are resolved, utilities find that mobile submetering is not technically feasible.
- Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) is not feasible until a ubiquitous clearing house for revenue-grade billing data aggregation is developed and available and other issues resolved.
- 3rd Parties would have to ensure that cross talk is not present and there is no duplication of data for the same charging event due to redundancy in submeters.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering and other non-subtractive billing options.

Use Case 13: In-Series Use Case w/ Cross Talk (FSub + MSub) [19]

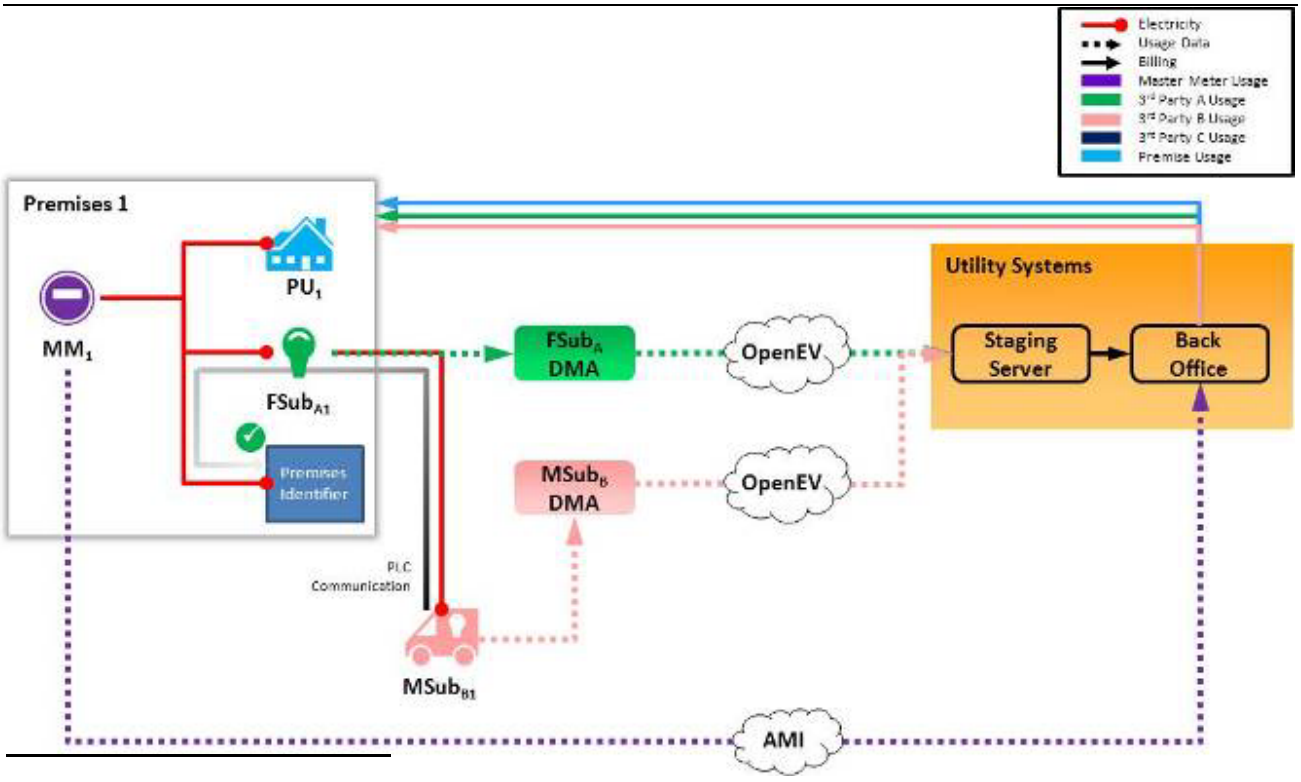
Description

- This use case consists of one mobile submeter (MSub) and one fixed submeter on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Mobile submeter (MSubB1) is associated with Premises 1 Account. FSubA1 is present. MSubB1 is not properly attached to the fixed premise identification device at FSubA1 creating a duplicative scenario. Cross Talk present.

Additional Assumptions

- All data and documents received from the third party must be accurate, which would require significant security testing (including negative testing) to ensure the integrity of the data received from these mobile submeters.
- Premises identifier is not capable of verifying correct electrical connectivity and sensing whether vehicle is charging at designated location.

Diagram



Use Case 13: In-Series Use Case w/ Cross Talk (FSub + MSub) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • It is conceivable that there may be in the near term a mobile meter standard and automakers would be able to place such a submeter in a car as long as it meets protocol requirements.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • Requires undetermined communication between submeter and Premises Identifier. • Submeter is associated to multiple master meters, creating complexity in registration and association. • Currently there is no method for associating a mobile submeter to a master meter. • Currently there is no system available for inter-utility data exchange for a "roaming" scenario.
Technical Availability	• EVSPs have developed submeters in cordsets.	• Premises Identifier and communication with it has not been defined yet. • Possible infrastructure must be built to install Premises Identifier. • Not all EVs and cordsets include submeters. • Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) will continue to be unavailable unless a 3rd party develops a ubiquitous clearinghouse for charging data aggregation. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Due to different additions and exemptions of associations between submeter and master meter, this use case heavily impacts utility enterprise systems. (Effects are still unknown.) • Mobile submeters are difficult to electrically associate with a master meter. • Submeter data may be associated to many master meters, and may not necessarily charge at all of them.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use. • It is conceivable that there may be a mobile meter standard in the near term • SAE is currently working on the testing and evaluation of PLC technology for electrical association.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed. • Mobile submeters may require a different set of standards due to rugged environment. • Premises Identifier may require development of a national standard.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Billing & Regulatory	• None identified.	• Dependence on timing and accuracy of 3rd party supplied data. • Would require manual calculation and/or adjustment to automated IOU billing process. • Without capability to receive mobile submeter premises verification, Utility will receive duplicate usage for same charging event (from fixed and mobile meter), and may bill both usage values in error. • If Mobile EV submeter charges at multiple premises during single billing period, creates order of magnitude increase in data processing and bill calculation functions. • Mobile submeter charging in different municipality jurisdictions creates Utility User tax and Franchise tax allocation issues. • Mobile submeter charging in different IOU service territories creates bill allocation and tax allocation issues.
Utility Cost of Integration	• Utility costs for implementing hardware for this use case are expected to be lower than using the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Due to heavily impacted utility enterprise systems, costs are assumed to be very high (Effects are still unknown.) • The Utility does not have the ability to determine if two meters are in series.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 13: In-Series Use Case w/ Cross Talk (FSub + MSub) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable, because:

- Utilities do not have a method of knowing whether two submeters are in series.
- Two submeters in series recording data for the same charging event could lead to erroneous billing data, and therefore national standards and processes would need To be developed. by both utilities and 3rd parties to avoid duplicate data for the same charging event.
- Utilities would need to develop processes to avoid duplicate data for the same charging event.

Use Case 14: In-Series Use Case (2 MSubs) [20]

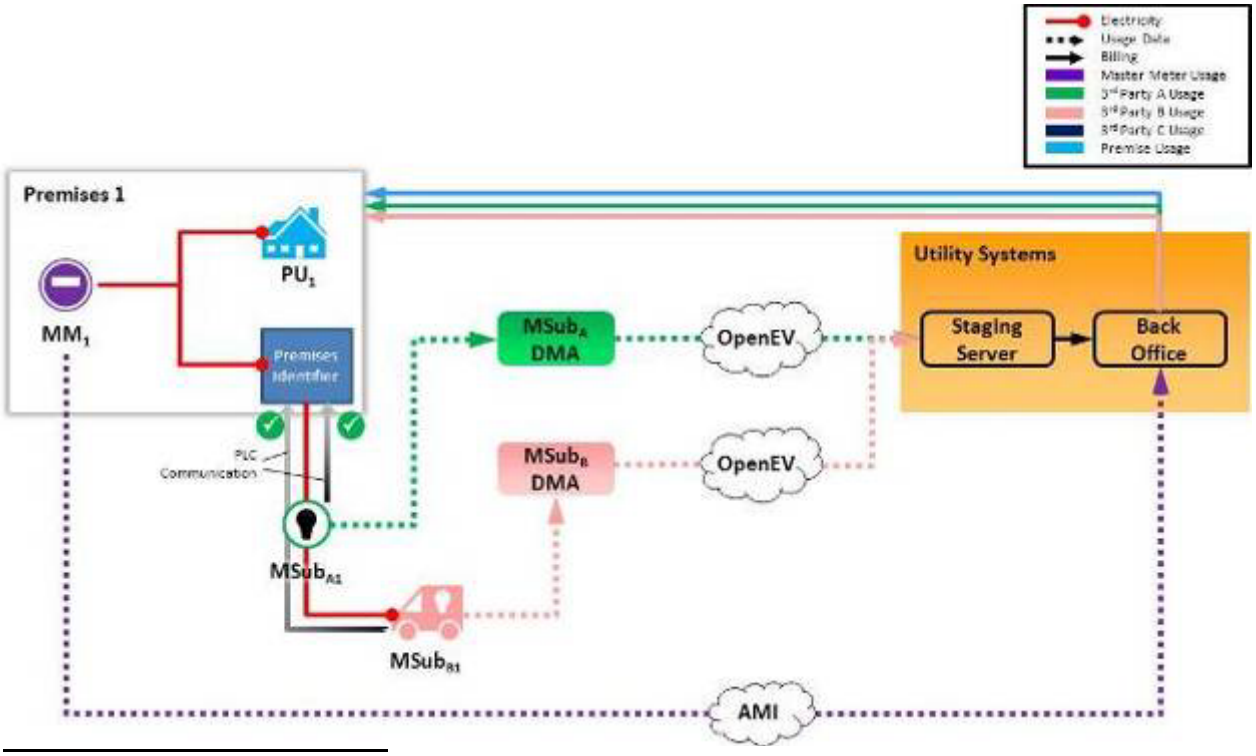
Description

- This use case consists of two mobile submeters (MSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Separate mobile submeters both in the vehicle and cordset send the utility two energy consumption data tables for the same transaction/charging.

Additional Assumptions

- All data and documents received from the third party must be accurate, which would require significant security testing (including negative testing) to be performed to ensure the integrity of the data received from these mobile submeters.
- Premises identifier is not capable of verifying correct electrical connectivity and sensing whether vehicle is charging at designated location.

