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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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)

ASSIGNED COMMISSIONER'S SCOPING MEMO AND RULING – PHASE 4

In accordance with Rule 7.3 of the Commission's Rules of Practice and Procedure, this ruling amends the scope of the proceeding. The issues included in the amended scope of this proceeding and the amended procedural schedule are set forth below. This part of the proceeding is referred to as phase 4.

1. Background

The Commission initiated this rulemaking proceeding in August 2009 as part of its efforts to ready the electric infrastructure for light-duty passenger plug-in hybrid electric vehicles and battery electric vehicles (collectively "plug-in electric vehicles").

The Commission has adopted two decisions in the proceeding: Decision (D.) 10-07-044 and D.11-07-029. These decisions concluded phase 1 and phase 2 of this proceeding, respectively. In phase 3 of this proceeding, the Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E) and Southern California Edison Company (SCE) were directed to make three joint

compliance filings, including a notification assessment report,[1] a submetering protocol report,[2] and the load research report.[3]

The notification assessment report was submitted on December 23, 2011 and the load research report was filed on December 28, 2012. The submetering protocol report remains outstanding and is further discussed below in section 2.

Today's ruling serves to conclude phase 3 of this proceeding. This ruling also defines the two issues to be addressed in phase 4: (1) submetering protocols related to plug-in electric vehicles and (2) cost allocation for distribution line extensions related to the charging of plug-in electric vehicles. Lastly, this ruling extends a prior Commission directive for the utilities to perform certain load research related to electric vehicles. These matters are discussed below in more detail.

2. Submetering Protocol Development Process

The Commission's decision in phase 2 of this proceeding directed the utilities to develop rules to accommodate customer-owned submeters and ordered the utilities to host a workshop on this topic before October 31, 2011. The Commission also set a deadline of July 31, 2012 for completing the

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[1] Ordering Paragraph 1 of D.11-07-029 described the notification assessment report as, among other things, a "report that sets forth notification options to track the location and re-location" of plug-in electric vehicles.

[2] Ordering Paragraph 4 of D.11-07-029. The Commission directed the utilities to include in this report, among other things, a proposal to allow the joint implementation of a comprehensive submetering protocol.

[3] Ordering Paragraphs 6 and 7 of D.11-07-029. The Commission directed the utilities to research six different topics related to Electric Vehicle load. This December 28, 2012 document is entitled, Electric Vehicle Load Research and Cost Studies.

submetering protocol report. The utilities submitted a preliminary report on January 3, 2012. The preliminary report identified 17 scenarios for submetering in the context of plug-in electric vehicles and evaluated the feasibility of each of these cases to determine which scenarios could accommodate the utility's billing system.

After reviewing the information provided in the preliminary report, the Administrative Law Judge issued a ruling on January 31, 2012 asking parties to answer additional questions related to the report. The utilities subsequently requested a one-year extension to comply with the deadline for developing the submetering protocol. The revised deadline is July 30, 2013. Other dates in the proceeding were adjusted to accommodate this extension. The utilities also submitted to the Commission's Energy Division a draft report, entitled the Strawman for Plug-In Electric Vehicle Submetering Protocol, on October 1, 2012.

The utilities' draft report dated October 1, 2012 is attached and entered into the record of this proceeding as Attachment 1. Also attached is a document entitled, Rule XX Plug-In Electric Vehicle Submetering. This document is attached as Attachment 2 and is entered into the record of this proceeding.

In response to this draft report, the Joint Electric Vehicle Service Providers[4] (EVSPs) sent a letter to the Commission dated October 22, 2012 suggesting that the utilities' proposal failed to meet the Commission's goals and asked the Commission to reject the proposal.

This October 22, 2012 letter is attached and entered into the record of this proceeding as Attachment 3.

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[4] The EVSPs include Coulomb Technologies, Ecotality, and Better Place.

The Commission's Energy Division subsequently held a workshop on January 8, 2013. At the workshop, Energy Division presented a proposal in response to the utilities' October 1, 2012 draft report. The Energy Division's proposal recommends two pilots to better understand the costs and benefits of electric vehicle submetering and also recommends an additional extension until September 30, 2015 for the utilities to submit a final proposal on submetering protocol, as required by Ordering Paragraph 4 of D.11-07-029, as modified. Following this workshop, Energy Division prepared a proposal, entitled CPUC's Energy Division Proposal for the Development of Electric Vehicle Submetering.

The CPUC's Energy Division Proposal for Development of Electric Vehicle Submetering is attached and entered into the record of this proceeding as Attachment 4.

To assist the Commission in evaluating the Energy Division's attached proposal, parties are requested to file comments. The schedule for comments is included below in section 5. The comments filed by parties should respond to the following questions:

- What are the estimated utility costs of administering each phase of the pilot in the Energy Division's proposal? How should these costs be shared between electric vehicle service providers and the utilities?
- The Energy Division's proposal includes two pilots, a Single Customer-of-Record pilot and a Multiple Customer-of-Record pilot. Should the results of the Single Customer-of-Record pilot be used to determine the need to do the Multiple Customer-of-Record pilot?
- How should the customer's experience with submetering be evaluated?

3. Utility Cost Recovery Policy for Electric Vehicle Residential Upgrades

Today, I also seek comments from parties on whether to extend for an additional limited period of time the cost recovery policy adopted by the Commission in D.11-07-029 related to residential service facility upgrade costs triggered by home-based electric vehicle charging.

In D.11-07-029, the Commission addressed the distribution cost impacts associated with electric vehicle usage. Specifically, the Commission determined that electric vehicle load is a new and permanent load as defined under Electric Tariff Rule 15 (Distribution Line Extensions) and Rule 16 (Service Extensions). The Commission also determined on an interim basis that facility upgrade costs associated with electric vehicle chargers at residential sites would be treated as a common facility, rather than a cost paid by the individual customer.[5]

The cost allocation policy was based, in part, on Pub. Util. Code § 740.2(a), which requires that the Commission implement "infrastructure upgrades necessary for widespread use" of plug-in electric vehicles. The Commission also relied on the state's efforts to reduce greenhouse gas emissions. The Commission adopted this cost allocation policy on a temporary basis and it expires on June 30, 2013.

In D.11-07-029, the Commission also directed the utilities to collect data on the distribution upgrade costs associated with residential plug-in electric vehicles beginning in 2012. The purpose of this data is to support the development of new policies to assign the upgrade costs associated with plug-in electric vehicles.

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[5] Ordering Paragraph 6 of D.11-07-029.

The utilities reported upgrade cost data to the Commission in December 2012 as part of their joint load and cost research reports in advice letters filed on October 1, 2012 and December 28, 2012. The data collected in the load research report, which covered an estimated 17,000 vehicles in the three utilities' service territories, suggests that costs for charging rarely exceed the traditional upgrade allowance. For example, of the 5,906 residential "infrastructure checks"[6] completed by utilities, only 22 customers (0.4%) required facility upgrades. For all but five upgrades (0.1% of total infrastructure checks) the existing Electric Tariff Rules 15 and 16 allowances covered the customer's cost responsibility.

In the December 28, 2012 report, SCE and SDG&E conclude that the existing allowances are appropriate for electric vehicle load. These two utilities find insufficient evidence exists to continue the cost allocation policy beyond June 30, 2013. PG&E agrees that costs have been *de minimis* but suggests that it is too early to understand the potential magnitude of these upgrade costs. PG&E recommends extending the cost allocation policy adopted in D.11-07-029 for three years so that additional information may be gathered.[7]

I recognize that the sufficiency of the current allowance may change as electric vehicle usage increases. Additionally, as electric vehicle charging stations are added in neighborhoods, distribution upgrade costs may change. In that regard and in line with PG&E's recommendations in the joint load and cost

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[6] The term "infrastructure check" refers, generally, to the utility's evaluation of the ability of the distribution system to support additional plug-in electric vehicle load.

[7] Joint Utilities' Electric Vehicle Load Research Final Report filed on December 28, 2012, pursuant to D.11-07-029 at 3 - 4.

research reports, an extension of the cost allocation policy for residential upgrades of an additional one to three years may be warranted. To better understand the benefits and drawbacks to extending the cost allocation policy adopted in D.11-07-029 for an additional time period, parties are requested to file comments according to the schedule in section 5 herein on the following questions:

- Regarding how shared upgrade costs should be treated after June 30, 2013, should the current upgrade allowance associated with plug-in electric vehicles be continued, and if so, for how long? These comments may include how plug-in electric vehicle adoption may change in the coming years and associated costs.
- What additional analysis is needed in order to better understand costs associated with residential service facility upgrades?

4. Continuation of Load Research

The Commission directed the utilities to perform certain load research in D.11-07-029. The Commission described the parameters of this research in Ordering Paragraphs 6 and 7. The purpose of this load research was to, among other things, "inform policies for the next stages of Electric Vehicle market development." This research has provided valuable insights into market development and, for this reason, I direct the utilities to continue this research, uninterrupted, in accordance with the directive in D.11-07-029. The utilities should continue this research until the Commission provides further direction on this issue in this proceeding or a subsequent proceeding addressing plug-in electric vehicles.

5. Phase 4 - Procedural Schedule

Comments	15 days after the issuance of this ruling
Reply Comments	10 days after the due date for comments
Estimated date for mailing of Proposed Decision on (1) the plug-in electric vehicle submetering and (2) extending the distribution upgrade cost allocation policy adopted in D.11-07-029	2nd Quarter of 2013
Estimated date for closing proceeding	December 31, 2013

Pursuant to Pub. Util. Code § 1701.5, the Commission must resolve the issues raised in the phase 4 scoping memo within 18 months of the issuance of the scoping memo. We anticipate this proceeding will conclude within 18 months. The statutory deadline in this proceeding was most recently extended in D.13-01-028.

IT IS RULED that:

1. The amended scope of the proceeding is set forth in section 1, above.
2. The amended schedule for the proceeding is set forth in section 5, above, subject to change by subsequent ruling by the assigned Commissioner or assigned Administrative Law Judge, as appropriate.
3. The statutory deadline for this proceeding set forth in Public Utilities Code Section 1701.5 is extended for 18 months from the date of the issuance of this amended scoping memo.
4. The Strawman for Plug-In Electric Vehicle Submetering Protocol (Attachment 1) is entered into the record.
5. The document entitled Rule XX Plug-In Electric Vehicle Submetering (Attachment 2) is entered into the record of this proceeding.

6. The letter to the Commission from the Joint Electric Vehicle Service Providers dated October 22, 2012 (Attachment 3) is entered into the record.

7. The CPUC's Energy Division Proposal for Development of Electric Vehicle Submetering (Attachment 4) is entered into the record.

8. Parties may submit comments on the issues in phase 4 in accordance with the schedule in section 5.

9. The utilities shall continue the load research, uninterrupted, in accordance with the directives in Ordering Paragraphs 6 and 7 of Decision 11-07-029.

Dated March 25, 2013, at San Francisco, California.

/s/ CARLA J. PETERMAN
Carla J. Peterman
Assigned Commissioner

ATTACHMENT 1

Strawman for Plug-In Electric Vehicle Submetering Protocol (PEVSMP)

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PEVSMP CONTENT

INTRODUCTION

The Plug-In Electric Vehicle Submetering Protocol (PEVSMP) is applicable to all market participants involved in PEV Submetering, or the provision of PEV Submetering related services, in California and specify the minimum standards for safety, accuracy, reliability and security of:

· Standards for Meter Products

· Standards for Meter Communications

· Standards for Meter Data Management and Meter Reading

· Standards for Meter Installation, Maintenance, Testing, and Calibration

These standards were established in accordance with California Public Utilities Commission (CPUC or Commission) Decision XX-XX-XXX Copies of the **PEVSMP** and Rule XX are available on the UDC (Utility Distribution Company) websites as follows:

UDC	Website	For additional information
SCE	www.sce.com	800-XXX-XXXX
PG&E	www.pge.com	415-XXX-XXXX
SDG&E	www.sdge.com	619-XXX-XXXX

Copies of CPUC decisions are available upon request from the CPUC by calling 415-703-1282 or on the CPUC's website at: www.cpuc.ca.gov

For detailed information regarding ANSI standards, please consult the American National Standards Institute website at: www.ansi.org. The standards contained in the PEVSMP are subject to change. As such, the UDC should be consulted in case of doubt regarding any particular standard. Nothing in the PEVSMP is intended to modify the parties' rights and obligations under Rule XX. The provisions of the National Electric Code, Authority Having Jurisdiction (AHJ), and / or UDC tariffs supersede any provisions contained in the PEVSMP which may appear to be inconsistent or contrary.

CHAPTER A. STANDARDS FOR METER PRODUCTS

I. TABLES OF STANDARDS

The intent of this chapter is to ensure the submeter is designed to standards that establish the minimum technical and functional requirements in areas of safety, accuracy, reliability, and security such that the submeter can be certified for use in applications under PEV submeter tariffs and rules. The current content of this chapter is written for a typical revenue meter used by electric utilities. Future content of this chapter will need to incorporate standards written for a style of meter considered to be integrated or embedded in the EVSE device which provides functionality required to charge an electric vehicle in addition to metering the charging load.

I.1 Standards Required (as applicable) For Meter Products Used In Submetering

Standards	Required in CPUC D.97-12-048	Effective Date	Comments
ANSI C12.1-1995, Code for Electricity Metering	Yes	12-17-98	To be used in conjunction with Standards for Meter Products, Section II: Certification Testing Requirements
ANSI C12.7-1993, Watt-hour Meter Socket	Yes	12-17-98	Applies only if a meter socket is being used
ANSI C12.8-1981 (R. 1997), Test Blocks and Cabinets for Installation of Self-Contained A-Based Meters	Yes	12-17-98	Applies only if an A-based meter is used
ANSI C12.9-1993, Test Switches for Transformer-Rated Meters	Yes	12-17-98	
ANSI C12.10-1997, Electromechanical Watt-hour Meters	Yes	12-17-98	
ANSI C12.11-1987 (R. 1993), Instrument Transformers for Revenue Metering, 10 kV – 350 kV BIL (0.6 – 69 kV NSV)	Yes	12-17-98	
ANSI C12.13-1991, Electronic TOU Registers for Electricity Meters	Yes	12-17-98	Applies only if the meter has a time-of-use register.
ANSI C12.20-1998, 0.2% & 0.5% Accuracy Class Meters (approved but not yet published)	Yes	3-18-00	To be used in conjunction with Standards for Meter Products, Section II: Certification Testing Requirements
ANSI C37.90.1-1989 (R. 1994), Surge Withstand Capability (SWC) Test	Yes	12-17-98	Adds to ANSI C12.1
ANSI 57.13-1978 (1987), C57.13.1-1981 (1992), C57.13.2-1991, C57.13.3-1983 (1991), Instrument Transformers	Yes	12-17-98	These accuracy and safety performance standards are used in conjunction with ANSI C12.11

Standards	Required in CPUC D.97-12-048	Effective Date	Comments
ANSI C12.18-1996, Protocol Specification for ANSI Type 2 Optical Port	No	6-1-99	Applies only if a Type 2 Optical Port is being used
Applicable FCC Regulations	Yes	12-17-98	All meters and associated equipment are to meet all applicable FCC regulations
Certification Testing Requirements	Yes	4-16-99	Standards for Meter Product, Section II
Submission of meter type self-certification documents to the Energy Division. Meter product manufacturer to make available all backup documentation that is related to the certification testing requirements for the meter type that is being certified.	Yes	4-16-99	Standards for Meter Product, Section III
Stickers, sealing and locking hardware requirements	Yes	4-16-99	Standards for Meter Product, Section VI
Manufacturing date to be included on all new meter products	Yes	4-16-99	Standards for Meter Production, Section V
Procedures to follow when rebuilding, retrofitting, or repairing a meter product.	Yes	4-16-99	Standards for Meter Product, Section VI
For meter products which store and provide interval meter data, the meter must be capable of providing and storing the interval meter data for a minimum of 35 days.	Yes	4-16-99	Standards for Meter Product, Section VI

I.2 List Of Tests In ANSI C12.1 And C12.20 Standards

Table I-2 provides a summary list of tests in ANSI C12.1 and C12.20 Standards, a sunlight test, and ANSI C37.90.1 test. All shall be applied in conjunction with Section II: Certification Testing Requirements. This list also shows the eight tests required to be performed in series.