Diagram



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Use Case 14: In-Series Use Case (2 MSubs) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • It is conceivable that there may be in the near term a mobile meter standard and automakers would be able to place such a submeter in a car as long as it meets protocol requirements.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • Requires undetermined communication between submeter and Premises Identifier. • Submeter is associated to multiple master meters, creating complexity in registration and association. • Currently there is no method for associating a mobile submeter to a master meter. • Currently there is no system available for inter-utility data exchange for a "roaming" scenario.
Technical Availability	• EVSPs have developed submeters in cordsets.	• Premises Identifier and communication with it has not been defined yet • Possible infrastructure must be built to install Premises Identifier. • Not all EVs and cordsets include submeters. • Leveraging mobile submeters for the purpose of roaming (inter-utility charging and bill reconciliation) will continue to be unavailable until a 3rd party develops a ubiquitous clearinghouse for charging data aggregation. • Embedded submeters pose potentially complex calibration, verification, and security procedures.
Utility Integration	• "Staging Servers" impact the least back-office systems. • Does not require the utility to establish connections with potentially thousands of 3rd party owned devices.	• Not all EVSPs have a "cloud service" network for communications with utilities. • Due to different additions and exemptions of associations between submeter and master meter, this use case heavily impacts utility enterprise systems. (Effects are still unknown.) • Mobile submeters are difficult to electrically associate with a master meter. • Submeter data may be associated to many master meters, and may not necessarily charge at all of them. • The Utility does not have the ability to determine if two meters are in series.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use. • It is conceivable that there may be a mobile meter standard in the near term. • SAE is currently working on the testing and evaluation of PLC technology for electrical association.	• An EV profile (i.e. "OpenEV") for the ESPI standard still needs to be developed. • Mobile submeters may require a different set of standards due to rugged environment. • Premises Identifier may require development of a national standard.

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Billing & Regulatory	• None identified.	• Dependence on timing and accuracy of 3rd party supplied data. • Would require manual calculation and/or adjustment to automated IOU billing process. • If EV charges at multiple premises during single billing period, creates order of magnitude increase in data processing and bill calculation functions. • Mobile submeter charging in different municipality jurisdictions creates Utility User tax and Franchise tax allocation issues. • Mobile submeter charging in different IOU service territories creates bill allocation and tax allocation issues. • Two meters in series reporting data pertaining to the same charging event could lead to erroneous billing.
Utility Cost of Integration	• Utility costs for implementing hardware for this use case are expected to be lower than using the AMI system.	• Utilities are expected to seek additional funding for implementation of a 3rd Party interface (costs are currently unknown). • Due to heavily impacted utility enterprise systems, costs are assumed to be very high. (Effects are still unknown.)
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 14: In-Series Use Case (2 MSubs) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as not implementable, because:

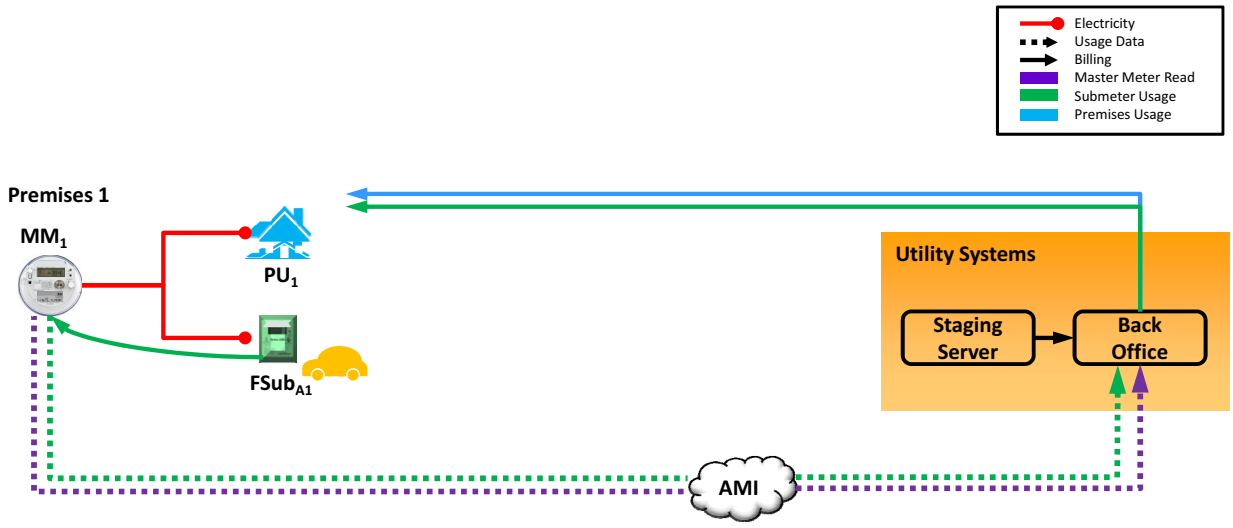
- Utilities do not have a method of knowing whether two mobile submeters are in series.
- Two submeters in series recording data for the same charging event could lead to erroneous billing data, and therefore national standards and processes would need To be developed. by both utilities and 3rd parties to avoid duplicate data for the same charging event.
- Utilities would need to develop processes to avoid duplicate data for the same charging event.

Use Case 15: Advanced Metering Infrastructure (AMI) Use Case [21]

Description

- This use case consists of one submeter (FSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Customer-owned submeter communicates submeter data to the utility via the HAN and through the AMI system.

Diagram



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Use Case 15: Advanced Metering Infrastructure (AMI) Use Case Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Submeters are fixed devices and can provide accurate electrical association. • Added flexibility: Platform and configuration. (i.e. can be in many shapes and sizes as long as it only measures the EV load. • AMI meters have the ability to communicate with HAN devices. • AMI meters have the ability to store and transmit data for back-office processing.	• Embedded submeters pose potentially complex calibration, verification, and security procedures. • 3rd Party submeters may significantly impact the master meter's memory allocation. • Quantity of submeters at a premises will be limited to the maximum supported by the master AMI meter. • 3rd Party submeters may significantly impact the master meter's bandwidth between the premises and the back-office. • 3rd party devices would be required to communicate via Zigbee Wireless using the SEP2.0 messaging protocol.
Technical Availability	• AMI are currently being deployed and are expected to be available statewide by end of 2012.	• SEP2.0 enabled submeters are nonexistent today.
Utility Integration	• Submeters would leverage the existing AMI link to back-office systems. • Submeters would leverage the soon to be established Home Area Network.	• Significantly impacts utility back-office systems, including the metered data management systems, data warehouse and the customer service system. • Does not allow for short-term manual solution. • Would require the development of new back-office processes .
National Standards	• Utilities are currently supporting the development of SEP2.0 for communications. • NIST is expected to support the use of SEP2.0 for smart grid HAN communications. • The SAE supports the use of SEP2.0 for communicating EV messages to the grid and have developed J2847/1 to address its implementation .	• SEP2.0 is currently under development and is not expected until Q4 2012 at the earliest. • Furthermore, it is the IOU's understand that automakers have not fully endorsed the use of SEP2.0 for utility communications .
Billing & Regulatory	• Fixed submeter establishes persistent association between premises and EV compared to mobile submetering.	• May require the potentially time-consuming development of CDFA DMS and/or County Weights and Measures processes to calibrate and verify meter accuracy.
Utility Cost of Integration	• None identified.	• This use case is expected to require significant up-front costs as it does not allow for an interim manual solution .
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 15: Advanced Metering Infrastructure (AMI) Use Case Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable only in the mid-term or long-term, because:

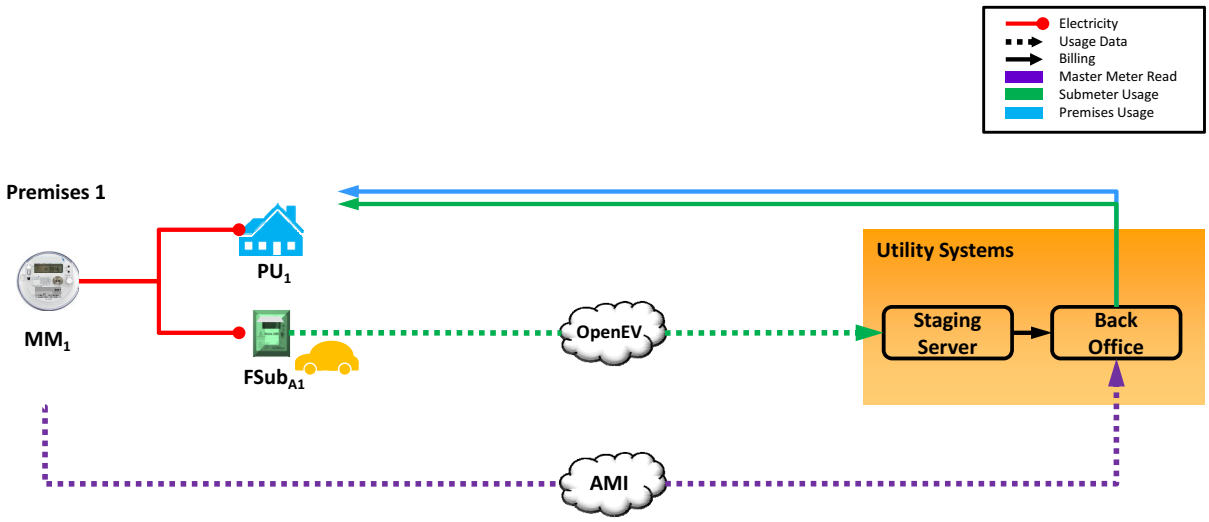
- AMI meters are still being deployed and adequate time is necessary to deploy master meter back-office systems.
- Back-office systems necessary to support submetering are not currently planned or funded.
- SEP2.0 is still under development .
- These back-office upgrades are *primarily* one-time fixed costs to upgrade the system, but over time there will be maintenance costs, as well as new meters, standards, and communication technologies requiring additional investment.
- The cost-effectiveness and timing for technical implementation are still indeterminate, compared to the current capability of the IOUs' AMI, separate metering and other non-subtractive billing options.

Use Case 16: Direct OpenEV Use Case [22]

Description

- This use case consists of one submeter (FSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Customer owned submeter communicates submeter data to the utility via a direct OpenEV connection.
- Similar to AMI use case, except that it leverages the staging server rather than the back office.

Diagram



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Use Case 16: Direct OpenEV Use Case Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• Does not a require a 3rd party cloud service, but instead leverages the customer's Internet connection.	• 3rd parties need to develop OpenEV-compatible submeters. • Dependent on customer Internet (which can be slow, out, or intermittent) for data communication.
Technical Availability	• None identified.	• Submeters conforming to OpenEV standard are not currently available.
Utility Integration	• Allows for the use of a staging server with manual back-office processing • Scalable to automated system.	• Investment required in staging server and interim manual processes.
National Standards	• NAESB ESPI standard ratified on October 2011 is currently available for use.	• An EV profile (i.e. "OpenEV") for the ESPI standard would need to be developed.
Billing & Regulatory	• Communication between customer and utility staging server is direct, thereby reducing hand-offs and interim data storage needs.	• Possible Internet connection failures could lead customers to be charged solely on their domestic rate. • May require the potentially time-consuming development of CDFA DMS and/or County Weights and Measures processes to calibrate and verify meter accuracy.
Utility Cost of Integration	• Utility upgrade costs for implementing this use case may be lower than the cost of upgrading the AMI system.	• Although not as extensive as other solutions, this use case still impacts utility enterprise systems. (Effects are still unknown.)
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable only in the mid-term or long-term, because:

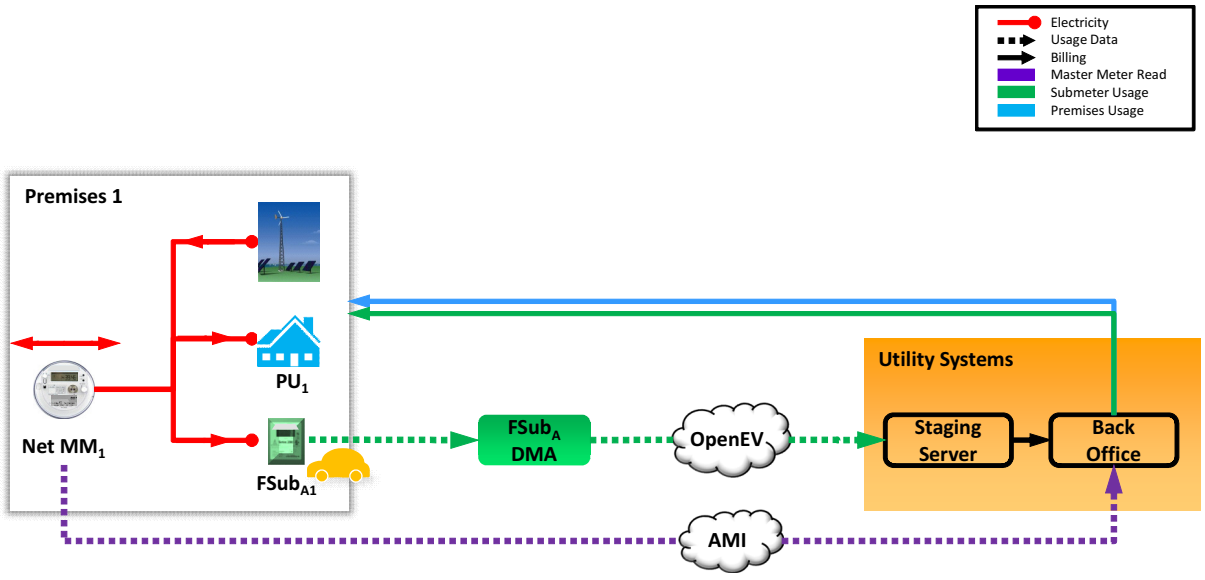
- This use case will leverage the utility interface staging server and the customer's existing Internet connection.
- Initially the back-office process will be manual but has the ability to be scalable and automated subject to the availability of future funding.
- NAESB ESPI enabled products are yet to be developed.

Use Case 17: Net Energy Metering (NEM) Basic Case [23]

Description

- This use case consists of one submeter (FSub) on one Premises.
- The Premises Owner is the Customer of Record.
- Submeter reading services are performed by a 3rd Party or utility, which reads the FSub and transfers usage data from its Data Management System (DMA) to the Utility.
- Customers have installed distributed generation equipment and currently have a net (bidirectional) meter.

Diagram



Use Case 17: Net Energy Metering (NEM) Implementation Analysis

CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Technological Characteristics	• This use case supports advanced applications of renewable energy.	• Net meters do not have the ability to disaggregate generation and load.
Technical Availability	• NEM meters are used today.	• Net meters with the required disaggregation functionality are not currently available.
Utility Integration	• This use case could potentially reduce system impact of vehicle charging because NEM customers would be generating their own power, so NEM could reduce customer use of electric power delivered from the utility.	• Utility systems are not equipped to calculate bills in NEM situations in which customer generation exceeds customer consumption from the grid. • The capability to correctly net out consumption and generation for billing purposes has not yet been developed. • To ensure that all different usages are billed at the correct rate, a customer generation submeter would be required. • Meter data management, customer information, and customer service systems would also need to be updated to establish customer-to-multi-meter relationships.
National Standards	• None identified.	• The generation submeter would need to follow the same set of standards as the EV submeter.
Billing & Regulatory	• Potential EV charging loads consume significant amounts of generated power within the customer's premises, helping reduce the need for utility billing credits for net generation on an annual basis.	• NEM adds significant complexity to the billing process as well as technical and tariff issues to be resolved. • Commercial rates are further complicated because of demand charges currently applied. • Increased potential for billing disputes.

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CRITERIA	PERCEIVED ADVANTAGE	PERCEIVED DISADVANTAGE
Utility Cost of Integration	• Utilities are already processing NEM credits, so this is functionality that does not have to be built.	• Existing utility billing systems are not equipped to calculate bills with the combination of NEM and subtractive billing for the EV submeter, in situations where the customer's generation exceeds total premises usage, or exceeds total EV usage at the submeter. • Would require additional submetering hardware in order to do billing calculations.
Customer Cost	• To be developed.	• To be developed.
Customer Experience	• To be developed.	• To be developed.

Use Case 17: Net Energy Metering (NEM) Key Conclusions

The assessment of this Use Case has led the IOUs to categorize this use case as implementable only in the mid- to long-term, because:

- The capability to correctly net out consumption and generation for billing purposes has not yet been developed.
- It is unclear how utilities would provide EV charging billing when premises net loads are 0 or negative (generation exceeds consumption).

5. SUBMETERING IMPLEMENTATION ISSUES AND REQUIREMENTS [24]

5.1 Submetering Implementation Issues and Requirements

5.1.1 Introduction

The requirements developed by the working groups address the guidelines specified in the CPUC's Phase 2 decision:

1. Use of submeters in various locations.
2. Technical performance requirements for submeters.
3. Minimum communication functionality and standards.
4. Support and protection of the security and privacy of EV user data collected by utilities and third party entities.
5. Methodology for settling disputes.
6. Compliance with national standards for measurement and communication functions.
7. Rules for incorporating subtractive billing into submetering tariffs.

These requirements were developed during project working group meetings conducted between September and December 2011. Due to the number and complexity of issues reviewed during this period, the submetering implementation requirements developed thus far remain at a fairly high level and will be subject to further collaboration and input from all stakeholders. That said, the requirements presented in this document do describe the scope of issues and dependencies that must be addressed and resolved by utilities, the CPUC, the CDFA DMS, and, to a lesser extent, third parties in order to implement submetering. Further assessments and detailed requirements will be developed as working groups continue to address Submetering Protocol development planning in 2012.

[24] Section source: Primarily PG&E, SCE, SDG&E, based on working group team meetings, individual telephone and email communication among utilities and third parties, and inter-utility communication.

5.1.2 **Guideline 1:** Use of submeters in various locations

Please see Use Case Section 4 in this Roadmap Report.

5.1.3 **Guideline 2:** Technical performance requirements for submeters

In its 5 weekly meetings and in discussions and draft development in between, the Submetering Protocol Technical Requirements Analysis team reviewed submetering technical design, testing, certification, audit, installation, maintenance, worker, and safety issues, arriving at the following decisions and conclusions.

- Defining submeter technical performance and functional design requirements and standards requires the following activities:
  - IOUs define in functional design requirements documentation the configuration, usage, and billing parameters necessary to support submetering and subtractive billing, including:
    - Format of usage information.
    - Percent error tolerance.
    - Submeter/utility meter time and date synchronization methods.
    - Local meter reading requirements and approval of meter location.
    - Meter data estimation requirements.
  - CDFA/DMS assumes responsibility for adopting specifications and establishing requirements, with technical support from IOUs and MSPs.
  - MSPs assume responsibility for implementation of technical requirements, compliance, and standards.

- Establishing requirements for submeter reliability requires the following activities:
  - CDFA/DMS and CCWM collaborate with submeter manufacturers on:
    - Developing a reliability statement and parameters specifying requirements for submeter accuracy throughout its expected life.
  - CDFA/DMS and CCWM also:
    - Investigate the appropriate length of time for meter recertification, if necessary.
    - Build reliability requirements into CDFA/DMS testing, certification, and auditing policies and procedures.

- Establishing requirements to address potential safety risks for customers, workers, and equipment requires the following activities:
  - MSPs map existing standards to the type of device based on electrical and connection parameters.
  - CDFA/DMS establishes equipment safety requirements.
  - Building code departments establish installation safety requirements.

- Establishing processes to certify and audit submeters and related submetering equipment and sites requires the following activities:
  - CDFA/DMS develops certification and audit processes and policies, including:
    - Sampling.
    - Testing.
    - Recertification.
    - How submeter manufacturers can self-certify the submeter.
    - How accuracy audits can occur with submeters embedded in other equipment.
    - How EVSE, cordset, and automaker submeter manufacturers submit:
      - New meter types for initial certification.
      - New products as sold to County Weights and Measures.
      - Operating submeters for re-certification, if necessary.
  - IOUs provide functional design requirements documentation.
  - IOUs and MSPs provide technical support.

- Establishing requirements for submeter installation, maintenance, and testing of submeters and related equipment compatible with utility meter usage data requires the following activities:
  - IOUs provide direction in the form of tariffed rules to MSPs on key requirements and how to work effectively with utilities, including requirements for:
    - De-energizing circuits during submeter installation.
    - Associating each submeter with a particular premises meter/account and network (registration) in fixed and mobile meter scenarios.
    - Establishing communication between submeter and premises meter.

- MSPs assume responsibility for implementing submeter and related equipment installation, maintenance, and testing requirements, including:
  - Obtaining data for verification purposes.
  - Recognizing when a meter is out of tolerance.
  - Fixing/updating submeter software, firmware, and hardware.
  - Handling reconfigurations based on changes in utility rates and programs.
  - Testing and verifying submeter testing equipment.

- Establishing requirements for the certification of submeter workers and providers requires the following activities:
  - IOUs provide recommendations for worker requirements.
  - DMS develops guidelines.
  - MSPs develop and implement worker training, certification, and auditing processes and content.

Conclusions of Submetering Technical Requirements Analysis Team

The Submetering Protocol Technical Requirements Analysis team arrived at the following conclusions with respect to completing the aforementioned activities:

- Significant collaboration will continue to be required between the IOUs, submeter manufacturers, automakers, and California inspection and certification authorities throughout the Submetering Protocol development process, with:
  - IOUs providing technical requirements, guidelines, recommendations, and support to MSPs, CDFA/DMS, and CCWM offices.
  - CDFA/DMS and CCWM offices developing equipment accuracy, reliability, installation, testing equipment, worker, and safety requirements based on both IOU and MSP input.
  - MSPs engineering functionality and building equipment meeting the requirements of CDFA/DMS and CCWM and factoring in the recommendations of the IOUs.

- To future-proof submeter designs, functionality should include:
  - Bi-directional capabilities enabling vehicle-to-grid functionality.
  - Demand response capabilities enabling load control.
  - NEM capabilities enabling the combined measurement of self-generation and battery charging.
  - Remote firmware and configuration update capabilities.

- CDFA/DMS and CCWM have not in the past worked with time of use submeters, submeters embedded in other equipment, or submeters relying on remote communication.
  - Establishing the required certification, testing, auditing, and recertification requirements, processes, and policies could take a considerable amount of time.

5.1.4 Communication Requirements

In its 5 weekly meetings and in discussions and draft development in between, the Submetering Communication Functionality, Standards, Security team reviewed and evaluated issues concerning:

- **Guideline 3:** Minimum communication functionality and standards.