Line No.	Tests Performed in Series (Sections II.1.6., II.5., & II.6.)	Descriptions of Certification Tests	ANSI C12.1	ANSI C12.20
1		No Load	Test #1	Test #1
2		Starting Load	Test #2	Test #2
3		Load Performance	Test #3	Test #3
4		Effect of Variation of Power Factor	Test #4	Test #4
5		Effect of Variation of Voltage	Test #5	Test #5
6		Effect of Variation of Frequency	Test #6	Test #6
7		Equality of Current Circuits	Test #7	Test #7
8		Internal Meter Losses	Test #8	Test #8
9		Temperature Rise	Test #9	Test #9
10		Effect of Register Friction	Test #10	Test #10
11		Effect of Internal Heating	Test 11	Not Applicable
12		Effect of Polyphase Loading	Not Applicable	Test #11
13		Effect of Tilt	Test #12	Not Applicable
14		Stability of Performance	Test #13	Not Applicable
15		Independence of Elements	Test #14	Not Applicable
16		Insulation	Test #15	Test #12
17		Voltage Interruptions	Test #16	Test #13
18		Effect of High Voltage Line Surges	Test #17	Test #14
19		Effect of External Magnetic Field	Test #18	Test #15
20		Effect of Variation of Ambient Temperature	Test #19	Test #16
21		Effect of Temporary Overloads	Test #20	Test #17
22		Effect of Current Surges in Ground Conductors	Test #21	Test #18
23		Effect of Superimposed Signals	Test #22	Test #19
24		Effect of Voltage Variation Secondary Time Base	Test #23	Test #20
25		Effect of Variation of Ambient Temp. Secondary Time Base	Test #24	Test #21
26		Electrical Fast Transient/Burst	Test #25	Test #22
27		Effect of Radio Frequency Interference	Test #26	Test #23
28		Radio Frequency Conducted and Radiated Emission	Test #27	Test #24
29		Effect of Electrostatic Discharge (ESD)	Test #28	Test #25
30		Effect of Storage Temperature	Test #29	Test #26
31		Effect of Operation Temperature	Test #30	Test #27

32		Effect of Relative Humidity	Test #31	Test #28
Line No.	**Tests Performed in Series (Sections II.1.6., II.5., & II.6.)**	**Descriptions of Certification Tests**	**ANSI C12.1**	**ANSI C12.20**
33		Mechanical Shock	Test #32	Test #29
34		Transportation Drop	Test #33	Test #30
35		Mechanical Vibration	Test #34	Test #31
36		Transportation Vibration	Test #35	Test #32
37		Weather Simulation	Test #36	Test #33
38		Salt-spray	Test #37	Test #34
39		Rain Tightness	Test #38	Test #35
40		Test #A1: Sunlight Interference	Not yet included	Not yet included
41		Test #A2: ANSI C37.90.1, Surge Withstand	Not yet included	Not yet included

II. CERTIFICATION TESTING REQUIREMENTS

This Section describes the certification testing requirements for Meter Products used in submetering products. This Section includes testing requirements that are not currently addressed in the ANSI C12.1 and C12.20 Standards. Some of these issues are: 1) duplication of the field electrical and environmental conditions is necessary to assure safety, 2) not all components of a meter product are required to be included in the meter product during certification testing, 3) reporting of certification tests is not based on all meter products tested, 4) no certification rejection criteria is provided for declaration of success or failure upon completion of certification tests.

II.1. General

II.1.1.The submeter accuracy class shall be .5% for residential and .2% for commercial and industrial accounts.

The tests specified shall be conducted by qualified facilities. A qualified facility is a facility that has access to the necessary equipment and personnel to perform the testing requirements specified in this document.

II.1.2.Complete performance testing is required for new meter types and for major design changes to existing meter types. If an incremental change or changes are made to an existing meter type, applicable tests shall be performed to assure that Meter Products meet the certification testing requirements as stated in this section.

II.1.3.The manufacturer shall provide a certified test report documenting the tests and their results to the purchaser. The test report shall be signed by the appropriate manufacturer representative(s) and shall include appropriate charts, graphs, and data recorded during testing.

II.1.4.No Meter Products and metering equipment shall be installed before all tests, as outlined in this section, are conducted.

II.1.5.Meter Products selected for certification testing must be representative of production run Meter Products and must meet all applicable FCC regulations. Standards for Meter Products

II.1.6.The following tests shall be conducted in sequence using the same Meter Products selected as specified in II.1.5 above: Insulation, Voltage Interruptions, Effect of High Voltage Line Surges, Effect of Fast Transient/Burst, Effect of

Electrostatic Discharge (ESD), Effect of Operating Temperature, Effect of Relative Humidity, and ANSI C37.90.1 (Surge Withstand). Other tests required by ANSI C12.1 and C12.20 may be done either in parallel or in sequence with the same Meter Products or a separate group of Meter Products; however, with the understanding that the same Meter Products must be used for all test procedures within each ANSI-numbered or FCC-numbered test.

II.1.7.All test Meter Products shall be kept as a certification proof for one year after the conclusion of the testing. These test Meter Products shall be made available during this period to any purchaser for inspection, if requested.

II.1.8.Meter Products which fail during the test shall not be repaired or tested further, but can be analyzed to identify the cause of failure.

II.1.9.When the test Meter Products fail to meet these testing requirements and after any correction is made on the new test Meter Products, all tests shall be re-started with the new test Meter Products.

II.1.10.If requested by the purchaser, the manufacturer shall notify the purchaser of the certification test schedule for purchaser's test witnessing.

II.1.11.If more than a minimum number of Meter Products are certification tested, the test results shall be based on and reported for all Meter Products tested.

II.1.12.There is a need for a national standard for embedded meters as well as a testing and certification program

II.2. Meter Product Failure Definition

A Meter Product shall be designated as failed if any of the following events occur during or after any certification test:

II.2.1.Failure of the Meter Product to perform all functions as specified in a test procedure.

II.2.2.Failure of the Meter Product to meet the fundamental technical performance specifications as specified by the manufacturer. The fundamental performance must include safety, accuracy and reliability of the Meter Product, and any other functions included in the Meter Product.

II.2.3.Signs of physical damage as a result of a test procedure.

II.2.4.The occurrence of a loss of data or other unacceptable mode of operation for the Meter Product as a consequence of a test procedure.

II.2.5.Failures of either hardware, firmware or software, or a combination thereof.

II.3. Meter Type Certification Rejection Criteria

The meter type certification will be rejected if any of the following events occur:

II.3.1 The Meter Products fail the certification tests as specified in Table II.3.1-a below:

Table II.3.1-a: Table of failures based on Meter Products tested

# Meter Products Tested	Failures in different tests individually			
	0	1	2	3 or more
3	PASS			
4	PASS		FAIL	
5	PASS		FAIL	
6	PASS		FAIL	
7	PASS		FAIL	
8	PASS		FAIL	
9 or more	PASS	PASS	FAIL	

Examples: The following examples explain how to apply Table II.3.1-a. Also, reference to “the series tests“ in this paragraph means tests required to be performed in the series manner as specified in Section II.1.6., and reference to “the parallel tests“ means testing is not required to be performed in any particular sequence (either series or parallel).

Example 1: If 3 Meter Products are selected for the series testing and one failure occurs in any test procedure, the meter type certification will be rejected and the entire eight series tests will be started over from the beginning.

Example 2: If 9 Meter Products are selected for the series tests and the first, second, and third failures occur separately in three different tests or test procedures, the meter type certification will be rejected. These failures described here mean that a failure of the first Meter Product during one test procedure, a failure of a second Meter Product during another test procedure, and a failure of a third Meter Product during another test procedure different from the tests that the first two Meter Products have failed previously. Once such failures occur, the entire eight series tests will be started over from the beginning.

However, if 3 Meter Products are selected for a parallel test performed concurrently with the 9 Meter Products selected for the series tests, the rejection criteria for the 3 Meter Products tested in a parallel test shall not apply to the 9 Meter Products tested in series, or vice versa. In addition, if a group of Meter Products tested in a parallel test(s) fails according to the rejection criteria, only the particular failed test(s) needs to be repeated.

II.3.2. The failure of two or more Meter Products during the same test procedure.

II.4. Test Setup

II.4.1.The Meter Product shall be connected to its normal operating supply voltage with a fully charged power failure backup system and shall be energized throughout the duration of the test procedures, unless otherwise stated.

II.4.2. Before testing commences, if necessary, the Meter Product shall be energized for a reasonable period at room temperature for stress relief.

II.5. ANSI C12.1 Tests

All Meter Product certifications shall be performed in accordance with the certification tests described in ANSI C12.1 (NEMA, 1995), unless noted otherwise below.

* Tests 1 through 29:	no clarifications required.
* Test 30:	meter covers removed during test, temperature limits are defined for operations under California weather conditions as +85° C = T oper-max, -20° C = T stor-min
* Test 31 through 38:	no clarifications required
* Additional test A1:	sunlight interference test is needed for optical pick-up type retrofit modules (ANSI C12.18 tests) and is further defined below.
* Additional test A2:	ANSI C37.90.1 Surge Withstand Testing

The same set of selected Meter Products, as defined by unique meter numbers, will be tested with the following tests performed in series: 15, 16, 17, 25, 28, 30, 31 and A2. Other tests required by ANSI C12.1 may be done either in parallel or in sequence with the same Meter Products or a separate group of Meter Products; however, with the understanding that the same Meter Products must be used for all test procedures within each ANSI-numbered or FCC-numbered test.

These ANSI C12.1 tests are listed and described in Table I-2 above.

II.6. ANSI C12.20 Tests

All Meter Product certifications shall be performed in accordance with the certification tests described in ANSI C12.20 (NEMA, 1998) for 0.2% and 0.5% accuracy class meters, unless noted otherwise below.

* Tests 1 through 26:	no clarifications required.
* Test 27:	meter covers removed during test, temperature limits are defined for operations under California weather conditions as +85° C = T oper-max, -20° C = t stor-min
* Test 28 through 35:	no clarifications required
* Additional test A1:	sunlight interference test is needed for optical pick-up type retrofit modules (not within scope of existing ANSI C12.20, NEMA-1998 tests) and is further defined below.
* Additional test A2:	ANSI C37.90.1 Surge Withstand Testing

The same set of selected Meter Products, as defined by unique meter numbers, will be tested with the following tests performed in series: 12, 13, 14, 22, 25, 27, 28 and A2. Other tests required by ANSI C12.20 may be done either in parallel or in sequence with the same Meter Products or a separate group of Meter Products; however, with the understanding that the same Meter Products must be used for all test procedures within each ANSI-numbered or FCC-numbered test.

These ANSI C12.20 tests are listed and described in Table I-2 above.

II.7.Test A1 - Sunlight Interference Test

II.7.1. This test verifies the Meter Product accuracy and full functional operations under direct sun light.

II.7.2. The meter cover shall be removed during this test.

II.7.3. The Meter Product shall be exposed to both the incandescent light source (Lab Test) and sunlight (Outdoor Sunlight Test).

Lab Test:

II.7.4. The incandescent light source, Smith Vector #710 or equivalent, shall be used to simulate the sunlight. The incandescent light shall be 600 watt and 3,200° K blackbody radiation as a minimum.

II.7.5 The Meter Product shall be exposed to the incandescent light source for a minimum of five minutes for each position of the incandescent light source.

II.7.6. The incandescent light source shall be pointed directly toward the meter product and positioned at a maximum direct distance of 19 inches from the center of the meter rotor shaft as follows: 1. Twelve positions around the meter base. 2. Eight positions at a 45° angle from the meter base. 3. One position at a perpendicular to the face of the meter.

II.7.7. Verify the Meter Product operations and report the direct and remote meter reads before and after each incandescent light exposure.

Outdoor Sunlight Test:

II.7.8. The sunlight conditions shall be outdoors, clear sky, bright sunny day, and no shades over the Meter Product.

II.7.9 The Meter Product shall be exposed to sunlight conditions for 24 hours.

II.7.10. The Meter Product shall be set in a position as normally installed the field. All Meter Products under test shall be exposed to the sunlight conditions at the same time and evenly face different directions starting with one Meter Product facing towards the sunrise direction.

II.7.11. Record and compare direct and remote meter reads at every hour under the sunlight conditions.

II.7.12. To pass this test the Meter Product shall operate as specified with no observed anomalies and have an accuracy of ±0.3% on both direct and remote meter reads.

III. REGISTRATION AND CENTRALIZED DATABASE FOR SUBMETERING COMPLIANT METER TYPE

REGISTRATION AND CENTRALIZED DATABASE FOR SUBMETERING COMPLIANT METER PRODUCTS

Certifying party must state that the submeter products meet the applicable Certification Testing Requirements in Section II of Chapter A. The certification document shall be submitted to the Energy Division of the CPUC. The staff of the Energy Division shall be entitled to obtain from the certifying party all backup documentation that is related to the certification testing. If the Energy Division determines the certification documents for a particular submeter are in order, the Energy Division shall post the model number of the meter type, along with the name of the submetering product manufacturer, on the Commission's web site. The document shall be verified by an officer or authorized employee of the certifying party with the

following statement:

DECLARATION

I, (print name and title) _____ hereby certify that I am empowered to act on behalf of _____ (certifying party's name) and to submit this certification document on its behalf. I declare under penalty of perjury under the laws of the State of California that the above statements are true and correct, and that if any documents are furnished in connection with this self-certification document, that those documents are true and correct copies. Dated _____, at _____ (date) (place of execution).

Signature: _____

If the verification is made outside of California, the verification must be made by an affidavit sworn or affirmed before a notary public.

IV. REQUIREMENTS FOR STICKERS, SEALING AND LOCKING HARDWARE

Below are the requirements for the stickers, sealing and locking hardware used in submetering. Requirements for application of these devices are covered in Chapter D: Standards for Meter Installation, Maintenance, Testing, and Calibration, Section II.1.

IV.1. Sealing and locking hardware

Sealing and locking hardware shall be imprinted with company name and/or logo and be made with material other than lead. Sealing hardware owned by the MSPs shall be orange in color and be imprinted with its certification number.

IV.2. 480 V sticker

A 480 V sticker used

V. REQUIREMENTS FOR LABELING MANUFACTURING DATE ON NEW SUBMETER PRODUCTS

New Meter Products shall be permanently labeled with a manufacturing date. Manufacturing date will be established in the Submeter Service Request

VI. REQUIREMENTS FOR REBUILT, RETROFIT AND REPAIRED METER PRODUCTS

VI.1. Rebuilt Meter Product

A Meter Product shall not be rebuilt and repackaged for resale by any entity except a manufacturer-authorized licensed agent. Once a Meter Product is rebuilt and repackaged, it shall be tested for accuracy, labeled as rebuilt and by whom, and dated accordingly.

V1.2. Retrofit Meter Product

A Meter Product may be retrofitted with other devices or modules.

Retrofitted Meter Products shall be tested in accordance with the above Section II.1.2 of the Certification Testing Requirements. Prior to use, retrofitted Meter Products shall be tested for accuracy, labeled as retrofitted and by whom, and dated accordingly.

V1.3. Repaired Meter Product

A Meter Product shall not be repaired for resale by any entity except a manufacturer-authorized licensed agent. Once a Meter Product is repaired, it shall be labeled as repaired and by whom, and dated accordingly.

V1.4. Interval Data Meter Product

The meter or the meter data system must be capable of providing and storing required interval data for a minimum of 35 days.

CHAPTER B. STANDARDS FOR METER DATA COMMUNICATIONS

I. Meter Communication Standards

I.1. Meter Password Authorization

There are three types of password authorization:

1. Full read/write
2. Billing read/write (other routine maintenance exclusive of programming revenue quantities)
3. Read only

Because the MDMA-S is responsible for safety, accuracy, and reliability of meters used in PEV submetering, they shall have the authority to issue meter passwords at their discretion, but must issue read passwords to the UDC for audit purposes upon request. The MDMA-S will provide meter passwords in a timely manner for the UDC to perform their scheduled functions.

I.2. Local Meter Read

The customer must be provided with the means to be able to retrieve the stored meter data in a way that is meaningful to the customer. All submeters shall have a visual kWh display or an interface to enable on-site interrogation of all stored meter data in compliance with ANSI C 12.10. There are two reasons for requiring a visual meter display: (1) For consumer protection: The consumer can verify that the meter read matches the bill, and (2) For on-site interrogation when other meter communications systems fail: this would enable entities who are responsible for billing/settlements to obtain the meter read when investigating the communications failure. At a minimum, electronic meters must have an interface to enable retrieval of all stored meter data locally in compliance with CPUC privacy requirements.

CHAPTER C. STANDARDS FOR METER DATA MANAGEMENT AND METER READING

I. DEFINITION OF MDMA-S BUSINESS FUNCTIONS

I.1. The minimum set of roles of MDMA-S includes but is not limited to the following functions:

1. Manage the meter reading schedule
2. Read and retrieve meter data
3. Validate, edit and estimate meter data
4. Calculate usage
5. Format data
6. Store data on the MDMA server
7. Manage data on the MDMA server
8. Manage and authorize data access to the MDMA server
9. Meter/device management (i.e., when the meter device was installed, what the device type is, what the service history has been, what the service parameters of the meter are, etc.)

I.2 The minimum set of roles of MDMA-Ss includes but is not limited to the following functions:

1. MDMA-S services will be performed in accordance with CPUC regulations and will be the responsibility of the party so indicated in the customer's SM service request.
2. Meter data for submetering Customers shall be read, validated, edited, and transferred pursuant to Commission-approved standards.
3. The MDMA-S shall provide Scheduling Coordinators (or their designated agents) reasonable and timely access to Meter Data as required to allow the proper performance of billing, settlement, scheduling, forecasting and other functions.
4. The MDMA-S is required to keep the most recent 12 months of Customer consumption data for each submetering Customer. Such data must be retained for a period of 36 months. Such data must be released on request to the customer or, if authorized by the customer, to any MDMA-S or to the UDC.
5. Within five days of registration of the meter, the MDMA-S must confirm that the submeter and its meter reading system is working properly and that the billing data gathered is valid.
6. Either no more than 10 percent of the accounts managed by the MDMA-S will contain estimated data, or no more than 1 percent of all the data managed by the MDMA-S will be estimated. In addition, to the above, the Commission also adopted the tariff provision that "The MDMA-S shall read interval meters on the UDC's scheduled meter reading date, or in the case of DA customers only, another date mutually agreed on per Rule 22

[1] MDMA business functions are defined in CPUC D.97-12-048, pages 28-29. These functions were developed for Direct Access and shall apply to PEV submetering and the functions of the MDMA-S.

[2] The CPUC-established limits on estimated data established for DA in D.97-10-087 and modified by D.97-12-048 shall apply to PEV submetering and the MDMA-S.

II. MDMA QUALIFICATION TESTING

COMMENT: Commission certification process to be finalized

III. METER READING FREQUENCY

To ensure that the meter data is recorded, we will require the MDMA-Ss to read the meters daily. The frequency of such a requirement should be consistent with the timing of how often bills are to be rendered.

IV. MDMA SAFETY REQUIREMENTS

It is required in the tariffs that all MDMA-S's comply with the pertinent electrical safety provisions of Cal OSHA and the UDC's safety requirements as they apply to the reading of electric meters. Prior to allowing an MDMA-S, in its role as the MDMA, or a third-party MDMA, to perform meter reading, we will require the UDCs, as discussed below, to review the safety training and procedures that the MDMA-S and its employees are to follow. With regard to the recommendation that the MDMA-S report meter, safety, and hazardous conditions, and that site-specific information be kept, those safeguards are already contained in the tariffs.

V. MDMA-S TECHNICAL/BUSINESS SUPPORT TO ESPs AND UDCs

The MDMA-S will provide access to technical and business assistance during normal business hours (8am to 5pm Pacific time, Monday through Friday, except holidays). At such times, staff will be available to address question and concerns on data availability, corruption and adjustments, and systems technical support. In addition, the MDMA-S will provide access to a support pager available 24 hours a day/365 days a year to address issues of server availability. The MDMA-S shall respond and provide a status to all pages within 2 hours. Server availability or access issues will be dealt with as soon as reasonably possible. At the MDMA-S's discretion, concerns over data availability, data corruption and adjustments or non-urgent problems will be addressed during the next business day.

VI. MDMA-S PERFORMANCE STANDARDS

The following MDMA-S performance standards shall be applied:

The first billing cycle shall be disregarded in performance standards.

Timeliness For Validated Meter Reading Data [4]

The following standards shall be used to establish the time requirements for posting validated meter reading data on the MDMA server.

(a) Interval Meters:

1. 80% of all usage data must be available on the first day after the scheduled reading date of the meter.
2. 90% of all usage data must be available within two days of the scheduled reading date of the meter.
3. 99% of all usage data must be available within five days of the scheduled reading date of the meter.

[4] The timeliness standards as defined in CPUC D.97-12-048, pages 31-32 and modified in D.98-12-080, pages 82- 83.

VII. MDMA-S PERFORMANCE EXEMPTIONS

In the event of a large catastrophe (i.e., hurricanes, earthquakes, etc.) that prevents the MDMA-S from reading meters, the MDMA-S shall estimate and post the data. This estimated data shall be reported separately by the MDMA-S in their performance report, and not be included in any performance penalties assessed against the MDMA-S.

In the event of submeter failure where the submeter is not accurately recording usage, the estimated data should be reported separately by the MDMA-S in its performance report, and would not be included in any performance penalties assessed against the MDMA-S, so long as the following conditions are met:

1. A manual reading has verified that the meter has failed and there is no problem with the remote reading technology; and
2. The exemption cannot occur for the same account more than once in a 12 month period.

VIII. OPEN EV (PEV Profile of ESPI

COMMENT: A preliminary proposal for the development of an ESPI Profile for PEV use has been submitted to the ESPI working group. A detailed profile will be developed and submitted for ratification based on the joint UDC and MDMA-S requirements identified as part of the current CPUC sponsored initiative.

IX. SUBMETER DATA TRANSFER (MDMA-S to UDC)

Submeter data shall be supplied from the MDMA-S to the UDCMDMA Server via the internet in a manner compliant with the PEV Profile of the Energy Service Provider Interface (ESPI) data format. ESPI is a North American Energy Standards Board (NAESB) standard as well as an approved standard on the NIST V2.0 Smart Grid Standards Roadmap. Its purpose is to standardize the interface for Energy Usage Information (EUI) sharing between a customer's designated data custodian (i.e. Distribution Company) and an authorized third party service provider. The ESPI format was based on requirements developed within the UCAIUG OpenADE working group.

There are currently two ongoing initiatives that use the ESPI standard, Green Button Download my Data© and Green Button Connect my Data©. The former is meant to automate and standardize a customer's access to their usage information and provides only a subset of the ESPI format (for the sharing of EUI between 2 parties- the customer and the Data Custodian). The latter, a full implementation of ESPI, is meant to automate the sharing of EUI between the UDC and the 3rd party under the permission of the customer. Additionally, a PEV profile of ESPI will be created for the purposes of sharing PEV specific energy information. The completion of the PEV profile of ESP is TBD. When implemented by the MDMA-S and UDC, ESPI in the format of Green Button Connect© or the PEV profile will allow for the MDMA-S to automatically push data (or be pulled) to the UDC at a regular interval or on demand.

IX.1. MDMA-S Involvement in Submetering Communications

MDMAs that participate in submetering communications must meet specific criteria including:

1. Certification of communications of meter data transfer
2. Agreement on data transfer methods as specified by the ESPI standard (push by MDMA-S or pull by UDC)
3. Agreement with UDC T&Cs
4. Including data privacy as specified by the Smart Grid OIR

IX.2. Security and Privacy of Customer Data

As the CPUC Data Privacy Mandate requires access to EUI by Third Party vendors using ESPI as the standard interface, the transfer of customer data shall conform to CPUC customer privacy rules as detailed in the OIR. ESPI utilizes the OAuth scheme which provides a process for end-users (submetering customers) to authorize third party access to their server resources (e.g., to authorize MDMA-S's to share their submetering data with the UDC) without sharing their credentials (typically, a username and password pair), using user-agent redirections. OAuth uses request and access tokens for 3rd parties and customers. An example of a typical OAuth customer flow would conform to the following sequence (TBD):

1. Customer logs into their UDC account with their username and password.
2. Customer chooses their submeter MDMA-S and allows access to their data (UDC would contact 3rd Party. UDC and 3rd Party must have their own existing arrangement to share data.).

3. Premises Owner then redirected to 3rd Party site and enters username/password (Temporary credentials now become associated with Premises Owner and can be used by the UDC to obtain 3rd Party data belonging to the Premises Owner).
4. Customer directs 3rd party to provide EUI to UDC at specific intervals or on demand.
5. Customer must periodically renew their authorization (credentials have a lifetime – if it is long, the UDC does not need reauthorizing regularly.

Present to Proposed Decision dated 7/24/2012, titled "Decision Extending Privacy Protections To Customers Of Gas Corporations And Community Choice Aggregators, And To Residential And Small Business Customers Of Electric Service Providers" ordering paragraph 12, EV service providers, when providing service to residential or small commercial customers, shall comply with the privacy rules contained in Attachment B of the proposed decision

Security shall comply with NAESB REQ.21 such that "All information exchanged by ESPI should be secure in accordance with the security recommendations referenced herein. Such recommendations are subject to the relevant Governing Documents and any requirements of the Applicable Regulatory Authority [REQ.21.3.1.6]". 3. Testing and Certification

3rd parties use of ESPI/Green Button must be tested and certified by the Certification Authorities (CAs) before implementation. As of this writing, testing and certification is under development.

IX.3. Further Information

The ESPI standard can be found at: http://www.naesb.org/ESPI_Standards.asp.

OAuth details are found at: http://tools.ietf.org/html/rfc5849.

Certification, testing, and further information can be found at:
http://collaborate.nist.gov/twikisggrid/bin/view/SmartGrid/GreenButtonESPIEvolution,
http://osgug.ucaiug.org/sgsystems/OpenADE,and http://www.nist.gov/smartgrid/greenbutton.cfm

X. VALIDATING, EDITING, AND ESTIMATION

The proposed implementation plan for changes to the interim interval rules is described in Table IX-1 below. The Optional/Required column indicates if market participants will be required to make this change. The Earliest date acceptable column indicates the earliest a market participant is allowed to implement this change (note to UDCs - this means the VEE test would need to allow these options), and the Required by column indicates the date by which market participants must implement the option (only applies to required options). MDMA-Ss that were accepted prior to the required date must comply, but do not need to go through the acceptance process again. During the discussion, it was noted that some of the optional changes have a bigger impact on some technologies than others.

[5] CPUC D.98-12-080, page 86.

CHAPTER D. STANDARDS FOR SUBMETER INSTALLATION, MAINTENANCE, TESTING, AND CALIBRATION

I. MSP METER WORKER QUALIFICATIONS

All meter workers performing meter services for submetering shall meet the appropriate requirements and qualifications outlined in this Chapter and exercise due care for the tasks performed. Out-of-socket meter accuracy testing, meter diagnostics and submetering work requirements are not addressed in these standards. Also, utilization of the meter's built-in diagnostics is not considered part of meter accuracy testing. [6]

[6] Submetering work performed in California is presently covered by California Business and Professions Code Sections #12531 (Meaning and Scope of Terms) and 12532 (Engaging in Business as Device Repairman or Maintaining Device Repair Service Unlawful without Registration).

I.1. Meter Worker Skill, Safety, and Qualification Information

The following are the descriptions and information of the five meter worker classes:

I.1.1. CLASS 1

I.1.1.1. Metering Types and Voltages.

This class includes single-phase, socket-based meters, 300 V phase-to-phase maximum and does not include transformer rated meters. Communication wiring must be outside of energized meter panels.

I.1.1.2. Work to be Performed

Class 1 Meter Workers can install, remove, and replace single-phase, 120/240 V or 120/208 V, self-contained meters in standard socket based residential-type metering equipment. Connections of communication conductors must be outside the energized meter panels.

I.1.1.3. Essential Technical Skills

I.1.1.3.1. Understanding of single phase electrical metering.

I.1.1.3.2. Understanding of electric distribution safety procedures.

I.1.1.3.3. Ability to identify energy diversion or tampering related to this class of meter work.

I.1.1.3.4. Ability to install and remove damaged and undamaged meters.

I.1.1.3.5. Understanding of the meter panel and socket layout for the metering conditions related to this class of meter work.

I.1.1.3.6. Ability to read meters used in this class.

I.1.1.3.7. Ability to properly use tools appropriate to the work in this class.

I.1.1.3.8. Ability to connect meter communications external to the meter panel.

I.1.1.3.9. Ability to initialize meter communication modules - not utilizing Type 2 optical ports and meter configuration software.

I.1.1.4. Worker Safety and Safety Equipment

I.1.1.4.1. Job performance in accordance with employing MSP's procedures and safety rules.

I.1.1.4.2. Knowledge of hazards of electricity and ability to perform work to avoid electrical hazards.

I.1.1.4.3. Ability to comply with CAL OSHA requirements.

I.1.1.4.4. On-site use of personal protective equipment.

I.1.2. CLASS 2

I.1.2.1. Metering Types and Voltages

This class includes all meters and skills required for Class 1. Class 2 includes up to 600 V, single-phase and poly-phase, safety socket, and standard socket based meters, and does not include transformer rated meters. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.1.2.2. Work to be Performed Class 2 Meter Workers can install, remove, and replace all meters consistent with the above. Class 2 Meter Workers must understand the operating characteristics of test-bypass facilities and test blocks, and may operate test-bypass facilities, but may not install, alter, maintain, or replace wiring between the meter and test block. On panels without test-bypass facilities, single-phase and poly-phase meters will not be removed or installed without first disconnecting the customer load or if deemed unsafe to do so under load. Communication wiring may be installed inside the panel, and work can be performed in and around energized circuits.

I.1.2.3. Essential Technical Skills

I.1.2.3.1. Cumulative including all skills for Class 1.

I.1.2.3.2. Additionally, possess skills related to meter voltages and meter forms used in Class 2.

I.1.2.3.3. Ability to perform phase rotation assessments.

I.1.2.3.4. Ability to operate test-bypass facilities or test blocks in a self-contained safety socket.

I.1.2.3.5. Ability to perform work required to route communication wiring to accommodate meter communications.

I.1.2.4. Worker Safety and Safety Equipment

I.1.2.4.1. Cumulative including all skills and safety knowledge for Class 1.

I.1.2.4.2. Electrical safety knowledge and work skills appropriate for single-phase and three-phase metering up to 600 V phase-to-phase, including the ability to identify and refer to a Class 5 meter installer services above 600 V phase-to-phase prior to performing work in the service equipment.

I.1.3. CLASS 3

I.1.3.1. Metering Types and Voltages

This class includes all meter types in Classes 1 and 2. Class 3 work includes up to 600 V, A base, K base, and transformer rated meters with internal diagnostics. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.1.3.2. Work to be Performed In addition to Class 1 and 2 Meter Work, Class 3 Meter Workers can install, remove, and replace all meters consistent with the above including transformer-rated meters with internal diagnostics. Class 3 Meter Workers may operate test switches, but may not install, alter, maintain, or replace wiring between the meter, test switch, test block, and associated equipment.

I.1.3.3. Essential Technical Skills

I.1.3.3.1. Cumulative of Classes 1 and 2.

I.1.3.3.2. Additionally, possess skills related to meter voltages and meter forms used in Class 3.

I.1.3.3.3. Ability to understand the operating characteristics of metering transformers and how to operate test switches.

I.1.3.3.4. Ability to understand, interpret, identify, and take appropriate actions based upon built-in diagnostics of solid state meters.

I.1.3.4. Worker Safety and Safety Equipment

I.1.3.4.1. Cumulative of all safety skills for Classes 1 and 2.

I.1.3.4.2. Ability to understand, interpret, and take appropriate action based on built in diagnostics of solid state meters.

I.1.3.4.3. Ability to work with transformer rated meters and operate test switches and test blocks.