- **Guideline 4:** Support and protection of the security and privacy of EV user data collected by utilities and third party entities.

- **Guideline 6:** Compliance with national standards for measurement and communication functions.

Key Findings

- Establishing an interface between MSPs and utilities to share 3rd party submetering data for billing purposes requires the following activities:
  - Draft an EV Profile within the Communications team and provide it to OpenSG OpenADE for evaluation.

- Develop a 3-way submetering agreement for 3rd party submetering documented in utility tariffs.
    - The actual three-way agreement is most likely to be executed via a web-portal and stored electronically with the Data Custodian (Data Custodian needs to be determined).
- Identify requirements for revisions to ESPI (e.g., advanced use cases).
- Facilitate the implementation of an ESPI submetering profile on utility and MSP systems.
- Ensure communication testing, certification, interoperability, and security.
    - Scope of team handling testing, certification, and security/privacy is yet to be determined.

- Making the best use of IOU, MSP, and other stakeholder time and effort requires participation in UCAIug and OpenSG OpenADE committees and activities to address:
    - ESPI conformance certification and interoperability.
    - Interoperability testing.
    - Test plans and requirements.

- Identify how communication requirements related to privacy and security—contractual agreements, privacy and security, certification, etc.—are defined, implemented, and enforced, including:
    - Who owns the "global effort" of ensuring data security.
    - What level should be attained (e.g., HIPAA, PCI credit cards could be used as benchmarks).
    - Responsibility and where this work should be completed.
    - Whether existing standards available or in place are sufficient.
    - Other (Liability, connection to ongoing CPUC work, scope, etc.).

- Other necessary submetering profile work (requirements identification, revisions, etc.), including the identification of use cases potentially involving standardized communications for sub-meters.

Conclusions of Submetering Communications Analysis Team

The Submetering Protocol Communications Requirements Analysis team arrived at the following conclusions with respect to completing the aforementioned activities:

- Developing communication functionality for the Submetering Protocol is best served by leveraging existing standards and standards development organizations, including:
  - NAESB ESPI.
  - OpenSG OpenADE.
  - OAuth.
  - Benchmarking.

5.1.5 Billing & Regulatory Analysis

In its 5 weekly meetings and in discussions and draft development in between, the Submetering Billing and Regulatory Analysis team reviewed issues relating to:

- **Guideline 5:** Methodology for settling disputes.

- **Guideline 7:** Rules for incorporating subtractive billing into submetering tariffs.

Key Findings

- Amending tariffs or developing new rules will require the following activities:
  - Identify potentially necessary tariff provisions – e.g., registration, enrollment, billing arrangements, fees, dispute resolution, technical performance, eligibility, etc.
  - Modify tariffs (rate schedules and rules) or create a new tariff (a new rule with reference to a technical protocol, or other solution) as necessary to align with approved Protocol.
  - Develop any necessary new technical protocol documents and forms via working process.
  - File formal applications and/or Tier 2 Advice Letter(s) with the CPUC to formally approve tariffed protocol(s) and to fully recover fixed and variable costs of submetering for subtractive billing, including any AMI and billing system upgrade costs.

- Anticipating and averting – to the extent possible – challenges caused by the complexity of customer-MSP-utility relationships requires the following activities:
  - Define roles and responsibilities, rights and obligations, and performance expectations.
  - Identify, describe, and develop mitigation steps for anticipated disputes.
  - Identify and describe incremental infrastructure needed to address disputes.
  - Review adequacy of existing rules and file new rules as necessary.

- Anticipating and averting – to the extent possible – challenges caused by the complexity of submetering data collection and subtractive billing for Direct Access (DA) and Community Choice Aggregation (CCA) customers requires the following activities:
  - Identify rights and obligations in the context of DA and CCA.
  - Expand dispute resolution approaches and steps if necessary to address DA and CCA customers.

- Anticipating and averting – to the extent possible – challenges caused by the complexity of combining submetering and NEM services requires determining:
  - The technical and regulatory feasibility of combining NEM and submetering services.
  - Measurement needed to integrate NEM and EV Submetering.
  - Tariff requirements resulting from integration.
  - Technology capabilities needed to process integrated billing.
  - Expand dispute resolution approaches and steps to address NEM customers.

- Establishing requirements for certification of Data Management Agents providing data for billing purposes requires the following collaboration:
  - IOUs provide recommendations based on Direct Access experience.
  - MSPs comply with CPUC approved requirements and implement policies and procedures.

Determining how to recoup incremental utility costs associated with submetering involves the following activities:

- Identify incremental metering, billing, customer service, and information system costs associated with submetering.
- Identify capital and O&M investments associated with new requirements, and determine whether submetering-related costs are:
  - Incremental or already accounted for in the GRC.
  - Overlapping with costs included in MSP business models.

Submetering Impact on IOU Billing Systems

In addition to participating in the weekly Billing and Regulatory team meetings, IOU representatives investigated the impact on back-office utility billing systems of using submeters to track and communicate EV charging load in standard, demand response, and net energy utility service scenarios. A new, required submetering billing process—as depicted in the right-hand column below—changes how the utility manages customer power usage, and submetering customer rates and charges, all billing processes would in turn affect all existing rates.

Standard Utility Service Scenario

Existing Billing Processes and System Steps	Billing Processes and System Steps with the Addition of 3rd Party Submeters Supplying Usage Data
1. Create customer of record 2. Associate meter to the customer 3. Assign rate class to customer's usage 4. Assign other customer charges to the customer's bill 5. Calculate bill charges for specific period and rate version 6. Print and send bill and populate usage and billing info to web portal for customer access	1. Create new customers of record for submeters 2. Associate submeters with master meters to allow subtractive billing 3. Assign rate class to submeters 4. Receive and process 3rd party data 5. Perform analysis by interval of usage on submeters and associated master meter , notify 3rd party DMA of any data anomalies/omissions 6. Reprocess corrected data submitted by 3rd party DMA, if any 7. Create new bill with overall usage and submeter usage 8. Assign costs to only residual master meter usage (MM minus SubM) 9. Assign costs to submeters 10. Assign other customer charges to submeter bills and master meter bills 11. Print and send bill and populate usage and billing info to web portal for customer access

While automated mass billing systems and processes are developed by PG&E, SCE, and SDG&E temporary solutions will be required to produce subtractive billing from submeter-generated data. It is expected, then, that during this period—potentially several years—subtractive billing will need to be handled via a "specialty" billing system with more labor and at higher cost than the automated mass billing system To be developed. This short-term solution implies the need for multiple transitional stages: the first from current systems and processes to the interim manual solution, and then from the interim solution to the automated mass market system.

And while the IOUs' current systems are automated and integrated to handle traditional billing requirements, the use of the AMI network to collect submeter data for subtractive billing would require further software updates and integration to automate back-office billing for submeter data.

5.1.6 Analysis of Other Impacts on Submetering, Subtractive Billing, and IOU Billing Systems

The four working groups identified other key questions meriting additional consideration. The utilities understand these questions to not be in scope at this time but we will keep them under consideration as the protocol is developed and address them as directed by the Commission:

1. How will Demand Response programs be affected by submetering for subtractive billing?

2. How will Net Energy Metering programs be affected by submetering for subtractive billing?

3. How will Quick-Charging stations be affected by submetering for subtractive billing?

4. How will Mobile Home Park billing be affected by submetering submeters for subtractive billing?

5. What impacts on the grid may be caused by moving away from parallel meters to submeters for subtractive billing?

6. Should the Submetering Protocol include functionality enabling vehicle-to-grid capability?

6. SUBMETERING ROADMAP [25]

6.1 Multi-Stage Roadmap Overview

The Roadmap timeline that follows illustrates a long-term, multi-phase view of Submetering Protocol planning, development, and implementation, provided that key cost-effectiveness, market development, and customer preference issues are resolved. Key elements are described in sections 6.1.1 – 6.1.5 below.

6.1.1 Detailed Roadmap for Phase 1 – Define/Plan (Complete)

This initial planning phase represents the creation of a California Submetering Protocol roadmap, which has been developed by the project working groups and detailed in this report document. Reasons for the initial focus on the California market include IOU operation and CPUC jurisdiction in California and the time required to establish nationally accepted standards. Protocol development work is planned to facilitate national acceptance. During this phase, customer and 3rd party-owned submetering is available to customers for non-billing purposes.

6.1.2 Detailed Roadmap for Phase 2 – Design/Develop California Submetering Protocol

Phase 2 consists of the activities required to develop a California Submetering Protocol. As in Phase 1, customer and 3rd party-owned submetering is available to customers for non-billing purposes. Key Phase 2 activities include:

- Completing an assessment of customer needs, technological and regulatory developments, and 3rd party product, service, and market plans:
  - In order to focus energies and leverage resources appropriately the project team has determined that it must maintain an up-to-date understanding of the marketplace as it continues to evolve.

[25] Section source: PG&E, SCE, and SDG&E

- For each use case applicable in the phase:
  - Developing business requirements and specifications for utilities, customers and 3rd party MSPs.
  - Developing technical, security, privacy requirements, specifications, and standards aligned with national standards.
  - Developing architectural design for end-to-end systems (including back office integration).
  - Developing implementation strategy and plan, schedule, tasks, and deliverables.

6.1.3 Detailed Roadmap for Phase 3 – Build Interim California Solution

Phase 3 consists of implementing a Submetering Protocol solution making customer- and 3rd party-owned submetering available to customers in California for billing purposes. In this phase utilities will be able to execute manual, small scale subtractive billing of EV charging loads. Key Phase 3 activities include:

- Building, testing, and refining the necessary processes, systems, and system interfaces.
- Pursuing development of national standards for submeters and subtractive billing.
- Establishing tariffs governing utility, customer, and 3rd party meter service providers.
- Developing certification process for 3rd party devices, systems, processes.
- Developing and carrying out customer information campaigns.

6.1.4 Detailed Roadmap for Phase 4 – Build Scalable Long-Term Solution

Phase 4 continues to enable customer- and 3rd party-owned submetering; however in this phase national standards are complete and implemented, and utilities will be able to execute automated, full-scale subtractive billing of EV charging loads. Key Phase 4 activities include:

- Upgrading utility systems to handle automated, full scale subtractive billing.

6.1.5 Detailed Roadmap for Phase 5 – Build Smart Grid Solution

Phase 5 represents long term solutions including:

- Utilities deploy Smart Grid field area networks capable of communicating with customer devices.
- National Standards are in place enabling the use of Power Line Communications for associating mobile submeters to master meters.
- NEM meters have the ability to report disaggregated data (load and generation).

Key Phase 5 activities include utilities:

- Verifying that mobile submeters are deployed consistent with all technical and billing requirements.
- Leveraging investments in Smart Grid Technologies by using an advanced field area network to collect customer submeter data.
- Assessing the market value of inter-utility communications to address vehicle "roaming".