I.1.4. CLASS 4(A)

I.1.4.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, and 3.

I.1.4.2. Work to be Performed In addition to Class 1, 2, and 3 Meter Work, Class 4(A) Meter Workers can install, remove, and replace all meters consistent with the above. May perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on single phase meters up to 300 V. Programs and verifies internal programs and software in solid state meters.

I.1.4.3. Essential Technical Skills

I.1.4.3.1. Cumulative of Classes 1, 2, and 3.

I.1.4.3.2. Ability to perform work on metering switchboards.

I.1.4.3.3. Ability to perform calibration, repair, retrofit, troubleshooting, data collection of electric meters within the Class, and install, maintain, and program advanced metering technologies, including TOU, interval data, real time pricing, remote meter communication, and load control devices.

I.1.4.4.4 Worker Safety and Safety Equipment

I.1.4.4.1. Cumulative of all safety skills for Classes 1, 2, and 3.

I.1.4.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment up to 300 V.

I.1.5. CLASS 4(B)

I.1.5.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, 3, and Class 4(A). Class 4(B) work includes all metering up to 600 V, including transformer rated meters with primary and secondary voltages less than 600 V. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.1.5.2. Work to be Performed In addition to Class 1, 2, 3, and 4(A) Meter Work, Class 4(B) Meter

Workers can install, remove, and replace all meters consistent with the above. May perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on all meters. Programs and

verifies internal programs and software in solid state meters.

I.1.5.3. Essential Technical Skills

I.1.5.3.1. Cumulative of Classes 1, 2, 3, and 4(A).

I.1.5.3.2. Ability to perform work on metering switchboards.

I.1.5.3.3. Ability to perform calibration, repair, retrofit, troubleshooting, data collection of electric meters, and install, maintain, and program advanced metering technologies, including TOU, interval data, real time pricing, remote meter communication, and load control devices.

I.1.5.4. Worker Safety and Safety Equipment

I.1.5.4.1. Cumulative of all safety skills for Classes 1, 2, 3, and 4(A).

I.1.5.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment up to 600 V.

I.1.6. CLASS 5

I.1.6.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, 3, 4(A), and 4(B). Class 5 meter work includes all metering above 600 V, including metering transformers, associated devices such as isolation relays and switches, and wiring between these transformers, associated devices, and meters. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.1.6.2. Work to be Performed In addition to Class 1, 2, 3, 4(A), and 4(B) meter work, Class 5 Meter Workers can install, remove, and replace all meters consistent with the above including transformer-rated meters. Replace high-voltage fuses. Perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on all meters. Inspect wiring and instrument transformer ratios utilizing various apparatus as necessary.

I.1.6.3. Essential Technical Skills

I.1.6.3.1. Cumulative of Classes 1, 2, 3,4(A), and 4(B).

I.1.6.3.2. Ability to identify primary metering equipment and characteristics of service equipment rated at voltages above 600 V.

I.1.6.3.3. Broad knowledge and familiarity of electrical distribution systems above 600 V and operating characteristics.

I.1.6.3.4. Ability to identify UDC service voltages and electrical service requirements.

I.1.6.3.5. Broad knowledge and familiarity of State of California General Orders.

I.1.6.4. Worker Safety and Safety Equipment

I.1.6.4.1. Cumulative of all safety skills for Classes 1, 2, 3, 4(A), and 4(B).

I.1.6.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment above 600 V.

I.1.6.4.3. Meet the State of California requirements for a "Qualified Electrical Worker" to perform work on metering systems with instrument transformer at voltages above 600 V.

I.1.6.4.4. Must have a minimum of two years of combined training and experience with high-voltage (above 600 V) equipment and circuits.

I.2. CERTIFICATION OF A METER DATA MANAGEMENT AGENT - SUBMETERING (MDMA-S)

The PEV submeter must be electrically connected to the Primary Meter. Therefore, the MDMA-S must certify that it possesses a general electrical contractor's license issued by the Contractors' State License Board.

The MDMA-S is required to have an electrical contractor's license or certify that it is using installers who possess such a license because the installation, removal or repair of an electric meter by a person other than a public UDC is subject to the Contractors' State License Law. Generally speaking, a contractor is anyone who adds materials to, repairs, or subtracts materials from a structure or premises. (Bus. & Prof. Code Section 7026.). An electrical contractor's license is appropriate because of the electrical voltage that is present.

Should the UDC question the ability of a MDMA-S to work on a particular meter type, the burden will be on the MDMA-S to prove to that the MDMA-S and/or its installers are using is qualified to work on that particular meter type.

II. METER INSTALLATION AND REMOVAL

This section proposes the minimum requirements for installation, maintenance, and testing for meters and metering equipment used in submetering.

II.1. SAFETY (CUSTOMER LIFE SUPPORT, PUBLIC, ETC.)

For safety reasons, the following requirements must be completed prior to performing any meter work on site and visual observations must continually apply as the meter work progresses. Meter work includes, but is not limited to, meter installation, meter replacement, maintenance, programming, and testing. Visually inspect all meter sites for the following conditions.

II.1.1 CUSTOMER LIFE SUPPORT

II.1.1.1. If a customer premise has a life support device or equipment and a UDC requires life-support seals or stickers, they shall be installed on the premise meter ring or cover respectively, to prevent avoidable service interruption during the process of submetering work.

II.1.1.2. If such life-support or sealing hardware is found on customer premise; meter covers, meter panels, test switches and/or metering transformer panel sections, submeter workers shall be cautious in performing submeter work and not cause an interruption of electric service to the customer's premise. If premise service will be unavoidably interrupted for any submeter work, the submeter worker shall notify the customer and obtain the customer's consent prior to performing work.

II.1.2. Electrical Hazards

II.1.2.1. Various Hazardous Conditions

The hazardous condition may include exposed wiring, damaged sockets (loose or burnt wiring or jaws), autobypass devices (load jaws still hot when meter removed), loose or missing screws (i.e., in bypass area), missing panels, loose or broken service insulators, service wires in bad condition/order, missing meter, improper grounding conditions, fused neutral conductor of a 2 wire or 3 wire single phase service, defective service switch/disconnect, new installations which fail to conform with the UDC's electric service requirements, etc.

II.1.2.3. 480 V Sticker

If the meter does not display voltage, the Meter Worker shall ensure that a 480 V sticker is in place either on the meter or on the meter panel near the meter before leaving the site.

II.1.3. Physical Hazards

II.1.3.1. Tripping hazards (slippery or uneven surfaces), debris, or materials stored in the working space, overhead hazards (stored materials or workers above meters), etc.

II.1.3.2. Environmental hazards: Chemical, caustic, hearing, biological, etc.

II.1.3.3. Inadequate or unsafe access.

II.1.3.4. Meter Mounting: loose meter mounting, undue vibration, inability to securely seal metering, unleveled meter, etc.

II.1.4. Customer Premises

Unsafe conditions of customer-owned stairs, railings, platforms, etc.

II.1.5. Vermin

Watch out for insects, snakes, and rodents when opening doors or removing panels.

II.2. Meter Security and Accessibility

The following requirements must be completed when performing any meter work on site and visual observations must continually apply as the meter work progresses. Visually inspect all meter sites for the following conditions, and report any irregular field conditions to the utilities:

II.2.1. Infraction and Evidence of Tampering/Energy Diversion

II.2.1.1. Meter Installation

II.2.1.1.1. Awareness of connected loads other than an electric vehicle (EV).

II.2.1.1.2. Irregularities in the PEV submeter load conductor's insulation ("skinned" insulation, newly-taped sections of conductors, burned or pitted conductors, etc.)

II.2.1.1.3. Unauthorized connection in PEV submeters load conductors.

II.2.1.1.4. Unauthorized seals, and unsealed or improperly sealed conditions on submeter voltage and current sensor circuits, test block compartments, test switch covers, and meter sealing rings.

II.2.1.1.5. Suspicious wiring.

II.2.1.1.6. Rate infractions in meter program/register.

II.2.1.2. Meter Cover

An unusually clean cover, small holes in the cover, burn marks on or near the cover, visible fingerprints inside the cover, etc.

II.2.1.3. KWH Register

KWH dial pointer alignment, register mesh, and register gears.

II.2.1.4. Meter Disk alignment to magnets, irregularity of disk rotation, foreign objects or materials on disk/bearing, scratches or wear marks on the disk, etc.

II.2.1.5. Test Blocks Damaged wiring between test block and meter, unusual marks, scratches or burns on test blocks, defective test blocks, etc.

II.2.1.6. Meter Base Unusual marks and mushroomed screw slots on potential links; broken meter seals; unusual wear or scratches, burn or pit marks on meter stabs/blades/terminals, etc.

II.2.1.7. Meter Socket Unusual wear or scratches, burnt or pit marks, irregular meter socket voltages, circuit bypass jumper, etc.

II.2.2. Meter Security

The following are the requirements for securing physical meters, panels, programmable meters, and data

II.2.2.1. Physical Meters and Panels

Meters and meter panels shall be secured with seals and locking devices as described in Chapter A, Standards for Meter Products, Section IV.

II.2.2.2. Programmable Meters and Data

Only programmable meters capable of supporting passwords or other protection means to restrict access to information contained therein shall be used for submetering. A security password shall be applied to prevent unauthorized access to a programmable meter and unauthorized modifications of the meter data and program. Passwords should be controlled by following generally accepted practices.

II.3. Site Verification

Visually inspect all submetering sites for the following conditions:

II.3.1. Submetering Verification

II.3.1.1. Check for proof of submetering certification or meter types that meet the CPUC requirements for submetering.

II.3.1.2. Verify for correct customer and customer account (records versus meters) including billing constant, meter number, accuracy test results, customer information, address, etc.

II.3.1.3. Verify for correct meter for service characteristics (voltage, form, etc.).

II.3.2. Submetering Communication Verification

II.3.2.1. Verify for correct communication devices and connections to ensure Internet transmittal of data per this Protocol

II.3.2.2. Verify for successful communication handshakes and data retrieval if remote read (This can be done by another person at a remote location, and data accuracy is not verified at this time).

II.3.2.3. Verify for successful meter reading if manual or locally read.

II.3.3. Transformer-rated Meter Sites

II.3.3.1. Billing Constant: Compare between records versus sites (CT's/PT's ratios when accessible).

II.3.3.2. Improper Wiring: Shorted current by-pass links, reverse current secondary wired, unmatched voltage and current circuits, pinched or rubbed secondary wires near panel hinges, etc.

II.3.4. Pole-mounted Meter Sites II.3.4.1. Cutouts: Open cutouts or blown triple link fuses.

II.3.4.2. Grounding: Grounding electrode conductors and connections shall not be broken at any point between the service equipment enclosure and the ground rods or other approved grounding electrode.

II.3.5. Pad-mounted Meter Sites

II.3.5.1. Cabinets: Check the cabinet is free of obvious shipping damage, paint damage, or corrosion.

II.3.5.2. Cabinet Safety

II.3.5.3.1. Verify that there is at least one penta-head security bolt permanently attached to high voltage compartment door(s) and door locking handle.

II.3.5.3.2. Verify secondary non-polarity neutral points and meter enclosure/pedestal electrically connected to ground bus.

II.3.5.3.3. Verify all metering electrical connections secured and properly made.

II.3.5.3. Cabinet Markings

II.3.5.3.1. Verify exterior warning labels properly attached

II.3.5.3.2. Verify electrical schematic and metal nameplate mounted to the enclosure

II.3.6. Grounding

Some three-phase, three-wire services have a ground connection on one of the phases. In situations where A, B, or C phase is not grounded and there is a voltage reading at or near zero volts on any phase and reading above zero volts on any other phases, this hazard shall be reported to the UDC prior to leaving the site for emergency corrections and the customer or customer's representative shall be contacted to inform them of the hazardous conditions. If it is unclear whether a phase is intentionally grounded, the local UDC shall be contacted to clarify the configuration of the service. On all services, grounding must meet best practices and must be correctly installed to avoid safety issues. Additionally, extreme caution must be taken on 480 V phase-to-phase or 277 V phase-to-neutral service

II.3.7. Watt Load Check

Record customer's load on the submeter and report any unusual findings

II.3.8. PT/CT Secondary Wiring

If accessible, secondary wiring shall be verified for correct wiring and no sign of tampering, and PTs and CTs shall be checked for normal operating conditions. If abnormal conditions exist, the MDMA-S shall notify the UDC serving the customer within 24 hours for their corrective actions.

II.4.Submeter Install

Below are the required procedures that a meter worker must follow when installing and/or removing submeters. These procedures do not necessarily include all procedures of a meter installation.

II.4.1. Pre-Installation

Verify type and size of metering is appropriate for site.

II.4.2. Self-Contained Submeters

II.4.2.1. Take closing read on existing meter.

II.4.2.2. For submeters with no bypass, check the load to make sure it is safe enough to remove the meter or disconnect load before replacing the meter.

II.4.2.3. For submeters with a bypass, the meter socket shall be bypassed and de-energized, before replacing the meter.

II.4.2.4. Verify voltage.

II.4.2.5. Verify 0 volts between line and load side of test blocks.

II.4.2.6. Install new meter.

II.4.2.7. Take initial meter read.

II.4.3. Transformer Rated Meters (CT Meter)

II.4.3.1. Take closing read on existing meter read.

II.4.3.2. Open test switch cover and verify voltages at the test switch.

II.4.3.3. Operate test switch/test block to de-energize meter sockets.

II.4.3.4. Install new meter.

II.4.3.5. Check voltage before closing voltage switches on test switch.

II.4.3.6. Take initial meter read.

II.4.4. Submeter Installation at New Sites

The parties (MDMA-S and UDC) shall work together to achieve new submeter sets and service connection in a timely manner, consistent with the customer's interest and public safety.

A new submeter set is defined as a meter service behind the UDC primary meter which is installed for the first time. This does not apply to a change in MDMA-S where new equipment is not required.

The UDC will issue an authorization to set a new submeter and notify the MDMA-S if coordination is required (i.e. primary rated voltages). If coordination is required, the MDMA-S shall use best efforts in meeting the UDC schedule. If no coordination is required, the MDMA-S shall set the new submeter within two (2) working days of UDC notification.

III. SUBMETER MAINTENANCE AND TESTING SCHEDULE

The primary purpose of the maintenance and testing program is to assure that the meter population owned by an entity is accurate as long as the submeters are in service. The required maintenance and testing program is a balance between the benefits and costs of maintaining and achieving high accuracy levels throughout a submeter life. This maintenance and

testing program enables the entity owning the submeters to verify the accuracy of the overall submeter systems and to test the meters periodically and/or on the basis of an annual statistical sampling plan. MDMA-S shall report the results with the associated primary meter number to the appropriate UDC.

III.1. Submeter Maintenance Schedule

PEV submeters shall be maintained, as a minimum, according to the following meter maintenance and testing schedule:

Maintenance and Testing Frequency	Customer Maintenance and Testing Criteria
One Year Interval	Customer's annual usage of 2 million kWh or higher
Two Year Interval	Customer's annual usage between 720,000 and 2 million kWh
Annual Statistical Sample Plan	Non residential customer's annual usage less than 720,000 kWh
Residential Meters	Either a formal sampling plan performed annually or tests done upon request and removal, where applicable
Direct Current (DC) Meters	Either a formal sampling plan performed annually or tests done upon request and removal, where applicable

III.2. Maintenance upon request

Testing and maintenance is required upon a reasonable request by a customer, MDMA-S or UDC. Prior consultation between the parties shall determine the entity that would perform the test and maintenance.

III.3. Statistical Sampling Requirements

The ANSI Z1.4 or Z1.9 Standards shall be used as the statistical sampling requirements for testing meters. Generally, inspection level of General II (G-II) shall be used if the use of other inspection levels is not justifiable.

III.4. Criteria for required corrections

The criteria for required corrections on the overall meter population include the trigger criteria and action criteria, which are specified in Table III.4.1 below:

Table III.4.1. Criteria for required corrections

Sampling plan applied on:	Trigger Criteria	Action Criteria
- Overall meter population	**2.5% AQL**	**4% AQL**
- A group of meter type	**2.5% AQL**	**10% AQL**

AQL is the Acceptable Quality Levels, which is the maximum percentage of non-conforming meters in the meter group. The non-conforming meters are those sample meters that are tested and found outside the CPUC-required accuracy limits. The current CPUC-required accuracy limits are ±2%. The overall meter population includes all meter types owned by an entity and is not divided into any groups of meters or meter types.