	Phase 1 **Define / Plan**	Phase 2 **Design / Develop**	Phase 3 **Build Interim Solution**	Phase 4 **Build Scalable Solution**	Phase 5 **Build Smart Grid Solution**
	Current Planning and Development of Submetering Protocol		**Short-Term Implementation**	**Mid-Term Implementation**	**Long-Term Implementation**
DESCRIPTION	**CUSTOMER OR 3RD PARTY-OWNED SUBMETERING IS AVAILABLE TO CUSTOMERS FOR *NON-BILLING* PURPOSES**		**CUSTOMER OR 3RD PARTY-OWNED SUBMETERING IS AVAILABLE TO CUSTOMERS FOR *BILLING* PURPOSES**		**NEXT GENERATION TECHNOLOGY IS AVAILABLE**
	• IOU customers may have the choice of residential and several EV rates • IOU customers can continue to use the utility's single whole house meter, which includes EV charging and billing • IOU customers can add a parallel meter service panel for a dedicated utility-owned and read parallel meter for EV charging and billing • IOU customers can install a submeter, either owned by the customer or a 3rd party, and receive usage data from those (non-utility) sources for energy monitoring		• Submeters for IOU subtractive billing are owned by customers or 3rd parties • Submeter data for IOU subtractive billing to be provided according to protocol (includes submeter ID, premise ID, and date/time stamped interval usage) • Utilities execute manual, small scale subtractive billing of EV charging loads • Full utility cost recovery in place for upgrades to IT/billing systems and related costs	• National Standards are in place • Submeters for subtractive billing are owned by customers or 3rd parties • Submeter data for IOU subtractive billing to be provided according to protocol • Utilities execute automated, full scale subtractive billing • Full utility cost recovery in place for upgrades to IT/billing systems and related costs	• Mobile meters meet technical performance and certification requirements are market available. • Division of Measurement Standards has developed and implemented procedures for certifying mobile meters. • Utilities deploy Smart Grid field area networks capable of communicating with customer devices • National Standards are in place (Power Line Communications) for associating mobile submeters electrically to master meters • NEM meters have the ability to report disaggregated data (load and generation)
ACTIVITIES	• Define a California Submetering Protocol Roadmap - Goals, objectives, scope, guidelines - List of Issues and/or Requirements and Preliminary Recommendations - Key tasks or activities and timing for each - Responsible organizations and individuals for each • Complete and submit the Submetering Roadmap Report	• Develop a California Submetering Protocol - Marketplace understanding - Business requirements and specs for utilities, customers and 3rd party meter service providers - Technical, security, privacy requirements, specs, and standards aligned with national standards - Architectural design for end-to-end systems (including back office integration) - Implementation strategy and plan, schedule, tasks, and deliverables	• Implement a solution - build, test, and refine the necessary processes, systems, and system interfaces • Pursue development of national standards for submeters and subtractive billing • Enable 3-way handshake among the utility, customer, and 3rd party meter service provider • Develop certification process for 3rd party devices, systems, processes • Develop and carry out customer information campaign	• Upgrade utility systems to handle automated, full-scale subtractive billing • National standards are implemented	• Verify that mobile submeters are deployed consistent with all technical and billing requirements • Leverage investments in Smart Grid Technologies by using an advanced field area network to collect customer submeter data • Assess the market value of inter-utility communications to address vehicle "roaming"

7. APPENDICES

A. Matrix of Detailed Requirements [26]

USE CASES						
ISSUES and/or REQUIREMENTS	**PRELIMINARY RECOMMENDATIONS**	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS**	**TIMING**	**COSTS**
• All use cases must be identified	• Determine extent of submeter measurements, whether they are impacted down to the EV driver • Address net metering use case(s) • Address mobile submetering • Address community choice aggregators (CCAs) use case(s) • Address use of utility AMI	• Where does the power come from? • Can submeters be an in-line solution, complementary to customers with existing EVSE equipment? • Consideration of parallel metering • Inter-utility issue with mobile submetering • Is there a use case with no 3rd Party involvement (possibly near-term solution)? • EVSP role needs clarification (whether reselling electricity or just seeking to bill separately) • Possibility of customer's EVSE acting as DMA?	• Distinguish residential vs. commercial • Distinguish Single Family Home vs. MDU • Identify "who uses" and "who pays" • Identify any missing use cases / applications	• Use Cases Team	• Must be addressed before end of year	Factors • … • … Estimate • … • …
• An analysis of the use cases must be performed	• Use Direct Access as a starting point / reference point • Assess current capabilities of utility & 3rd Party systems • Assess current status of technical gaps to determine timing (Comms) • Clarify regulatory jurisdictions as they may impact cost & technical feasibility (Billing & Reg)	•	• Determine aspects of each use case, namely technological, legal and regulatory, cost (to consumers, customers, utilities, and 3rd parties), actor capabilities, national and/or collaborative requirements, & timing • With challenges, attempt to identify solutions and/or timing of solutions • Determine timing and cost of each use case (feasibility) • Place use cases into buckets corresponding to the 4 phases of the roadmap	• Use Cases Team • Billing & Reg Team • Comms Team •	• Occurs in conjunction with identification of use cases • Likely to be used as input for roadmap (due end of year)	Factors • … • … Estimate • … • …
• Short-term decisions may impact long-term approaches, costs, timing, etc.	• Identify which use cases are short term and which are long term	•	• Find discrepancies between short- and long-term decisions; go through each aspect of the use cases, which are identified in use case analysis	• Use Cases Team	• To be done before Protocol Report is completed (7/31/12)	Factors • … • … Estimate • … • …

[26] Section source: Submetering protocol working groups

BILLING AND REGULATORY REQUIREMENTS						
	ISSUES and/or REQUIREMENTS	**Discussion Points**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**COST**	**RESPONSIBLE ORGANIZATIONS**
• 1	• Amend tariffs or develop new rule(s) **PRELIMINARY RECOMMENDATIONS** • Assess existing rates and rules to determine which areas will require new language or modifications • Identify and to detail relationships with 3rd Party MSP's • Leverage Direct Access rules (where / if applicable). What was put in place for Direct Access that would need to be done for AFV sub-metering in some form	• What was exactly done in Direct Access, what can be done, will we be addressing the same questions here? • DA rules, start with IOUs to look over and comment on	• Identify regulatory requirements of Protocol. What tariff provisions are needed such as registration, enrollment, billing arrangements, fees, dispute resolution, technical performance, eligibility, etc. • Identify required changes implied by Protocol. • Modify tariffs (rate schedules and rules) or create a new tariff (a new rule with reference to a technical protocol, or other solution) to align with approved Protocol • Develop any new technical protocol documents via working process as well as new forms to file with Commission • Make advice filling (Tier 2)	• Iterative process aligned with Protocol development schedule • Make compliance filing by due date and decision (September 3rd, 2012)	Factors • … • … Estimate • … • …	• Regulatory policy and affairs • Rate design groups • Law • Customer service organizations (Revenue Services, Meter Services and Customer Communication Services) • Information technology • Communication and training • Other stakeholders (parties to the proceeding)
• 2	• Establishment of the Customer / 3rd Party MSPs / Utility relationship introduces complexity to utility billing and service delivery, and this more complex relationship has higher potential for disputes **PRELIMINARY RECOMMENDATIONS** • Adopt appropriate rules, procedures, prerequisites, and fees to mitigate conditions likely to generate disputes • Leverage DA dispute rules as a starting point • Put rules and protocols in place to assure appropriate customer service contact for customers and utilities, such as availability during CA business hours	• Utilities and customers will need ability to contact third party MSPs in the event of billing issues or other disputes • Some 3rd party MSP's may have a business model that in the long run will have customers dealing directly with them in disputes • Submetering and other PEV services may introduce billing relationships beyond CPUC and Utility jurisdiction Spell out what each party will have to do and when	• Define the nature of the relationship between IOUs, Customers and 3rd parties, including: - Roles and responsibilities of each party - Performance expectations of all participants • -Rights and obligations of each party • Identify and detail expected dispute types • Identify methods for settling identified dispute types • Identify and detail incremental infrastructure needed to address these disputes Review adequacy of existing rules and file new rules as necessary with commission	• P to September 2012 filing, will need a vetting step to ensure all parties at least have reviewed proposals and supporting arguments. • Review process	Factors • … • … Estimate • … • …	• Utility and 3rd Party MSP • Regulatory Policy • Legal Team • IOU revenue services org • Customer service org • IOU Customer relations dept.

BILLING AND REGULATORY REQUIREMENTS						
	ISSUES and/or REQUIREMENTS	**Discussion Points**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**COST**	**RESPONSIBLE ORGANIZATIONS**
3	• Utilities will need to recoup incremental costs associated with sub-metering including data collection, assembly, and QC services provided to 3rd Party MSP's **PRELIMINARY RECOMMENDATIONS** • Identify costs and recommend method of recovery from fees, rates, or other means. • If appropriate, leverage current DA or CCA service fee structure, and/or assess allocation of costs to rates •	• Determine method for the utilities to request recovery through application to recover costs • Cost allocation – what and how are costs built in to EV rates? • Each utility may take a different approach to the cost allocation and recovery • At what point would this need to be submitted to recover costs through an application? Early decision point? • There are some use cases not covered under the regulatory directive, would need to consider leaving the doors open to allow for use cases at a later date	• Determine impact of each requirement on existing utility processes and systems for each use case • Identify O&M and Capital costs associated with each of the requirements • Review existing / forecast PEV-related O&M and capital expenditures in GRC to determine which costs are incremental to existing / forecast costs • Review costs to determine any overlap with costs included in 3rd party MSPs business models • Determine cost allocation within the utilities	• Make a submittal according to the decision • Then make a recommendation for filing an application on how to recoup costs (in advance of implementation) •	Factors • … • … Estimate • … • …	• Energy Division • IOU Law, Regulatory, and finance • DRA • Parties to the proceeding
4	• Providing sub-metered services with Direct Access (DA) or Community Choice Aggregation (CCA) customers expected to add complexity to the overall utility / customer relationship, and billing systems and processes **PRELIMINARY RECOMMENDATIONS** • Current DA rules were not designed to address sub-metering; DA meters measure the entire load., DA rules and protocols may require significant restructuring to properly facilitate sub-metering • Maintain existing rules that load cannot be split (you can have only one generation supplier) •	• Where DA is considered in this context, CCA should also be considered •	• Identify rights and obligations of DA customers, CCA customers, and 3rd Party MSP's • Review and expand the results of Item #2 (Dispute Resolution) to address DA and CCA customers • Identify incremental metering, billing, and customer service processes, O&M and Capital costs associated with providing submetering services to DA and CCA customers for inclusion in #3 above	• Ready by time report is due.	Factors • Could be costs • … Estimate • … • …	• IOU Regulatory / Law • IOU ESP and CCA Services • CCAs, ESPs, and other DA market participants as appropriate • MSP Law