When the trigger criteria of 2.5% AQL is not met during a scheduled maintenance and testing, the second or more sampling plans for further testing and checking shall be required to monitor the accuracy performance of the overall meter population, groups, or types. Upon the violation of the action criteria, corrective actions shall be taken to correct the problems. Such corrective actions may lead to removals of certain inaccurate and aging meter groups or types.

III.5. Troubleshooting and Corrective Actions

Troubleshooting shall include all applicable tasks as indicated above and shall be performed to verify the submeter products

operation and accuracy as required. If the troubleshooting indicates a hazard or out-of limit accuracy condition at a submeter site, the responsible party shall take corrective actions within 48 hours of this finding.

III.6 MDMA-S Communications

The MDMA-S is ultimately responsible for the quality of the data from the meter and will determine if the meter data should be adjusted, including the cause and correction factor.

III.7. Demarcation Point of Submeter Work

As established for Direct Access, the demarcation point with respect to the primary meter shall remain as follows:

Per D.98-12-080 and D.97-10-087 "Potential and current transformers shall be considered part of the distribution system and shall remain the responsibility of the UDC." Accordingly, and pursuant to D.97-10-087 and D.98-12-080, all instrument transformers, test switches, and associated wiring up to the meter socket shall remain the responsibility of the UDCs. However, per D.98-12-080, reconnecting existing wires to a replacement of the existing meter socket, A-base socket adapter, or A-base meter may be performed by either UDCs or MSPs.

The demarcation point of submeter work shall be as follows:

The electrical and physical components of the submeter and its associated infrastructure from the point of connection to the customer's service panel on the load side of the panel's main breaker to the point of connection to the load served by the EVSE and metered by the submeter.

IV. SUBMETER SYSTEM TESTING

The following submeter system testing requirements shall be applied to: 1) ensure the accuracy of the overall metering system at a customer site within the CPUC-required limits, 2) ensure safety in meter work procedures, and 3) provide a consistency of testing once such testing is performed for a submetering customer.

In general, there are seven tasks involved in testing an electric meter system. The metering system, defined for use in Section IV only, is 1) the meter itself, or 2) the meter and its attached equipment or module(s). These tasks are described in Section VI, Guideline for Meter Testing, which meter workers may use as a guideline for their meter work. The following requirements shall are applied when testing is performed on meters, meter sockets, and metering systems:

IV.1. Submeter Socket

Voltage test (Task #1 in Section VI) shall be performed on meter sockets or service connections to verify correct voltages. When a phase shifting transformer is in use, a phase angle test (Task #5 in Section VI) shall be required (if load is present).

IV.2. Submetering System

The following tests are required to be performed on a metering system:

IV.2.1 Light and full load test or customer load test (Task #2 in Section VI).

IV.2.2 Demand test (Task #3 in Section VI).

IV.2.3 Register verification (Task #4 in Section VI).

IV.2.4 Separate element check (Task #6 in Section VI).

IV.3. Notification

Meter worker shall notify the UDCs and MDMA-S upon finding a defective meter that affects billing.

V. TEST STANDARDS

V.1. Calibration and Maintenance of Test Standards

The following are the requirements for maintenance and calibration of test standards which are used for testing the accuracy of electric meters in the field or in the shop:

V.1.1. Out-of-calibration

A test standard that is found to have accuracy outside the limits of ±0.1% of a reference test standard.

V.1.2. Basic Reference Test Standard

A basic reference test standard that is certified according to NIST requirements and used as an accuracy reference in the laboratory or meter shop.

V.1.3. Portable Test Standard

A portable test standard that is used to certify the accuracy of meters in the field.

V.1.4. Routine Accuracy Check Requirements

Each test function of a test standard shall be checked and compared with a reference standard monthly. If a test standard used in testing meters has a result of three consecutive meters tested out of the CPUC-required accuracy limits, this test standard shall be checked against the reference standard.

V.2. Meter Re-testing upon Finding of An Out-of-calibration Test Standard

Once a test standard is checked and found out-of-calibration, it shall be calibrated according to NIST requirements, and meters that were tested by this test standard since the last routine check or calibration of the test standard shall be re-tested with an accurately-calibrated test standard according to the following:

V.2.1. A submeter sample from the submeters tested by this portable standard since its last check or calibration shall be selected for re-testing as follows:

V.2.1.1. 3–20 submeters: All meters will be re-tested for accuracy.

V.2.1.2. 21–100 meters: A random sample of 20% or 20 meters, whichever is less, will be retested for accuracy.

V.2.1.3. 101–200 meters: A random sample of 10% or 20 meters, whichever is less, will be retested for accuracy.

V.2.1.4. Over 200 meters: A random sample of 10% or 50 meters, whichever is less, will be retested for accuracy.

V.2.2. If at least 95% of the first sample pass the submeter test for accuracy, all submeters will be considered accurate.

V.2.3. If less than 95% of the first sample pass the meter test for accuracy, a second sample of the same size will be tested.

V.2.4. If a second sample is drawn, 95% of the sample submeters must pass the submeter test standard for accuracy.

V.2.5. If less than 95% of the second sample pass the meter test for accuracy, all meters previously tested by the portable standard will be re-tested and re-calibrated for accuracy.

VI. GUIDELINE FOR SUBMETER TESTING

Section VI – Matrix of Submeter System Testing

The following matrix indicates which testing task can be applied to a submeter technology, and it serves as a guide in submeter testing.

		TASK								
CODE	**Type of Meters/Registers**	**1** Voltage Test	**2** Light & Full Load or Customer-Load Test	**3** Demand Test	**4** Register Verification	**5** Phase Angle Test	**6** Separate Element Check	**7** Burden Test	Possible Other Types	Comments
(a)	Self-Contained kWh Meters	X	X						**(g), (i)**	Mechanical Meter
(b)	Transformer-Rated kWh Meters	X	X				X	X	**(g), (i)**	Mechanical Meters
(c)	Hybrid Meters	X	X	X	X		X		**(i), (j)**	
(d)	Solid State Meters	X	X	X	X				**(g), (i), (j)**	
(e)	Transformer-Rated kVARh Meters	X	X			X	X	X	**(j)**	Mechanical Meter
(f)	Multi-Quadrant Meters	X	X		X		X		**(g), (j)**	
(g)	Solid State Recorders	X		X						
(h)	Mechanical Registers								**(g), (j)**	
(i)	Electronic Registers								**(g), (j)**	
(j)	Pulse Devices			X						
(k)	Self-Contained Network Meters	X							**(g), (j)**	

Performed when deemed necessary or requested by customers. The alphabetical codes in the "Possible Other Types" column refer to the "Code" column on this matrix and indicate that additional tests must be performed as required if the other types exist at the sites.

VI.1. Task #1: Voltage Test

The voltage test is necessary to 1) ensure safety in the meter work procedures, 2) provide a meter worker a knowledge of the correct service voltage prior to any meter work, 3) provide a confirmation of no short-circuit or hazardous conditions in customer equipment or panel. Below is a procedure for the voltage test:

On all services, measure the secondary voltage, with an approved volt meter, between the line phases and line to ground even if it is an ungrounded service and record all voltage readings on the test tag. All nominal voltages have an allowable tolerance of ±5%.

VI.1.1. Secondary Distribution Voltages Normal rating of 120 V.

Table VI.1.1-1: Nominal Voltages and allowable limits on Secondary:

Nominal Voltage (V)	Maximum (V)	Minimum (V)
120	126	114
208	218	198
240	252	228
277	291	263
480	504	456

TableVI.1.1-2: Service Voltages and allowable limits on Secondary

Service Voltage (V)	Measured Voltage (V)	Maximum (V)	Minimum (V)
120/240 V 3w 1ø	120 V Phase to Ground 240 V Phase to Phase	126 252	114 228
120/208 V 3w 1ø	120 V Phase to Ground 208 V Phase to Phase	126 218	114 198
120/208 V 4w 3ø	120 V Phase to Ground 208 V Phase to Phase	126 218	114 198
120/240 V 4w 3ø	120 V Phase to Ground 208 V Phase to Ground 240 V Phase to Phase	126 218 252	114 198 228
277/480 V 4w 3ø	277 V Phase to Ground 480 V Phase to Phase	291 504	263 456
240 V 3w 3ø	240 V Phase to Phase	252	228
480 V 3w 3ø	480 V Phase to Phase	504	456

VI.1.2. Primary Distribution and Transmission Voltages

These voltages have a secondary voltage rating of 115 V or 120 V. The voltage transformer primary may be connected either wye or delta.

Table VI.1.2-1: Primary and Transmission Voltages with their secondary voltages and ratios

Possible System L-L Voltage (V)	VT Primary Voltage (V)	Secondary Rating (V)	Ratio
2,400 or 4,200	2,400	120	20:1
4,200 or 7,200	4,200	120	35:1
7,200 or 12,000	7,200	120	60:1
12,000 or 20,125	12,000	120	100:1
17,200	18,000	120	150:1
20,125 or 34,500	20,125	115/67.08	175/300:1
60,000	34,500	115/69	300/500:1
69,000	40,250	115/67.08	350/600:1
115,000	69,000	115/69	600/1000:1
138,000	80,500	115/69	700:1
230,000	138,000	115/69	1,200/2000:1
500,000	287,500	115/69	2,500/4200:1

VI.2. Task #2: Light Load & Full Load Test or Customer-Load Test

This test is the accuracy testing to assure that the submeter is accurate at various load conditions. Typically, the accuracy of the solid state meters varies minimally in the full and light load conditions. it becomes a common practice to test meters for accuracy at both light and full load conditions.

Light load is 10% of test Amp rating, and full load is 100% of test Amp rating. The light and full load test is performed at 100% power factor to verify the accuracy of the submeter by comparing its test results with a standard meter of known traceable accuracy. Customer Load Test will consist of two or more test runs using the customer's load. Each heavy load test run shall be at least 60 seconds in duration. Heavy load is defined as any load over 10% of Test Amp rating of the meter. Each light load test run shall be at least 90 seconds in duration and two revolutions of the meter disk

Test submeters will be energized with no connected load, and the disk observed for rotation. A minimum amount of creep is acceptable if the rotation stops when an anti-creep hole reaches the meter stator.

VI.2.2. Accuracy test

Single phase and polyphase submeters are to be tested with potential coils connected in parallel and the current coils connected in series; or an on-site test can be performed using customer load. The minimum duration of the test will be 1 disk revolution for light load and 10 disk revolutions for full load. For solid state submeters, calculated pseudo revolutions will be used. Customer Load test will be at least 60 sec in duration and minimum 2 revs for heavy load test. Light load test run at least 90 sec in duration and two revolutions of the disk

VI.2.3. Adjustments

Submeters found within the limits required by the local UDC need not be adjusted.

VI.2.4. Reporting

Correction factors for light load and full load tests will be recorded as the meter accuracy results as specified in ANSI C.12.1 (1995)

For example, for a 0.5% fast and slow meter:

	Correction Factor	Accuracy
Fast	0.995	+0.5%
Slow	1.005	-0.5%

VI.3. Task #3: Demand Test

The demand test is performed to ensure the accuracy of the demand function of a meter.

VI.3.1. Mechanical Demand Submeters

Test for the accuracy of the demand registers by checking the marked register ratio and time interval as follows:

VI.3.1.1. Advancing Mechanism: Visually inspect the pusher arm and gears for worn out parts.

VI.3.1.2. Clutch: Check that the pusher arm returns to zero at the end of interval when the clutch releases it. Verify that this is a smooth operation and that the pusher arm returns to the stop position.

VI.3.1.3. Timing Motor: Check that the timing motor is operating. If the motor is not operating, the demand reading will most likely be off scale.

VI.3.1.4. Time Interval and Demand Test: Test the time interval to ensure that it is as marked on the register name plate by timing the motor gear and clocking an interval (i.e. 900 seconds for 15 minutes), or performing a demand test. The demand test is performed by minimally applying full load current for 125 disk revolutions on 15 minute demand submeters and for 250 disk revolutions on 30 minute demand submeters.

VI.3.1.5. Demand Mechanism: Check that the demand reset returns the pointer to zero on a reset action and that the pointer will advance to full scale.

VI.3.1.6. Reporting: Correction factor for the demand test will be recorded as the meter accuracy result.

For example for a 0.5% fast and slow meter:

	Correction Factor	Accuracy
Fast	0.995	+0.5%
Slow	1.005	-0.5%

VI.3.2. Solid State Submeters and Electronic Registers

Below is a procedure for a demand test on a solid state meter or an electronic register:

VI.3.2.1. Place the submeter register in the TEST MODE.

VI.3.2.2. Press the reset button to clear all test registers and start a new demand interval.

VI.3.2.3. Apply full load current for 10 disk revolutions (or equivalent) as a minimum.

VI.3.2.4. Scroll the register display to show present kW demand. If the kW value is in pulses, calculate the actual kW value.

VI.3.2.5. Calculate and record the correction factor by comparing the meter kW value with the kW in the test standard.

VI.3.2.6. Return the submeter to the NORMAL MODE.

VI.4. Task #4: Register Verification

The register verification is performed to ensure that the register parts and components are working to provide and retain accurate billing data and information.

VI.4.2. Electronic Register

Because electronic registers are different for each type and manufacturer, the manufacturer's manual should be referred to for specific procedures for these registers. Below is a typical procedure for verifying electronic registers after they are programmed with proper parameters:

VI.4.2.1. Check all numerical segments and identifiers on the meter display.

VI.4.2.2. Check that the meter is scrolling properly through all registers.

VI.4.2.3. Check the function of the registers by disconnecting and then restoring power on the meter. The meter should resume normal display operations and reading after this power outage.

VI.4.2.4. Verify the programming parameters are correct.

VI.4.2.5. Check the register memory and load profile data memory to verify that data is being stored.

VI.5. Task #5: Phase Angle Test

The phase angle test is performed to ensure the correct wiring for a meter system and therefore ensure the meter site accuracy because the correct wiring depends on a unique phase rotation (ABC or CBA) supplied by a UDC, customer load, and service wiring (delta vs. wye and three wires vs. four wires). The following is an example of procedures to follow when performing a phase angle test:

VI.5.1. UDC Phase Rotation Requirements

Refer to specific UDC requirements regarding phase rotation prior to performing this test, and check for correct wiring on a reactive metering site and proper phase shift on each phase circuit.

VI.5.2. Phase Shifting Transformer (Reactaformer) Voltage

Measure the secondary voltage to ensure correct voltage is applied to the potential coil in the kVarhr meter. If the phase voltage is not correct, check for the following possible errors:

1. incorrect wiring on the phase shifting transformers, and
2. incorrect service voltage.

VI.5.3. Power Factor Calculation

Calculate the load on the (real power) kWhr and the (reactive power) kVarhr meters and the power factor for the site. This power factor is used as a cross check for the measured phase angles.

VI.5.4. Current Measurement

Measure each phase current and record it accordingly.

VI.5.5. Phase Angle Measurement

Use a phase angle meter to measure each phase angle and record it accordingly.

VI.5.6. Phase Angle Plot

After measuring all voltages, currents, and phase angles, plot a phase angle test and cross check with the calculated power factor.

VI.6. Task #6: Separate Element Check

The separate element check is performed to ensure that each element is still in a good working condition. This check is necessary because a meter has more than one element, and it still measures energy usage even if one element is burnt or defective.

Check individual elements for proper disk rotation or registration by performing the following:

VI.6.1. Testing

Energize with the appropriate phase potentials and place current on individual elements, and check for forward rotation or positive registration

VI.6.2. Correct phasing

Check that the proper potential coil and current coil are wired correctly in the meter. If the meter is installed correctly on the socket, the meter disk will rotate forward.

VI.6.3. No forward rotation

If an element has no rotation, check for no load current and for open potential coil(s) with a magnet or an ohmmeter.

VI.6.4. Cautions

Phase angle relationships may cause reverse rotation in cases where there is a poor power factor, possible un-metered load, and/or short circuit. This will only occur on three wire three phase metered service sites.

VI.7. Task #7: Burden Test

Burden is the total load or impedance in the current transformer (CT) circuit due to meter coils, leads, and other connected devices. The burden test is performed to check for the proper operating conditions of CTs. This test is necessary to verify that the output current is proportional to the CT's nameplate ratio. Below is an example procedure for the burden test on a CT:

VI.7.1. Procedure

Put built-in burdens of a multi-range Ammeter in series with the secondary of the test CT to obtain the Amp readings. These Amp readings should have the same deflection.

VI.7.2.

Possible Problems If a CT has a reading significantly different from the others, check for shorted turns or other problems, such as short circuited primary turns, short circuited secondary turns, high resistance connections in the secondary circuit, short circuited secondary wiring, or grounding of normally ungrounded wire.

GLOSSARY OF TERMS AND ACRONYMS

1. GLOSSARY OF TERMS

Adjustment: Any change to a customer's usage data made to correct an error in the original data.

Average Daily Usage (ADU): Average daily usage over a specified period of time, such as a billing period. For example, if all constants and factors have already been applied to the reads, the ADU could be calculated by: ADU = (current billing read - previous billing read)/ (# days between billing reads).

Electricity meter or Submeter: A device that measures and registers the integral of an electrical quantity with respect to time. Electronic Data Interchange

Energy Service Provider (ESP): The party that contracts with the end-use customer to provide commodity electric service.

Electric Vehicle Service Provider: Per D.11-07-029, Electric vehicle service providers or EVSPs are providers of electric vehicle charging services and could include owners of standalone electric vehicle charging spots. (D.10-07-044 at 3.)

End-Use Customer: A customer that takes final delivery of electric power and does not resell the power

Estimated data: Usage or demand data that has been calculated based on standard estimation rules

Interval data: Metered end-use data from a meter capable of recording actual energy usage for each time interval (e.g., hour, half-hour, etc.) during the billing cycle

Meter Data Management Agent (MDMA): See Rule 1

Meter Data Management Agent - Submetering (MDMA-S): Plug-In Hybrid and Electric Vehicle Sub-meter Services Provider. An entity, which may be an existing Customer of Record or a 3rd party responsible for establishing a subtractive billing arrangement with SCE for the purpose of billing EV usage for electricity recorded on a 3rd party owned submeter, and for providing the submetered data to SCE for billing purposes.

Meter Service Provider (MSP): The MSP function includes provision of the meter instrument, installation, testing, maintenance, programming, and possibly metering local area network (LAN)

Meter Type: The design and specifications for a meter product which includes all parts, components, and circuit boards, functioning as a unit. A meter type includes all communication technologies and any additional functions utilized by that meter type and operated as a unit. In a situation where a meter can work with multiple technologies or functions, but can only operate separately and individually with a single communication technology or function, the combination of the meter and one communication technology or function shall be considered as a different meter type from the combination of that meter and another communication technology or function. For example, meter brand "X" with a phone modem attached is a different type from the same meter brand "X" with a radio modem attached

New Meter Type: Meter type that satisfies CPUC requirements described in the PEVSMP. This meter type can be a new meter design or an existing meter which has undergone a significant design change. A significant design change includes addition of a new circuit board with new meter function(s) not previously used with the meter type, or consolidation of two or more circuit boards

Pulse overflow: Condition in which the actual usage during an interval is larger than can be captured by the meter or recorder

Raw data: Usage or demand data that has not gone through the validation, editing and estimation (VEE) process

Re-framing: Changing the time frame of the metered usage data posted to the MDMA server. This typically refers to changing

the beginning or ending date/time of the usage data

Submetering Electric Vehicle Submetering Standards for Metering and Meter Data Document : Standards that are approved as regulatory requirements for metering and meter data used in Submetering in California by the California Public Utilities Commission in its D. 98-12- 080 issued on December 17, 1998

International Standards: Open standards as adopted by an international standards body; the U.S. participates in ISO, IEC, and others.

National Standards: Open standards As adopted by a standards body accredited to a national standards body; in the U.S., ANSI Standards.

Open Standards: Voluntary standards which are: (1) developed in an open forum, (2) sanctioned by an official standards body, (3) vendor-neutral, and (4) readily available to the public at a reasonable cost

Proprietary Standards: Standards which are privately owned and for which access may be unilaterally withdrawn or otherwise restricted

Test mode: Period during which a test load is applied to a meter or recorder to verify its accuracy

Validation check: Data check designed to identify usage or demand data that may not reflect actual usage, typically due to problems at the meter or recorder

Valid data: Usage or demand data that has gone through all required validation checks and either passed them all or has been verified

Validated Data: Usage or demand data that has been validated, edited and estimated (VEE) in accordance with approved procedures

VEE: Validating, Editing, and Estimating. Validation is the process of performing standardization validation checks on usage and demand data. Estimating is the process of using standard estimation rules to calculate usage or demand data. Editing is the process of inserting estimated values into a validated data stream that has errors, gaps or omissions.

Verified data: Usage or demand data that failed at least one of the required validation checks but was determined to represent actual usage

Watt-hour meter: An electricity meter that measures and registers the integral, with respect to time, of the active power of the circuit in which it is connected

The power integral is the energy delivered to the circuit during the integral over which the integration extends, and the unit in which it is measured is usually the kilowatt-hour (ANSI C121)

II. ACRONYMS

ADU: Average Daily Usage

ANSI: American National Standards Institute

SMSR: Submetering Service Request

DQIWG: Data Quality and Integrity Working Group

CMEP: California Metering Exchange Protocol

CPUC: California Public Utilities Commission

CT: Current Transformer

ESP: Energy (Electric) Service Provider

ESPI: Energy Service Provider Interface

EUI: Energy Usage Information (used in ESPI to reference customer energy usage data)

FCC: Federal Communications Commission

ISO: Independent System Operator

kVARh: kilovar-hours

kWh: kilowatt-hours

MDCS: Meter and Data Communication Standards

MDMA: Meter Data Management Agent

MDMA-S: Meter Data Management Agent - Submetering

MSP: Meter Service Provider

NAESB: North American Energy Standards Board

NEC: National Electric Code

PG&E: Pacific Gas and Electric Company

PSWG: Permanent Standards Working Group

PT: Potential Transformer

RSIF: Retail Settlements and Information Flows

SC: Schedule Coordinator

SCE: Southern California Edison Company

SDG&E: San Diego Gas and Electric Company

TLS: Transport Layer Security

TOU: Time-of-Use

UIG: UDC Industry Group

UDC: Utility Distribution Company

V: Volts

VEE: Validating, Editing and Estimating

ATTACHMENT—VEE STANDARDS FOR VALIDATING, EDITING, AND ESTIMATING INTERVAL DATA

Section A: CA Interval Data VEE Rules (Revision 2.0)

I. Introduction

This section defines the interval data validation, editing, and estimation techniques required to participate in the California market as an MDMA.

2. Required Data Validation Checks

Data validation checks are designed to identify things that can go wrong at the meter/recorder and cause the data collected to not reflect actual usage.

These rules apply to both kWh and kVARh data, depending on the data required by the meter's tariff(s). If data is provided for informational purposes only (not used for billing purposes), validation is not required. Data that has not gone through the validation process is raw data.

General MDMA-S and MSP business practices should ensure that the meter is programmed correctly for the required revenue data and that the MDMA-S system – the means of moving the data from the meter to the MDMA server to the billing process - is set up to accurately maintain information such as interval size, meter constants, and what quantity is recorded by what channel. These VEE rules do not require or describe how the MDMA-S verifies that the meter is programmed correctly.

All validation checks must be run. Failure of one check does not preclude the MDMA-S from performing other validation checks.

The following validation checks are required for interval kWh and kVARh data. They are described in section 3 of this document:

All the boxes below refer to "meter" and not submeter

Check	Purpose
Time check of meter reading device/system	Check for the following: • time drift of meter reading device/system outside CPUC standard
Meter identification check	Check for the following: • meter ID was reported correctly • meter has not been changed out • data is being reported for the correct meter
Time check of meter	Check for the following: • time drift of meter clock outside CPUC standard
Pulse Overflow check	Check for the following: • improper scaling factor in meter • improperly sized transformer • hardware problem
Test Mode check	Check for the following: • Data collected when meter was in test mode that represents test load rather than actual usage
Sum check	Check for the following in combination meter/recorder installations: • Crossed channels between meter and recorder • pulse relay problems Check for the following for all installations: • invalid PT and CT ratios, • invalid meter constants
Spike check	Check for the following for all installations: • transmission error • spike resulting from meter test. Note that a spike can also occur after an outage - in this case the data is valid, but may or may not be used for peak billing depending on the tariff and company policy.
kVARh check (for kWh data only if corresponding kVARh data available)	Check for the following: • kWh channels are correctly mapped to kVARh channel • meter is operating correctly

Check	Purpose
High/Low Usage check	Check for the following in all installations: • dropped phases • inaccurate meter constants • energy diversion • fast/slow meters Also check for the following in combination meter/recorder installations: erratic pulse input to recorder

3. Interval data collection and validation rules

If interval data is read more often than required for billing checks need to be performed at different times in the process. Some must be done as the data is read from the submeter; some can be done anytime between when the data is collected from the submeter and the end of the cycle, and others have to be done on a billing period basis at the end of the billing cycle. They are broken out that way in this description.

3.1. Time check of submeter reading device/system ensures that the collection device is synchronized to the

national time standard before data collection begins.

3.2. Collect Data

3.3. As Data Are Collected

3.3.1. Check submeter identification – verify that the submeter's identification matches what is expected.

3.3.2. Perform Time Tolerance check on submeter and data.

The time tolerance check is performed to minimize and correct submeter clock drift and to minimize and correct the data problems associated with submeter clock drift.

How to do Time Tolerance check on submeter

To perform a time tolerance check on the submeter, compare meter time to data collection device time. Note that depending on the communication technology used, network latency must be taken into account.

Pass/Fail Criteria

· If meter time is within 3 minutes of time standard, the submeter passes the time tolerance check. (Note that if the meter time is within the 3-minute tolerance, the submeter time can optionally be corrected.)

· If submeter time is off by more than 3 minutes, the meter time must be corrected. If the submeter fails the time tolerance check for three consecutive months, the submeter must be physically inspected/tested.

How to do Time Tolerance check on data

To perform a time tolerance check on the data, compare the number of intervals retrieved from the submeter to the number of intervals expected given the elapsed time.

Pass/Fail Criteria

· If the actual number of intervals is equal to the expected number, the data passes the time tolerance check.

· If the actual number of intervals differs from the expected number, the data fails the time tolerance check. The data to be corrected includes all intervals from the last time the submeter time was determined to be good (i.e., within the 3-minute tolerance) and when it was discovered that the submeter time was off by more than 3 minutes and the submeter time was reset.

If data fails the Time Tolerance Check…

(1) If the submeter time was off by less than or equal to 75 minutes, prorate the data using one of the algorithms in Attachment VEE-A, Section 1.1.

(2) If the meter time was off by more than 75 minutes, the data must be estimated.

3.4. Either as data are collected or prior to publishing on MDMA Server

3.4.1. Perform Pulse Overflow Check

Inspect each interval for this condition. If a pulse overflow occurs, the submeter requires physical submeter test/maintenance. Intervals with pulse overflows must be estimated.

3.4.2. Perform Test Mode Check

If the MDMA-S determines the submeter was in test mode, the MDMA-S must ensure that the customer is not billed for the test load. If no actual customer usage data is available for the time in which the meter was in test mode, zero usage is reported for that period; this data is valid. If the meter is inadvertently left in test mode, the data must be estimated if actual usage data is not available from the submeter

3.4.3. Perform Sum Check

The sum check is performed to ensure that the difference between the energy use recorded in the intervals and the energy use recorded in the submeter over the same time period is within an acceptable range. This check may be done on either consumption or pulse data, provided the data scaling is consistent throughout the period.

How to do the Sum Check

(1) Calculate the energy use recorded in the intervals by summing the intervals between the start and stop meter readings.

(2) Calculate the energy use recorded by the meter by taking the difference between the start and stop readings accounting for possible rollover between start and stop readings. For example, if the start reading was 99968 and the stop reading was 00294, and the meter reading rolls over at 99999, the difference would be 326.

(3) Compare the energy use recorded in the intervals to the energy use recorded by the meter. Note that the values must be in the same units for the comparison.

Pass/Fail Criteria

· If difference is <= two meter multipliers, the data passes the sum check. (meter multiplier = CTR x VTR, where CTR is current transformer ratio and VTR is voltage transformer ratio)

· If difference is > two submeter multipliers, the data fails the sum check.

If data fails the Sum Check

(1) Several optional steps may be taken to resolve the sum check failure.

(a) Reread the submeter and redo the sum check from original start submeter reading to new stop meter reading.

(b) Redo the sum check, taking into account the differences between the time of the start read and the start of the first interval, and the time of the stop read and the end of the last interval. See Attachment VEE-A, Section 1.2 for more information.

(c) Redo the sum check, taking into account missing or incomplete intervals. See Attachment VEE-A, Section 1.2 for more information.

(d) Additional checks may be performed, based on the technology used, to verify that the interval data is an accurate representation of usage as measured by the submeter readings.

(2) If sum check is not resolved, perform manual inspection of data.

(a) Verify submeter and pulse multipliers. If a multiplier was incorrect, redo the sum check using the correct multipliers.

(b) Check for a submeter change between the start and stop meter readings. If the submeter was changed, redo the sum check for each meter independently.

(c) Manually inspect data. If the data seems reasonable, it can be considered verified.

(d) If the data does not seem reasonable, perform physical submeter test/inspection. If submeter tests OK, the data can be considered verified. If a problem is found with the submeter, the data must be estimated. (Note: if the problem existed prior to this billing period, previously posted data must be adjusted and re-posted.) If unable to visit site and perform submeter test prior to posting the data, the data must be estimated.

(e) If interval data is available but submeter readings are not available, manually inspect the data. Data that seems reasonable (compared with historical data) can be considered verified. Any data that does not seem reasonable must be estimated.

(3) If the sum check failure cannot be resolved, the data must be estimated.

3.4.4. Perform Spike Check

The spike check is performed to identify intervals with suspiciously high usage relative to the surrounding intervals. This check may be done on either consumption or pulse data, provided the data scaling is consistent throughout the period.

How to do the Spike Check

(1) For each 24-hour period, identify the highest and third highest peaks. (Normally the 24-hour period is from midnight to midnight. If the data is at the beginning of the span and doesn't start at midnight, use enough data from the next day of data to get 24 hours of data. If the data is at the end of the span and doesn't stop at midnight, use enough data from the next to last day of data to get 24 hours.)

(2) If the highest peak is less than or equal to the spike check threshold of 10 pulses, skip the spike check. (A spike check threshold is used to eliminate false spikes for meters with very low usage.)

(3) If the highest peak is greater than the spike check threshold of 10 pulses, subtract the third highest peak from the highest peak and divide by the third highest peak.

Pass/Fail Criteria (this criteria was developed for large commercial customers and has been heavily modified for residential loads in AMI. Residential and small commercials loads tend to have a higher "spike" meaning the peak demand is much higher than the average demand over 24 hours, and the 180% standard here will result in numerous false positive results, which the UDC and/or DMA will have to investigate and resolve.

· If ((highest peak - third highest peak)/third highest peak) <= 1.8, the interval passes the spike check.

· If ((highest peak - third highest peak)/third highest peak) > 1.8, the interval fails the spike check.

If data fails the Spike Check

(1) Optionally reread the submeter. If you get different value from reread, redo spike check.

(2) If value is the same on reread or you cannot reread the submeter, perform manual inspection of data.

(a) Look for similar patterns on similar days. If a similar pattern is found and this seems reasonable, the data can be considered verified.

(b) Optionally check with customer for unusual conditions at the time of the spike. If a legitimate reason for spike is found, the data can be considered verified.

(3) If no similar pattern or legitimate reason for spike is found, the interval with the spike must be estimated.

(4) If there is a regular pattern of failing this check, the customer may be an irregular usage customer. See section on Irregular Usage Customers for additional information.