BILLING AND REGULATORY REQUIREMENTS						
	ISSUES and/or REQUIREMENTS	**Discussion Points**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**COST**	**RESPONSIBLE ORGANIZATIONS**
5	• Complexity and additional cost of multiple 3rd Party MSP's providing metering services at the master meter and multiple submeters **PRELIMINARY RECOMMENDATIONS** • Establish common interface protocol to receive data from the 3rd parties to the utility • Associate all submeters to one common master meter	• May not be a requirement for this protocol • Is this applicable for CCAs? • This may not be an issue. Already resolved within the DA context • Potential for apartment complex where tenants can select different 3rd party MSPs	• Dependent on which use cases will be in play for this protocol • Determine if this issue is already resolved through the use cases	• Early inventory of what is in scope for this protocol •	Factors • … • … Estimate • … • …	• IOU Regulatory • IOU and 3rd Party MSP Law •
6	• IOUs anticipate the need for subtractive billing as the method to process the submeter output into the utility billing stream and bill the premise and PEV loads separately **PRELIMINARY RECOMMENDATIONS** • Develop integration solutions applicable on a broad basis (manual and automated) •	• There is a whole tariff aspect to this and would want to look at usage patterns and implications for rate design and cost recovery • IT to understand who development for EV subtractive billing may be include future products • Understand variable and fixed components of each product • When does the data need to move from Party A to Party B • Identify boundaries to define what is included	• Understand methodology for subtractive billing • Determine the roles and responsibilities of each party • Review existing IT systems to determine the cost to implement subtractive billing through the development of new or enhancement of existing IT systems • Determine the cost to develop an interface to receive the 3rd party data • Develop the rules to receive 3rd party data • Understand (ref. metering team) what is technologically feasible • Define where is it that we're actually trying to go. What will it look like when we're done? (In stages…toward the "lofty goal.")	• IT development will be addressed with the Communications team • Rules for receiving 3rd party data will be guided by existing DA rules (pertaining to unbundling of the metering services) • SM Technical Requirements to address…	Factors • Understand the costs of various categories of subtractive billing • Identify differences between 3 IOUs • … Estimate • … • …	• Utility and 3rd Party MSP • Regulatory Policy • Legal Team • IOU revenue services org • IOU IT
7	• How we extend demand response controls to submeters **PRELIMINARY RECOMMENDATIONS** • There should be interval usage measurement • The submeter should have some capacity for demand response direct load control	• May be worthwhile to look into how this would work • Don't want to preclude any future requirements when addressing submetering • Specify in the protocols what would be enabled or excluded to meet these needs • Do we need Cal ISO involvement? (Can't answer right now. Could be beyond what we're trying to enable with submeters.) • Where are quick charging technologies today with respect to DR? (Appears to be out of scope for developing a submetering protocol.)	• Determine whether addressing this issue is in scope • Identify what we mean by "in scope." (can again be multiple stages of development), and what are the priorities. • Assess the technical feasibility of load control for a light-duty electric vehicle submeter. • Determine the necessary steps to implement DR load controls from the technical (standards / communications) and regulatory perspectives • (Suggest removing because of number and current status of DR programs.)	• Early resolution is required	Factors • … • … Estimate • … …	• Utility and 3rd Party MSP • Regulatory Policy • Legal Team • IOU revenue services org • IOU IT • IOU Demand Response • CAISO

BILLING AND REGULATORY REQUIREMENTS						
	ISSUES and/or REQUIREMENTS	**Discussion Points**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**COST**	**RESPONSIBLE ORGANIZATIONS**
8	• The possible combination of NEM and submetered services may add further complexity to the overall utility / customer relationship, and billing systems and processes **PRELIMINARY RECOMMENDATIONS** • NEM integration with Submetering protocol should be separate, focused effort after Dec 2011 roadmap filing, but acknowledged in the roadmap report. • CPUC: Main point of roadmap report: define the problem and potential ways to solve it. • SUM: Submetering could allow NEM customers to participate in market signal programs.	• At least half of customers will have EV and Solar • NEMMT (multiple technologies) can be expanded to include EVf • Need to determine what can be done (talk to Meter group about this) • Subtractive billing capabilities may not be the solution in this instance, will need to look at other solutions • Current net metering process and technology is not sufficient to provide direct PV to PEV measurement • Separate rates for master meter and sub meter add more complexity to measurement • If customer chooses to have master meter and sub meter on same rate, this could reduce the complexity from a price per kwh standpoint • Need to consider projected volume of customers that would fall in this scenario • Not noted in protocol guideline. Need to determine if this is in or out of the OIR decision. • This is going to come up a lot, and will do ourselves a disservice if we delay…need to address metering of NEM and PEV via or with PEV submeters. Need to identify possible variations of how PEV charging and NEM systems are metered, data communicated, and billing handled. • **Definitely need to note in the roadmap** • Use case team is adding a NEM use case	• Determine the technical and regulatory feasibility of combining NEM and submetering services. • Review and expand the results of Item #2 (Dispute Resolution) to address NEM customers • Identify incremental metering, billing, and customer service processes, O&M and Capital costs associated with providing submetering services to NEM customers for inclusion in #3 above • Determine measurement needed to integrate NEM and PEV Submetering • Determine tariff requirements resulting from integration • Determine technology capabilities needed to process integrated billing	•	Factors • … • … Estimate • … • …	• IOU Regulatory / Law • IOU ESP and CCA Services • PV suppliers • IOU Metering Standards • IOU Generation Interconnection • IOU RP&A • IOU DR and EE Programs

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS

ISSUES and/or REQUIREMENTS	DISCUSSION	KEY TASKS OR ACTIVITIES	RESPONSIBLE ORGANIZATIONS / INDIVIDUALS	TIMING	UTILITY COSTS
Technical performance and functional design requirements and standards **PRELIMINARY RECOMMENDATIONS (10.27.2011)** EV participants jointly develop these, using DASMMD (Direct Access Standards for Metering and Meter Data) as baseline	*TOU, Timing, Synchronization* • TOU measurement is 60 min. for residential and 15 min. for commercial. • SCE keeps meters on standard time and do seasonal adjustments in the back office systems, not at the meter. There has been too much trouble with calendars and clocks in meters. • ECOtality: I agree we should reduce the number of synchronizations required, and that clock standards need to be established • CSMD: I don't believe that's happened yet. • The immediate task at hand is to determine kWh usage formats and to determine how calendar and clock requirements are handled. Agree with UTC approach. • SUM: Be careful about federal requirements and time changes • DMS: If time becomes a function of billing, then we would have some involvement *Local Meter Reading, Usage Estimation* • Is there a requirement about local meter reading that can be specified for MSPs? • We don't want data estimation to be the default solution when data isn't available. This is especially important for DR programs. • If tariffs change—e.g., DR—that can drive a change for the submeter *Error Tolerance Levels* • GE: There is a possibility that DMS will have to retool their requirements and testing. Current accuracy requirement is 1%, while meter capability is .01%. • There appear to be two requirements for DMS: Initial certification at 1%, re-certification at 2%. • Requirements are at a system level. *Accuracy Standards* • Utilities are driven by ANSI standards for testing while the state sets the tolerance levels • Regulations have not kept up with advancements in meter technology • DMS hasn't determined how to re-certify meters every 10 years • Utilities do annual sample testing among different meter types and will check when there are billing complaints (SCE and SDG&E do similar testing). Once installed the bulk of the testing is in the field, both for general accuracy and billing complaints. (PG&E to provide more information.) DASMMD standards are followed. • Wouldn't the utility still have the authority to set the standards for what would be used for billing? • We would accept what CDFA DMS specifies for accuracy. It's the same requirement imposed on the utilities. It should be the same level, or on par, with existing meter accuracy standards. • SDG&E: That's very important; SM accuracy has to be the same as other meters. *Other* • Utilities may have different parameters. Won't necessarily be one set of requirements; need to maintain flexibility.	• **IOUs define billing and usage parameters (load, time, etc.)** - Define interval data needs, or if we need interval data at all. - Define configuration needs - Confirm format of usage information, especially for time of use and associated clocks and synchronization, including impacts of federal requirements and time change impacts - Address V2G power flow scenarios in requirements in order to future-proof the technology - Verify that types of technical requirements, compliance, and standards identified are complete - Identify source documents offering requirements that can either be used as is, as models, or for ideas ▪ Review DASMMD standards for appropriateness, make comments on what's appropriate and what isn't (e.g., multiple users of same meter during the day) ▪ Check F&A DMS documents (Reference Manual) posted on web (need to assure accuracy, avert tampering) ▪ Gary Fox has documents and can share them - Establish percent error tolerance ▪ Should be on par with a utility meter (or better), if it's used for customer billing purposes ▪ Confirm utility accuracy requirements ▪ Confirm that CDFA DMS creates the standards for billing accuracy ▪ Confirm CDFA DMS processes for testing embedded meters and meters with TOU/synchronization clocks that can communicate wirelessly - Recommend how to synchronize submeter time clocks with utility meters on the premises, including: ▪ Defining data storage requirements: ▫ Data quantity ▫ Duration of storage ▫ Duration of intervals - Recommend local meter reading requirements ▪ If we can't get the data remotely, how do we get it locally? We need to determine that this is a requirement. - Recommend meter data estimation requirements when it is not available locally either ▪ VEE (data Validation, Estimation, and Editing) Rules for situations in which data doesn't exist and estimations are required	• IOUs responsible for identifying for DMS how the submeters should be configured to support submetering & subtractive billing; • IOUs provide functional design requirements documentation and technical support • CDFA/DMS responsible for adopting specifications and establishing requirements • MSPs responsible for implementation	• Dependent on tariff requirements. • Need language on meter clock and calendar. • Approximately 1-3 months (just tech functional design) • Need to integrate discussions w/ MSPs and DMS • But if requirements cause a change in standards that will extend the time frames.	<u>Factors</u> • Labor only • Communication <u>Estimate</u> • No incremental cost

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Technical performance and functional design requirements and standards *(continued)* **PRELIMINARY RECOMMENDATIONS (10.27.2011)** EV participants jointly develop these, using DASMMD (Direct Access Standards for Metering and Meter Data) as baseline *(continued)*	*Accuracy Standards (continued)* • SUM: In speaking with consumers, they're also looking for similar levels of accuracy in NEM situations. • CCWM: I don't believe any of our systems have a clock in them. This hasn't been relevant to the mobile home parks, so industry hasn't developed this equipment. • TOU, IDR, interval data needs will drive requirements into submeter manufacturing. • Other • ANL: It would be nice to have a table of submeter vendors. • ANL: Shouldn't we be defining what we want in the future, rather than looking at what EVSE manufacturers are doing today? • ANL: Computational power demands will increase significantly. • The ideal way to do this project would be: Use Case Team → Billing & Regulatory → Tech & Comms Requirements • ANL: Point of contact question. Who is a good point of contact to give DOE the official line on what's happening with CPUC? DOE is currently getting different information from different sources. (A little bit of misinformation goes a long way.) • DOE should be referencing the October 27 Workshop Report and December 31 Roadmap Report as the proper source. • Will refer DOE to Adam Langton at CPUC.	• Narrow the use case scenarios (meters don't care who's plugging in, but there are requirements on the billing side, which is complicated) • Can we have a one size fits all use case scenario? This becomes very complicated and time-consuming.	• Refer to Use Case Team		
		• The task at hand is to determine the jurisdiction of the submeter, and that will drive the accuracy requirements. In California we've heard over time that DMS has the jurisdiction over submetering in California in a billing application. If there's a final transaction going on CDFA DMS drives the accuracy requirements. • If tariffs change—e.g., DR—that can drive a change for the submeter. Tariffs can drive the need for much more complex submeters. • Is there a requirement about local meter reading that can be specified for MSPs? • We don't want data estimation to be the default solution when data isn't available. This is especially important for DR programs .	• Refer to B&R Team		
		• Determine how data communication technology, standards, security will affect the metering hardware	• Inform Comms Team		