3.4.5. If interval kVARh data is available, perform kVARh Check

The kVARh check is performed to identify intervals where reactive load (kVARh) is present and active load (kWh) is not, indicating a suspicious usage pattern and possible meter malfunction. This check is only required when both kWh and kVARh are used for billing. If kVARh data is available but not used for billing, the check is optional. This check be done on either consumption or pulse data, provided the data scaling is consistent throughout the period.

How to do the kVARh Check

(1) If multiple kWh channels map to a single kVARh channel, or multiple kVARh channels map to single kWh channel, the appropriate channels must be totaled prior to this check.

(2) If there are any kWh intervals with zero consumption, check the corresponding kVARh interval.

Pass/Fail Criteria

· If the corresponding kVARh interval is also zero or less than or equal to the kVARh check threshold of 4 pulses, the kWh data passes the kVARh check. (A kVARh check threshold is used to eliminate false errors for submeters with very low usage.)

· If the corresponding kVARh interval is greater than the kVARh check threshold of 4 pulses, the kWh interval fails the kVARh check.

If data fails the kVARh Check

(1) Several optional steps may be taken to resolve the kVARh failure.

(a) Investigate to determine if this data represents actual customer usage, in which case the data can be considered verified.

(b) If multiple kWh channels map to a single kVARh channel, investigate to determine if the problem can be directly traced to specific kWh channels. If this is the case, only data for those channels must be estimated. If the problem is not attributable to specific channels, all kWh channels need to be estimated.

(2) If no legitimate reason for the kVARh failure is found, the intervals with failures must be estimated.

(3) If there is a regular pattern of failing this check, the customer may be an irregular usage customer. See section on Irregular Usage Customers for additional information.

3.5. On the billing cycle for the meter

3.5.1. High/Low Usage Check

This test must be performed on the data that has passed or been verified for previous checks, with no estimated values included. This identifies metered usage that is suspiciously high or low relative to historical usage. It may optionally also be performed on all data (valid and estimated) to provide a reasonableness check on the estimates derived using the standard estimation techniques. This check must be done on consumption data, not pulses.

How to do the High/Low Usage Check

(1) If last year's data is available, calculate average daily usage for same billing month last year; use summed VEE or

historical billing interval data if available, if not use VEE or historical billing usage (i.e., difference between register readings).

(2) If last year's data is not available, calculate average daily usage for the previous billing month; use summed VEE or historical billing interval data if available, if not use VEE or historical billing usage (i.e., difference between register readings).

(3) If last year's data and last month's data are not available, skip the high/low usage check.

(4) Calculate average daily usage for this billing month using either summed VEE data (if check includes estimated data) or sum of all intervals not requiring estimation (if check does not include estimated data). If not all intervals are included in the sum, prorate the sum accordingly.

Pass/Fail Criteria (similar to spike check, a 50% / 150% threshold may not work for all customer classes)

· If |(historical daily average - this month's daily average)| <= 0.5* historical daily average, the data passes the high/low usage check.

· If |(historical daily average - this month's daily average)| > 0.5* historical daily average, all data in the billing month fails the high/low usage check.

If data fails the High/Low Usage Check

(1) Perform manual inspection of data.

(a) Look at recent history for the submeter. If monthly usage has been on a trend in the appropriate direction and this seems reasonable, the data can be verified.

(b) Optionally check with customer for changed usage patterns. If changed usage patterns match change in data, the data can be verified.

(c) Check to see if some of the data looks reasonable; reasonable looking data can be verified. For example, if a meter fails sometime during the month, the data at the beginning of the month may be OK, while the data after the meter failure may be obviously bad. (d) If the data does not seem reasonable, perform physical meter test/inspection. If meter tests OK, the data can be verified. If a problem is found with the meter, the data must be estimated. (Note: if the problem existed prior to this billing period, previously posted data must be adjusted and re-posted.) If unable to visit site and perform meter test prior to posting the data, the data must be estimated.

(2) If the data is investigated and found to be accurate, the data is verified.

(3) If the data fails high/low usage check, suspect data must be estimated.

(4) If there is a regular pattern of failing this check, the customer may be an irregular usage customer. See section on Irregular Usage Customers for additional information.

3.6. After all validation checks have been performed and required data has been estimated, optionally rerun validation checks to ensure reasonableness of estimates.

3.7. Record Keeping Requirements

If data failed one or more validation checks, the specific checks that the data failed must be recorded on an interval level, and:

(1) If the data was manually verified, that information must be recorded on an interval level. Verified data is valid.

(2) If the validation failure(s) were not resolved through accepted methods, the data must be estimated. For each interval that is estimated, the MDMA-S must record the estimation algorithm used. Interval data estimation algorithms include:

· less than 2 hours (4.1)

· greater than 2 hours (4.2) – not scaled based on usage

· greater than 2 hours (4.2) – scaled based on usage

· time-drifted intervals prorated (Attachment VEE-A, Section 1.1)

· time-drifted intervals prorated (Attachment VEE-A, Section 1.2)

· intervals adjusted (4.3)

· intervals manually estimated (4.2.8)

· intervals estimated due to meter interval programmed incorrectly (4.4)

· load profile template used (4.2.7)

3.8. Irregular Usage Customers

An irregular usage customer is one whose usage pattern does not follow normal usage patterns and consistently fails the spike check, kVARh check, or high/low usage check. An MDMA-S can identify a customer as an irregular usage customer if:

(1) The customer data fails the standard validation check for three consecutive months and the MDMA-S verifies that the data represents the actual customer usage, OR

(2) MDMA is notified by the customer's ESP or previous MDMA of the irregular usage pattern.

The data used to identify an irregular usage customer could be data collected by the MDMA-S, or historical data provided by the previous ESP or MDMA-S. An MDMA-S may modify the spike check and/or high/low usage check, and skip the kVARh check if an irregular usage customer consistently fails the check. The MDMA-S must notify both the customer's ESP and UDC of the customer's irregular usage status and what modified checks will be performed.

The goal of the modified checks is to automate the manual procedures the MDMA-S would perform to verify that this is the customer's normal usage pattern. An MDMA-S may use a variation of the spike check or high/low usage check based on the actual usage pattern. Note that the MDMA-S may not skip the spike check or high/low usage check. If the data passes the modified check, the data is valid and does not need to be marked as verified.

Examples of modifications for the spike check include modifying the spike check value (180%) or the pulse threshold value (10 pulses).

Examples of modifications for the high/low usage check include changing the percentages (+/- 50%), using the year's average instead of one billing period's average, or comparing to the minimum and maximum values for the past year.

For some customers, irregular usage patterns are symptomatic of the business and will always be present, such as co-generation customers. For other customers, irregular usage patterns may be a temporary condition, such as when a factory adds a second shift and fails the high/low usage check for the first 12 months. The MDMA-S must determine whether a customer is a permanent or temporary irregular usage customer. Temporary irregular usage customers must be reviewed annually to determine if they are still irregular usage customers or should be returned to the normal checks.

4. Interval Data Estimation Rules

Estimate intervals needing estimation using the following estimation rules

4.1. If section of data needing estimation is 2 hours or less in length, use point-to-point linear interpolation to estimate the data. Intervals containing a power failure cannot be used as end points for interpolation.

How to apply Point-to-Point Linear Interpolation

(1) If the section occurs in the middle of the data, the "first point" is the last valid interval before the section, and the "second point" is the first valid interval after the section.

(2) If the section occurs at the beginning of the span, use the last interval from the historical data as the first point if the historical data is available and valid. Otherwise, use the second point (the first valid interval after the section) as the first point – this will cause the load to be estimated as a flat load.

(3) If the section occurs at the end of the span, use the first point (the last valid interval before the section) as the second point – this will cause the load to be estimated as a flat load.

4.2. If the section of data needing estimation is more than 2 contiguous hours, use the average of selected reference days to estimate the data.

Rules and definitions for selecting reference days for estimation:

· "Same weekdays" are defined as the same day of week as the day that needs estimation. In the case of holidays, "same weekdays" are holidays.

· "Like days" are defined as the same day type (i.e., weekday, weekend, or holiday) as the day that needs estimation.

· A standard list of holidays will be used, regardless of the tariff or service territory of the meter. The "legal" definitions of the holiday is used; if the holiday falls on a Sunday, the "legal" holiday is the following Monday. Otherwise the "legal" holiday is the same date as the actual holiday. The holidays used are the following:

· New Year's Day

· Washington's Birthday

· Memorial Day

· Independence Day

· Labor Day

· Veterans Day

· Thanksgiving Day

· Christmas Day

· Only "valid" intervals can be used for estimation. Valid intervals are defined as those that have passed all validation checks or have been verified. Estimated intervals cannot be used for estimation.

· Data from days with a power failure cannot be used for estimation. Power failures can cause irregular usage patterns, resulting in data that is not typical for the customer.

· Valid intervals from "partial" days can optionally be used for estimation. "Partial" days are defined as those containing estimated data or those on which data collection began at some time other than midnight.

· Historical data up to 90 days prior to the day needing estimation and from the current billing period may be used for estimation.

· Reference days are chosen to be the closest chronologically to the data needing estimation, regardless of seasonal crossover.

This may include days after the day requiring estimation. If two potential reference days are equidistant from the day requiring estimation, use the earlier day first. For example, if June 2, 2012 needed estimation and the billing period was from June 1 to June 30, the reference days used would be May 19, May 26, and June 9, provided they contained valid data.

4.2.1. Develop a daily profile

COMMENT: Profiles are dependent on a certain customer population to be statistically valid, and this option may not be available in a nascent PEV market, at least at first. The normal rate schedule specific profile would lack the influence of the EV charging, and may result in inaccurate estimation. Profiling should be a workshop item for the utilities and EVSPs to determine the number of profiles needed and the rules for application of profiles to estimation).

(1) Find the three "same weekdays" with valid data closest in time to the day with the data needing estimation based on the rules listed in the previous section. If the day with data needing estimation is a holiday, the "same weekdays" are holidays, not the same day of week. If not enough historical holidays exist in the current billing period or previous 90-day period, use Sundays. Calculate the average daily profile using the three selected days.

(2) If only two same weekdays are available from the current billing period and 90 days of historical data, calculate the average daily profile using the two selected days.

(3) If only one same weekday is available from the current billing period and 90 days of historical data, use it as the daily profile.

(4) If no same weekdays are available in the current billing period and 90 days of historical data, look for the three "like" days that are closest chronologically to the day with intervals needing estimation. For example, if the intervals needing estimation were on Tuesday, use Monday, Wednesday, and Thursday. Only use weekdays with weekdays; only use weekends with weekends; only use holidays or Sundays with holidays. Calculate the average daily profile using the three selected days.

(5) If only two like days are available from the current billing period and 90 days of historical data, calculate the average daily profile using the two selected days.

(6) If only one like day is available from the current billing period and 90 days of historical data, use it as the daily profile.

4.2.2. Use the daily profile to estimate the required data

(1) Estimate the data needing estimation by applying the appropriate intervals from the average daily profile to fill the missing intervals.

(2) If start and stop submeter readings are available and known to be good, they may optionally be used to scale the estimated interval data. See Attachment VEE-A, Section 1.3 for more information.

4.2.3. If there are no similar days or like days, use the load profile for the customer's class to estimate the data.

Use this month's usage, if available, to scale the load profile. If this month's usage is not available, use last month's

usage or last year's usage, whichever is determined to be more reasonable, to scale the load profile. Refer to the UDCs' load profile documentation for more information on applying load profiles. Note that the load profiles are for hourly data. If 15 minute data is required, assume a flat load throughout the hour (i.e., each 15-minute interval would have 1/4th the hourly usage).

4.2.4. If there is no historical data that can be used, the data must be estimated manually and the process and assumptions documented.

4.3. Correcting Data Problems Attributable to Submetering Problems

If on investigation the cause of the data problem is determined to be a problem with the submeter or meter installation and the data can be corrected by scaling the intervals and meter readings, the MDMA-S will be notified of:

(1) The time period requiring correction.

(2) The scaling factor to be applied to each interval in that period. Examples of these situations include a meter running slow, a submeter running fast, one or two phases dropped, etc. When the data is posted, it is marked as estimated if it had not been previously posted, and marked as adjusted if it had previously been posted

4.4. Interval in meter doesn't match tariff or settlement requirements

If the meter programming and the MDMA-S requirements are inconsistent, the data is calculated as follows:

(1) The submeter is programmed to collect data at a smaller interval than required by its tariffs, and the meter's interval evenly divides into the interval required by the tariff – for example, the meter was programmed to collect 5-minute data, and the tariff requires 15-minute data. Sum the 5- minute intervals into 15-minute intervals on even 15-minute boundaries. If the data passed all the other validation checks, it is valid and does not need to be marked as estimated or verified.

(2) The meter is programmed to collect data at a larger interval than required by the meter's tariff. For example, the meter is programmed to collect 60- minute intervals, but the tariff requires 15-minute intervals. Prorate the data by assuming an even load distribution during the interval. In this example, the usage in the 60-minute interval would be divided by 4 to estimate the usage in a 15-minute interval. The data is marked as estimated. The meter must be reprogrammed to the correct interval.

(3) The meter is programmed to collect data at a smaller interval than required by its tariff, but the meter's interval doesn't evenly divide into the interval required by the tariff. For example, the meter is programmed to collect 10-minute intervals, and the tariff requires 15-minute intervals. The data would be estimated and marked as estimated. To estimate data, all collected intervals that are contained within the required reporting interval are included in the appropriate reporting interval. Collected intervals that cross the boundaries of required reporting intervals are included proportionally in both reporting intervals. In this example, if there were three 10-minute intervals containing 10 kWh, 20 kWh, and 30 kWh, the corresponding estimated 15-minute intervals would contain 20 kWh (10 + 0.5*20) and 40 kWh (0.5*20 + 30). This is similar to the prorating technique discussed in Attachment VEE-A Section 1.1. The meter must be reprogrammed to the correct interval.

Attachment VEE-A: Interval Data VEE Technical Methods (Revision 2.0)

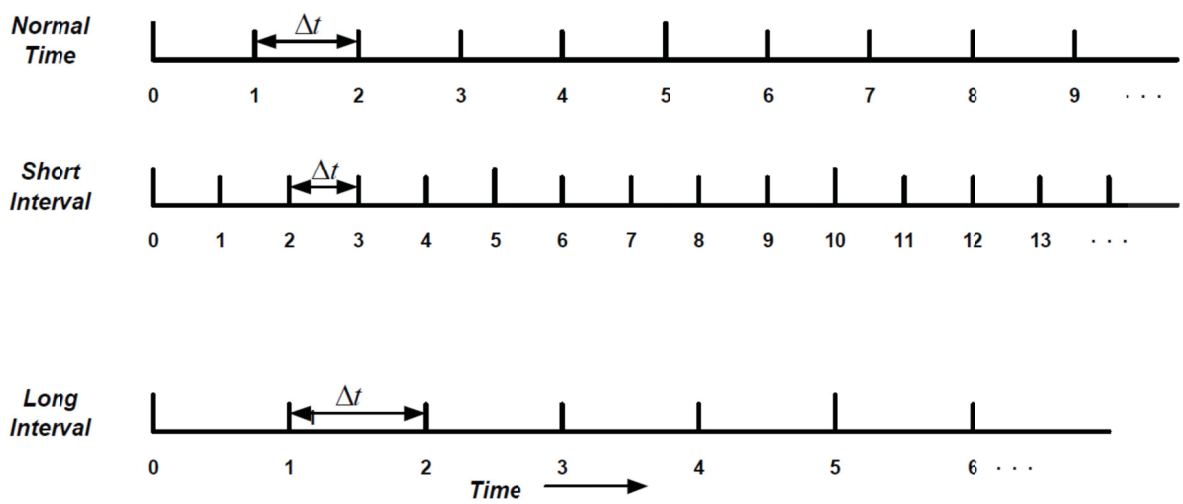
This attachment provides technical information for Section A (CA Interval Data VEE Rules) of Attachment VEE.

1.1. Prorating Time Drifted Data

Two options are provided for correcting the data when the actual number of intervals retrieved from the meter does not equal the expected number of intervals based upon the elapsed time.