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS

ISSUES and/or REQUIREMENTS	DISCUSSION	KEY TASKS OR ACTIVITIES	RESPONSIBLE ORGANIZATIONS / INDIVIDUALS	TIMING	COSTS
Certification and Audit of submeters and submetering equipment/sites **PRELIMINARY RECOMMENDATIONS (10.27.2011)** Dept. of Food & Agriculture Division of Measurement Standards (CDFA/DMS) oversees certification process (reference: DASMMD)	*Current CDFA/DMS Procedures, Guidelines, Tools* • Current understanding is that meter approval is in multiple stages: (1) Basic meter type/technology certification; (2) Then individual meters are certified at County Weights and Measures Departments (CCWM); (3) Every 10 years meters are re-certified – Determine how testing and certification occur with meters built into EVSE (cordset and charger) and automotive equipment • Current reference manual covers traditional utility socket meter, and not a submeter connected to something else. • ECOtality: We currently have a meter that is internal to our equipment which you can see from the outside. That meter could be certified. The meter is being used by some utilities and incorporated it into our level 2 EVSE. Would we need to expose this meter to the outside? If the EVSE is certified, would this meter need to be physically mounted on the outside? – DMS: Our preference would be that the meter be exposed so a cabinet doesn't have to be opened up. • Coulomb: Is it reasonable to have a display that is a separate device than the meter displaying the energy usage on the outside? – DMS: Yes. • We need to define and standardize what needs to be read out on the meter (cum. Hours, hours by time period, etc.) – DMS: We have to compare the metering and readout to double-check them • DMS not experienced with TOU, embedded meters, or wireless communication of metering data *MSP Certification Requirements* • Coulomb: Is there a federal certification body for multi-state certifications? – We don't think there is one. – But in the DASMMD there is language about using a nationally recognized testing lab (NRTL). There are independent testing labs out there marketing their services to whoever needs a product tested. They would test according to the standards applying to those devices. • Coulomb: Would we have to certify state by state then? • IOU: Probably. • GE: Only California has existing language on submeters • IOU: But if you go by what CA has there's a chance the other states would accept it. *Other* • IOUs may have input on certification and audit requirements and processes, but basically this is a CDFA/DMS activity.	• CDFA/DMS establishes process to certify and audit technical requirements (as defined above) – Testing and auditing approaches – 100% vs. sampling – Re-certification requirements and timing – How the meters are to be tested – How meter certification is documented – Roles and responsibilities – Understand current CDFA/DMS/CCWM processes, and confirm that they are the drivers of this process. ▪ SCE would accept that process as established by CDFA DMS ▪ SDG&E: Uncertain as to accuracy requirements of CDFA as compared to existing accuracy levels; so there could be an issue if there is a mismatch ▪ CPUC: I have the same question; I thought utilities set their own standards for utility meters – Clarify circumstances requiring 100% vs. a sampling of meters for certification – Clarify whether CDFA/DMS and/or CCWM can adjust their current processes and requirements – Understand how submeter manufacturers can prove accuracy prior to (or instead of) testing and certification – Determine how submeter accuracy auditing can occur with meters built into EVSE (cordset and charger) and automotive equipment – Determine how EVSE, cordset, and automaker submeter manufacturers ▪ Submit new meter types for initial certification ▪ Submit products as sold to County Weights and Measures ▪ Submit products decennially for re-certification	• IOUs responsible for identifying for DMS how the submeters should be configured to support submetering & subtractive billing; • IOUs provide functional design requirements documentation and technical support	• DMS' timeline • 6-12 months max, certainly < 1 year (including county weights and measures) • NOTE: DMS activity is on the critical path of utilities developing a submetering protocol. If DMS has to start from scratch it could take a long while.	Factors • Labor only • Communication Estimate • No incremental cost

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Certification and Audit of submeters and submetering equipment/sites *(continued)* **PRELIMINARY RECOMMENDATIONS (10.27.2011)** Dept. of Food & Agriculture Division of Measurement Standards (CDFA/DMS) oversees certification process (reference: DASMMD) *(continued)*	*CDFA/DMS Authority* • CCWM: Until CPUC decides that submeters are subject to DMS regulation, I'll have nothing to do with it… - Adam to forward decision. We may need new standards and processes. - Adam to get a call together with DMS to discuss these issues, and to get David Lazier to join us on these calls. - Ron described meter from England with comparable accuracy	• CPUC/CDFA/DMS clarify the jurisdiction of the submeter in California, and identify guiding documents (F&A DMS, regulation, legislation). - DMS has not verified its role in sub-metering; responsibility may be delegated to county weights and measures. There appears to be flexibility in existing standards. - Verify in field reference manual. - Check with legal • IOUS determine whether certification requirements come from submeter manufacturers, utilities, and/or CPUC. (Certification requirements should come from the CDFA DMS with input from the utilities or CPUC.)	• Refer to Billing & Regulatory Team		
	Dispute Resolution • Customer complaints usually start at the county level; disputes then move to the submeter manufacturer and then to the utility. There are implications for the auditing process depending on who owns the billing dispute process.	• IOUs determine impact of dispute resolution processes on the auditing process	• Refer to Billing & Regulatory Team		

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Requirements for installation, maintenance, and testing of submeter and related equipment compatible with the utility meter usage data **PRELIMINARY RECOMMENDATIONS (10.27.2011)** EV participants jointly develop these, using DASMMD (Direct Access Standards for Metering and Meter Data) as baseline submeter is capable of providing interval data (e.g. 15 minute interval data configuration)	*Roles and Responsibilities* • EVSE, cordset, and auto manufacturers have to figure out how to maintain this device with respect to testing and accuracy • Utilities need to support the registration of these SMs when installed *Other* ECOtality: What impact will vehicle-to-grid (V2G) power flow have an impact on submetering? Will we need a whole new protocol for this? IOUs: We'll need a bi-directional meter. That would be driven the rates and tariffs. If that comes into play, IOUs: Good point. We might need to include that in technical design that submeters need to be bidirectional. (to future-proof them) IOUs: There have been discussions about this concept. It's not that big of a deal with solid state electronics today. IOUs: If scope of decision is charging only, generation would not be included in the protocol, but we need to be mindful of it. (Get Billing & Regulatory opinion on this.) ECOtality: This would fall into the category of net metering. Submetering should probably follow that approach/work. CPUC: Something to address, don't want to preclude it with what we're doing now.	• Utilities develop: – Requirement for shut-down/de-energizing circuits during installation of submeters, particularly at commercial sites. – What it takes to associate the meter with a particular premises meter/account and network (registration) in fixed and mobile meter scenarios ▪ Establishing communication between submeter and premises meter ▫ There are multiple ways to get the data back to the cloud ▫ There are multiple types of submeters to be profiled as well (Comms team addressing) • MSPs identify source documents offering installation, maintenance, and testing requirements either usable as is, as models, or for ideas – Review DASMMD contents; determine what's appropriate and what isn't – Identify EVSE, cordset, and auto manufacturer materials; determine what's appropriate (as is, as a model, or to generate ideas) and what isn't • MSPs determine how to verify the quality of submeter data – How to obtain data for verification purposes ▪ Locally and remotely ▪ Relates to VEE rules for verifying quality of data once retrieved into MDMS – How to know when a meter is out of tolerance ▪ Generally, at a high level, when we retrieve data you stop getting it. Or, the data looks way out of whack; the numbers don't compare with the premises meter; it's grossly wrong. – Validation should be provided by meter reader (MDMA) • MSPs: – Benchmark EVSE, cordset, automaker, utility processes for data verification – Determine how to correct and/or replace submeters discovered to be out of tolerance – Determine how to handle reconfigurations based on utility rates and programs ▪ For example, shifting from 60 min. intervals to 15 min. intervals – Determine how to fix/update software and firmware issues	• MSPs responsible for requirements definition and implementation, with specifics spelled out in the tariffs • Utilities provide direction on key requirements and how to work effectively with the utilities	• 1 – 2 months	Factors • Labor time adapting current electrician and other training, web info Estimate • … • …

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Certification of submeter workers/providers **PRELIMINARY RECOMMENDATIONS (10.27.2011)** EV participants jointly develop these, using DASMMD (Direct Access Standards for Metering and Meter Data) as baseline	*Roles and Responsibilities* • In DA the IOUs certified employees and their training, because they're touching utility equipment. • Installers need to meet certain qualifications/state requirements	• MSPs identify source documents offering testing equipment manufacturer, data processing, and worker certification methods that can either be used as is, as models, or for ideas - Review DASMMD contents; determine what's appropriate and what isn't - Identify EVSE, cordset, and auto manufacturer materials; determine what's appropriate (as is, as a model, or to generate ideas) and what isn't • MSPs develop a worker training, certification, and auditing process - How training, certification, and auditing occur - How training, certification, and auditing results are documented - Responses for out of conformance results - Determine roles and responsibilities • DMS develops a submeter testing equipment certification process - How certification occurs - How certification results are documented - Responses for out of conformance results - Determine roles and responsibilities	• MSP certifies • DMS to provide guidelines for worker requirements • IOUs to provide recommendations	• 4 – 6 months	Factors • … • … Estimate • … • …

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Certification of Data Management Agents	*What are we talking about?* • We're talking about certifying the DMAs providing data for billing purposes. *Roles and Responsibilities* • 3rd party DMAs have to be certified to OpenEV interface standards. Who has responsibility for this? Today in the DA world MDMAs are certified by utilities (forced on utilities because no one else could do it). This role is undesirable for cost and other reasons. • We'd have to meet with MDMAs to check on how well they were meeting data requirements (time, quality) • DMS certifies data, shouldn't they certify the DMA as well, the provider of the data? - CPUC and DMS don't have authority in this area.		• MSP certifies		

METERING TECHNICAL REQUIREMENTS, COMPLIANCE, STANDARDS REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Safety risk (equipment, workers, customers) **PRELIMINARY RECOMMENDATIONS (10.27.2011)** Use applicable and existing national and state standards & requirements (e.g. UL, NEC, FCC, ANSI, DASMMD)	*Definition and Background* • Mitigating potential damage to life and property • Meters are embedded in equipment. • This refers to building equipment to various standards applying to electrical devices installed in residential, commercial, industrial premises. • Safety requirements are driven by local jurisdictions (electrical inspectors and guiding documents can differ depending on location and resource availability) • First you have to make the device and have it comply with applicable standards, and then there's an installation process that has to comply with local safety standards. *Existing Safety Standards* • UL is standard agreed with. Main standard. It is required. It's about the safety of the overall equipment as a device by itself. • UL 2594 is the standard used by most EVSE manufacturers for L1 and L2 charging stations. *Defining and Implementing Safety Standards* • Product use needs to be listed. This is already part of the NEC Section 90.7, calls for a testing laboratory. Makes it possible for AHJs to complete assessments without inspections of internal components. • There is the local AHJ, which will vary across the state and country. It's a local thing, so you have to comply with local jurisdiction requirements driven by NEC and various other local codes. (Installation side). There will be installation instructions from the manufacturer, and the AHJ will check for compliance. *Other* • These different metering scenarios and charging levels feed into the use case work. But the safety—and certification—needs are related to the type of device. • SCE is doing testing and evaluation of a smart receptacle (110v). Also working with DOE US Drive on a standalone submeter that could be inserted in a circuit for a non-smart EVSE. The Roadmap should include continued investigation.	• The task here is for MSPs to map the standards to the type of device based on its electrical parameters and how it makes a connection. Hard-wired vs. plug in device have different requirements. - Look at issues by location of meter. • MSPs identify applicable standards (on manufacturing side) and develop requirements - This should be a fairly routine process for manufacturers • Part of certification process by DMS (UL or ANSI certified equipment meets DMS requirements. Installation should be referred to building code agencies.)	• MSPs (e.g., EVSE manufacturers) and DMS certification and audit processes		
	• Many EV drivers might be interested in 110 volt charging on a submetering basis. • 8 hours of home and workplace charging can be handled with 110 v. • In the future, if we can handle L2 240v like a dryer circuit, EVSE equipment could just become plug-in equipment if homes come with 240v and rated amperage. Would that fulfill technical requirements? • This is valid. I submitted to use case team the idea of a dumb EVSE. • There are already manufacturers with plug in 50 amp equipment. Tesla has 70 amp and 90 amp on the way. • There's a case for a smart submeter standalone unit or in line. The service providers could cover a lot of those cases.	•	• Refer to Use Case Team		

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ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Accurate billing **PRELIMINARY RECOMMENDATIONS (10.27.2011)** Use applicable and existing national and state standards & requirements (e.g. ANSI, DASMMD)	• Contents moved to first issue on developing technical requirements.				

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ISSUES and/or REQUIREMENTS	**DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**RESPONSIBLE ORGANIZATIONS / INDIVIDUALS**	**TIMING**	**COSTS**
Reliable submeter **PRELIMINARY RECOMMENDATIONS (10.27.2011)** Use applicable and existing national and state standards & requirements (e.g. ANSI, DASMMD)	*Consumer Elements* • People have to know that once you get to certain point in time it's time to replace the device. Utilities give premises meter requirements to manufacturers. Originally called out in ANSI. Life expectancy of solid state equipment has dropped from electro-mechanical days. • Consumers will use a device as long as they can (beyond designed life and accuracy levels). CSMD needs to revisit the recertification/accuracy verification interval. *Utility Preferences* • Utilities want the meter device to have a safe and accurate life time of 20 years (SCE-specific) allowing for temperature, humidity, vibration, voltage variation *Roles and Responsibilities* • Mainly up to the device manufacturers to determine the expected life of their equipment. *Changing State Recertification Requirements* • CSMD: Given this issue, should recertification be more often than 10 years? • Let's defer this to CSMD and the manufacturers	• We need to establish a reliability statement and parameters such that the meter maintains its accuracy over its expected life. At a high level the submeter has to perform its function reliably and accurately over its expected life. • Investigate whether meter recertification should be more often than 10 years • This all has to be spelled out in the initial certification process, which describes initial evaluation and ongoing testing	• CDFA DMS, CCWM and EVSE manufacturers		

COMMUNICATION FUNCTIONALITY, STANDARDS, AND SECURITY REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**PRELIMINARY RECOMMENDATIONS & DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**Integration COST (Utility)**	**RESPONSIBLE ORGANIZATIONS/ CROSS CUTTING ISSUES**
• Establish an interface between 3rd parties and utilities to share 3rd party sub-metering data for billing purposes	• Utilize existing utility systems to implement interface standard • Utilize the NAESB Energy Services Provider Interface (ESPI) standard • Leverage the OpenSG OpenADE working group to create an ESPI profile or necessary document modifications to align with proposed sub-metering phased approach	• EV profile will be drafted within Submetering Communications, Std & Sec. team and shared with OpenADE for verification. ○ Need to choose data types to determine if revisions need to made (e.g., Usage Data, PQ data) ○ Possible sub-team work • Develop 3 way sub-metering contract for 3rd party sub-metering • Implement ESPI sub-metering profile on utility and EVSP systems • Identify requirements for revisions to ESPI (e.g., advanced use cases)? • Testing, Certification, Interoperability, Security	• Depends on many system-wide factors (development, testing and certification, implementation…) • Updates provided to ESPI in 2012 (if necessary for fixed sub-metering or advanced use cases) • Ability to certify by middle of next year •	Factors • • … Estimate • … • …	• Work will be conducted within CPUC Submetering Comms, Std & Comm team. OpenSG OpenADE working group. Expected participants include California IOUs, Interested EVSPs, and other interested parties. • Determine next steps for advanced use cases (e.g., Use Cases 4 & 5)
• Implement ESPI on end device (sub-meter) to interface with service provider directly (for sub-metering only purposes)	• Could be implemented w/ current technology as alternative to Use Case 1&2 • Could add a 3rd party in at a later date • Similar to VOIP. Certified device list able to call home (?) when plugged in to the internet • Security? 3rd party management- certificate? ○ Benefit: Direct communication b/t sub-meter and utility • VPN through homeowners internet connection • Servicing? Access? • EVSP Networks in use for value Added Services? ○ Synchronization problems • EVSE Wi-Fi possibility • Other comms connections for upgrades, etc. • Sub-meter identified as conformant	• Determine priority compared to other use cases • Determine OAuth and ESPI implications • Next Steps?	• Depends on priority compared to existing use cases (Use Case team?)	Factors • • … Estimate • … • …	• Use case (and RegulatoryTeam?) to look at
• ESPI conformance certification and interoperability	• Use the certification authority and processes in development by UCAIug and OpenSG OpenADE	• Participate in UCAIug and OpenSG OpenADE committees • Interoperability testing	• By middle of next year	Factors • … • … Estimate • … • …	• Test plan development, Testing and Certification w/in OpenSG OpenADE • OpenSG OpenADE (participation encouraged) and iinterop committee

COMMUNICATION FUNCTIONALITY, STANDARDS, AND SECURITY REQUIREMENTS					
ISSUES and/or REQUIREMENTS	**PRELIMINARY RECOMMENDATIONS & DISCUSSION**	**KEY TASKS OR ACTIVITIES**	**TIMING**	**Integration COST (Utility)**	**RESPONSIBLE ORGANIZATIONS/ CROSS CUTTING ISSUES**
• Privacy and Security of the customer and energy consumption data	• Common security and privacy requirements for customer and energy information (at rest and in transit). E.g., ESPI security requirements on utility side • Included as part of the contractual relationship between customers, 3rd parties, and utilities (Terms and Conditions)	• Review ESPI security requirements • Determine who owns the "global effort" of ensuring data security. • Determine what level should be attained (HIPAA, PCI, credit cards?) • Determine responsibility and where this work should be completed • Determine if existing standards available or in place are sufficient	•	Factors • Dependent on level of cert. • … Estimate • … • …	• DOE Report (http://energy.gov/gc/downloads/department-energy-data-access-and-privacy-issues-related-smart-grid-technologies) **QUESTIONS FOR CPUC, REGULATORY TEAM, OTHERS:** • Is there coordination or discussions in the CPUC DECISION ADOPTING RULES TO PROTECT THE PRIVACY AND SECURITY OF THE ELECTRICITY USAGE DATA OF THE CUSTOMERS workshops relating to the use of ESPI for sub-metering? • What is the scope and outcomes of that rule and workshops (e.g., 3rd parties requirements? utility regulations? data being communicated? Access to data? Contracts? Certification? Data storage? Enforcement/liability? Others?) that can or must be applied to the sub-metering effort? • What is the scope of the (1) CPUC (2) IOUs (3) Communications team to define security and privacy for sub-metering beyond the ESPI interface (e.g., on the sub-meter, between the sub-meter and 3rd parties, etc.)? • For 3rd party collection, communication, and storage? • Related to existing IOU rules and practices? • Certification? Liability? Contracts (Terms and Conditions)? Enforcement? Etc.
• Communication standards for submeters	• 3rd party communication complies with defined requirements identified in contractual relationship between customers, 3rd parties, and utilities •	• Define which use cases could involve standardized comms	•	Factors • … Estimate • …	• Use Case group should look at where/if sub-meter communication is in scope (e.g., standardization)

B. Glossary

AHJ	-	Authority Having Jurisdiction
ALJ	-	Administrative Law Job
ANL	-	Argonne National Labs
ANSI	-	American National Standards Institute
CCA	-	Community Choice Aggregator
CDFA/DMS	-	California Department of Food and Agriculture Division of Measurement Standards
CPUC	-	California Public Utilities Commission
CCWM	-	California County Weights and Measures (offices)
DA	-	Direct Access
DASMMD	-	Direct Access Standards for Metering and Meter Data
DMA	-	Data Management Agent
DOE	-	U.S. Department of Energy
DR	-	Demand Response
ESPI	-	Energy Services Provider Interface standard
EVSE	-	Electric Vehicle Supply Equipment
EVSP	-	Electric Vehicle Service Provider
FCC	-	U.S. Federal Communications Commission
GE	-	General Electric
HIPAA	-	Health Insurance Portability and Accountability Act (health care privacy and security standards)
MDMA	-	Meter Data Management Agent
MDMS	-	Meter Data Management System

MDU	-	Multi-Dwelling Unit
MSP	-	Meter Services Provider
NEC	-	National Electric Code
NEM	-	Net Energy Metering
OAuth	-	Open Authorization (data security protocol enabling users to grant 3rd party access to web resources without sharing passwords)
OpenADE	-	Open Automatic Data Exchange (specifications for granting a 3rd party access to customer electricity data held by utilities)
OpenSG	-	Open Smart Grid (forum for the development of requirements for Smart Grid systems)
PCI	-	Payment Card Industry (data privacy and security standards)
PG&E	-	Pacific Gas and Electric
PLC	-	Power Line Communications
PQ Data	-	Power Quality Data
SCE	-	Southern California Edison
SDG&E	-	San Diego Gas and Electric
SM	-	Submeter
SUM	-	The SUM Group Security Solutions Company
TOU	-	Time of Use
UCAIug	-	Utility Communications Architecture International Users Group (not-for-profit corporation consisting of utility user and supplier companies that is dedicated to promoting the integration and interoperability of electric/gas/water utility systems through the use of international standards-based technology)
UL	-	Underwriters Laboratories
V2G	-	Vehicle to Grid (power flow)
VEE	-	Validation, Estimation, and Editing (of data estimates used in billing when actual data are not available)
VPN	-	Virtual Private Network