1.1.1. Option 1 for Prorating Time Drifted Data

This section describes how to normalize interval data when the clock in the meter does not agree with the clock in the computer reading the meter. This phenomenon is called Clock Drift. Clock drift can be both a negative or positive value, depending upon whether the real time (at the computer) is greater than [negative drift] or less than [positive drift] than the clock in the meter. This is illustrated below.



For each of the illustrations shown above, the actual interval of measurement is different. We assume that the meter and the computer systems are synchronized at some time, T_0 {for example, the last meter read} and that the meter is now being read at a read time, T_r. For each case above, assume that the meter reading system reads at the same time. The elapsed time is given by

Elapsed Time = Te = Tr - T0

The elapsed time for the shorter interval case is given by

Short Interval Elapsed Time = ΔTes = Tms - T0

where Tms is the time that the meter clock gives when the meter is read. The elapsed time for the longer interval case is given by

Longer Interval Elapsed Time = ΔTel = Tms - T0

where Tml is the time that the meter clock gives when the meter is read. Note that Tms > T0 , i.e. the meter clock is running faster therefore clocking more intervals and more elapsed time. And that Tml < T0, i.e., the meter clock is running slower, hence fewer intervals and a shorter elapsed time.

In each case, the internal clock in the meter is registering that the interval length is the length that is specified for the meter, namely Δt or 15 minutes for CA interval meters. However, since the clock is running faster for the short interval case and slower for the long interval case, we must adjust the values such that the correct usage is obtained for each meter. The total drift time for the clock can be calculated for each case as follows:

Total Drift Time For Short Intervals TDs = |ΔTe - ΔTes| = |ΔTr - Tms|

and

Total Drift Time For Long Intervals TDl = |ΔTe - ΔTel| = |ΔTr - Tml|

Note that TDs would be negative had we not taken the absolute value. The actual number of intervals for each case can be calculated using the elapsed time measured by the meter and dividing it by the preset meter interval, Dt or 15 minutes. Or when truncated to an integer:

Expected Number of Intervals, N = ΔTe / Δt

Number of Short Intervals Ns = ΔTes / Δt

Number of Long Intervals Nl = ΔTel / Δt

Two cases are considered:

Case # 1 is when N = Ns = Nl, i.e. the clock drift is small enough that no additional interval is generated. For this situation, we could elect to do nothing since for a thirty day reading schedule for 15 minute interval data, there will be about 2880 intervals and a time drift error of less than 0.04% in each interval. The actual drift time for each interval, ignoring any fractional intervals at the end of the read period can be calculated as

ΔDTs = TDs / N and for the long interval case,

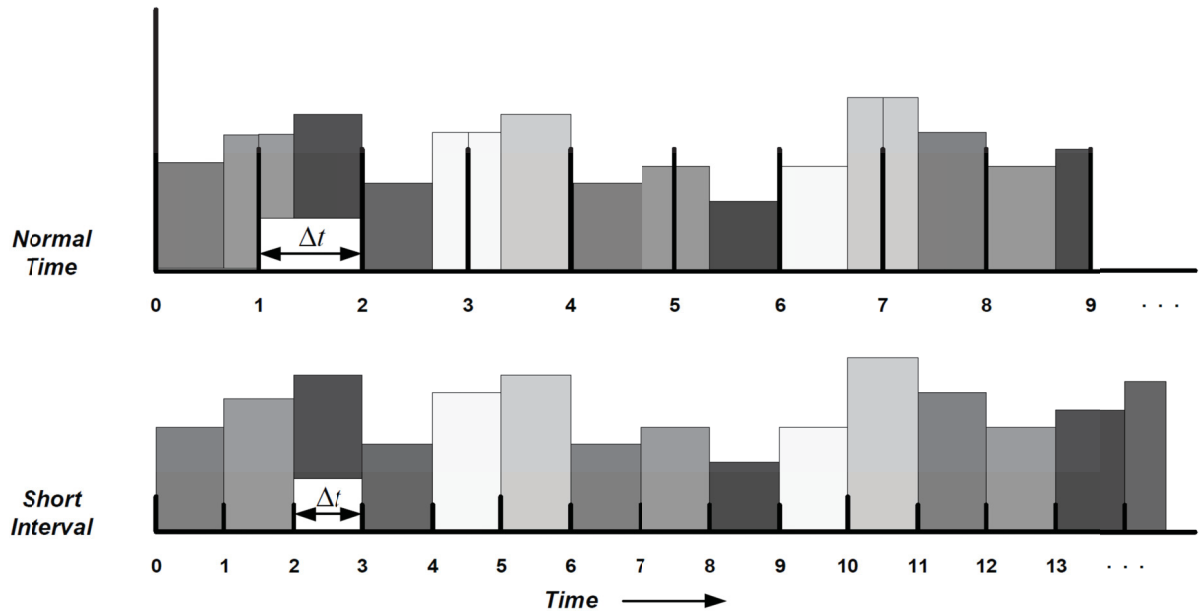
ΔDTl = TDl / N

This result could be used in combination with the actual interval width to increase or decrease the usage in the particular interval.

Case #2 involves a situation when N ≠ Ns or N ≠ Nl and hence there are a fewer or greater number of intervals that expected. Here we suggest that a procedure be adopted that distributes the measured interval values into intervals that have the correct length, namely Δt. Thus we increase or decrease the interval length to correspond to actual interval length that should have been in the meter based on the drift, Δt + ΔDTl or Δt - ΔDTs.

Thus the interval distribution that is shown in the above figure would now have proper interval lengths in minutes. The

procedure for distribution this data is fairly straightforward. We simply insert the real 15-minute interval grid on the actual interval grid taken from the meter and adjusted by the above technique. Next we divide each of the obtained usage values at the corresponding 15-minute grid points.



This figure shows how to allocate each of the respective values. For example in the first corrected interval, the usage would equal the sum of the usage in the incorrect time interval case plus the fraction to the left of the corresponding interval in the correct zone. For example, if the drift per interval was found to be 4 minutes for short interval case, then the time grid would be 0, 11, 22, 33, 44, 55, 66, 77, etc. The amount taken from the second short interval would be the usage in interval 2 multiplied by 4/11 or 34%. For the case of the third correct interval, there would be components from interval 3, 4, and 5 of the incorrect interval usage. From the third interval, it would be 3/11 of the usage, from the fourth interval it would be 100% of the usage, and from the fifth interval it would be 1/11 of the usage. This scheme should be easy to implement. The one caution is that additional manipulation of the usage data will be required if the interval values are stored as kW for the interval, rather than kWh. But this should not be a problem.

1.1.2. Option 2 for Prorating Time Drifted Data

The objective of this algorithm is to create the expected number of intervals while preserving the usage recorded in the actual number of intervals.

<u>When the Actual number > Expected Number…</u>

(1) Truncate the extra intervals.

(2) The total usage will decrease by the amount recorded in the truncated intervals. In order to preserve the recorded usage, the usage in the remaining intervals will need to be scaled up as described below.

When the Actual number < Expected Number…

(1) Interpolate using the last good interval to create the expected number of intervals.

(2) The total usage will increase by the amount in the interpolated intervals. In order to preserve the recorded usage, the usage in each interval will need to be scaled down as described below.

To scale the usage in the truncated or interpolated intervals…

(1) Calculate the recorded usage.

Recorded Usage = total usage for the period. It can be derived from the sum of the usage in the "actual" intervals or from good meter readings.

(2) Calculate the pre-scaled usage.

Pre-scaled Usage = The total usage in the intervals after they have been truncated or interpolated to the expected number of intervals.

(3) Calculate the scaling factor.

Scaling Factor = (Recorded Usage/Pre-scaled usage).

(4) Multiply the usage in each interval by the scaling factor to create corrected usage. The sum of the usage in the scaled intervals should now be equal to the recorded usage.

(5) Flag all intervals for the period as estimated.

1.2. Sum Check Failure Troubleshooting Techniques

The objective of the sum check is to compare the energy use recorded by the meter to the energy use recorded by the pulse recorder over the same time period. Due to data collection methods, often the period represented by the meter reads does not correspond exactly to the period represented by the interval data. For example, the period of data collection may span from 5/1/98 01:12 AM to 6/1/98 01:22 AM, with the meter readings corresponding exactly to this time period. With 15-minute interval data, the interval data for this same period of data collection would begin at 5/1/98 01:00 AM and end at 6/1/98 01:15 AM. The difference of 12 minutes from the start meter reading and 7 minutes from the end meter reading could be the source of error in the failure of the sum check.

1.2.1. Account for Start and End Time Differences

The following technique enables the MDMA-S

to resolve sum check failures by taking into account time differences between the meter readings and the interval data.

Redo the sum check, taking into account the differences in time between the time of the start read and the start of the first interval, and the time of the stop read and the end of the last interval:

(1) Calculate a prorated start meter reading to be used in this check by doing the following:

(a) Calculate the percentage of an interval that has elapsed between the start time of the first interval and the time of the start meter reading. For example, if the meter was read at 3:30 PM, the first interval in an hourly interval data stream would start at 3:00 PM. The percentage of time elapsed is (30 min./60 min.) = 50%.

(b) Multiply the usage from the first interval by the percentage from the previous step. For example, if the usage in

the first interval is 240 kWh, the percentage usage is (240*0.50) = 120 kWh.

(c) Determine how many meter increments are represented by the percentage usage from the previous step. For a meter multiplier of one, the usage is equal to the number of meter increments, so 120 kWh is equal to 120 meter increments. For a meter multiplier of 80, 120 kWh is equal to 1 meter increment (i.e., 120 divided by 80 and rounded down to the nearest integer).

(d) Calculate a prorated start meter reading by subtracting the number of meter increments from the previous step from the actual start meter reading. For example, if the start meter reading is 55555, and the number of meter increments is equal to 120, the prorated start meter reading would be (55555-120) = 55435.

(2) Calculate an allowable margin of error to be used in this check by doing the following:

(a) Calculate the percentage of an interval that has elapsed between the end time of the last interval and the time of the stop meter reading. For example, if the meter was read at 11:15 AM, the last interval in an hourly interval data stream would start at 11:00 AM. The percentage of time elapsed is (15 min./60 min.) = 25%.

(b) Multiply the usage from the last interval by the percentage from the previous step. For example, if the usage in the last interval is 120 kWh, the percentage usage is (120*0.25) = 30 kWh.

(c) Determine how many meter increments are represented by the percentage usage from the previous step. For a meter multiplier of one, the usage is equal to the number of meter increments, so 30 kWh is equal to 30 meter increments. For a meter multiplier of 80, 30 kWh would result in .375 meter increments.

(d) Calculate the allowable margin of error by adding 2 to the value calculated in the previous step.

(e) Redo the sum check using the prorated start and original stop meter readings and the allowable margin of error instead of the two multipliers.

1.2.2. Account for Missing or Incomplete Intervals with some metering and data collection technologies; it is possible for the meter or cumulative usage register to reflect accurate usage even when the interval data is missing or incomplete. The following technique enables the MDMA-S to resolve the sum check failure for those intervals that were successfully collected. If some intervals are missing or incomplete, redo the sum check after scaling the difference between the adjusted start read and the stop read by the percentage of good intervals:

(1) Count the number of good intervals in the data stream.

(2) Calculate the percentage of good intervals by dividing the count from the previous step by the number of intervals elapsed between start time and stop time.

(3) Multiply the percentage by the difference between the start reading and the stop reading. (Note that you may use the actual start and stop readings or the prorated start and stop readings from 1.2.1 in this step.)

(4) Compare the new difference with the sum of the usage in the good intervals. Note that the values must be in the same units for the comparison.

(5) If the difference is <= allowable margin from 1.2.1, the good intervals pass the sum check. The missing or incomplete intervals need to be estimated.

1.3. Scaling estimated data using good meter readings if start and stop meter readings are available and are known to be good, they may optionally be used to scale the estimated interval data as follows:

(1) Determine the total usage for the time period based upon the meter readings.

Total Usage = ((Stop Reading-Start Reading)*Meter Multiplier)

(2) Sum together the valid intervals.

(3) Subtract the sum of the valid intervals from the total usage to determine the total estimated usage.

Total Estimated Usage = Total Usage – Sum of Valid Intervals

(4) Sum together the previously estimated intervals.

(5) Calculate the scaling factor by dividing the total estimated usage by the sum of the estimated intervals.

Scaling Factor = Total Estimated Usage/Sum of Estimated Intervals

(6) Multiply each estimated interval by the scaling factor.

This attachment provides an example of validating and estimating usage based on previous day usage of similar customers. The text is a duplicate of the corresponding sections (Sections 3.3.2 and 4.1) in CA Monthly VEE Rules. The numbers to the left of the text correspond to the numbers on the spreadsheet at the end of the attachment.

1.3.2. Method based on previous day usage of similar customers

Note that this method requires a certain density of customer data for residential customers in the same geographic area, where weather patterns are typically consistent throughout the geographic area.

1.3.2.1. The following steps are performed at the end of each meter reading cycle day for each geographical area in order to validate and estimate usage the following day:

1.3.2.1.1. At the end of the reading day, for each good meter read (open account, billed, between 27-33 days & ADU =< 100), perform the following calculations to determine an ADU for the billing period:

1. Calculate ADU (= KWH/days in billing period)
2. Add ADU to Sum of Current ADU
3. Calculate ADU squared
4. Add ADU squared to Sum of Current ADU squared
5. Add 1 to total meters
6. Calculate last month's ADU
7. Calculate current ADU times last month's ADU
8. Calculate last month's ADU squared

1.3.2.1.2. Determine which range of usage (high, medium or low) the current ADU should be grouped with by comparing current ADU to yesterday's ADU Low and High Range Factors (Reference 3.3.2.1.3 for ADU low and high range factor calculation methodology)

1. If the current ADU is less than yesterday's ADU low range factor:
   1. Add current ADU to Sum of current low ADU
   2. Add last month's ADU to Sum of last month's low ADU

3. Add current ADU times last month's ADU to Sum of current low ADU times last month's ADU
4. Add current ADU squared to Sum of current low ADU squared
5. Add last month's ADU squared to Sum of last month's low ADU squared
6. Add 1 to total low meters

7. If the current ADU is not less than the ADU low range factor from yesterday and is less than the ADU high range factor, add the figures to the medium range following same format is in 3.3.2.1.2. Step 1.

8. Otherwise, add the current ADU to the ADU high range following the same format in 3.3.2.1.2. Step 1.

1.3.2.1.3. Calculate an aggregated ADU for current data for each geographic area

1.3.2.1.3.1. Sum together the ADU values for each geographic area

1.3.2.1.3.2. Calculate the mean for the total ADU (=Sum of Current ADU / total meters)

1.3.2.1.3.3. Calculate the standard deviation for the total

1.3.2.1.3.4. Calculate the current ADU low and high range factors:

· ADU Low Range Factor = mean -.43 Standard Deviation. If ADU Low range factor is less than the total current mean * .5, the ADU low range factor becomes the mean half.

· ADU High Range Factor = mean + .43 Standard Deviation

· NOTE: By determining the low & high factors, the Medium Range = (mean - .43 Standard Deviation) to (mean + .43 Standard Deviation)

1.3.2.1.4. For each of the three ranges determined above (low, medium, and high), calculate a percent of change of monthly usage for each geographic area.

1.3.2.1.4.1. After each meter's current billing period's (ADU) is grouped in 3 Ranges (Low, Medium, and High) as specified in

1.3.2.1.5. The following data are summed up by ADU range and area:

· Number of customers

· Sum of all last month's ADU

· Sum of all current month's ADU

· Sum of {each last month's ADU times current month's ADU}

· Sum of {all last month's ADU squared} i.e., Square all ADU, then sum them.

· Sum of {all current month's ADU squared}

From the data above modified ADU mean factors and standard deviation factors are determined for each range as follows:

<u>Modified Mean Factor:</u>

Sum of {last month ADU times current month ADU} divided by the sum of {all last month's ADU squared}

<u>Modified Standard Deviation Factor:</u>

Step 1: (Sum of {all current month's ADU squared} minus (Mean squared times sum of {all last month's ADU squared}) divided by (Total Meters minus 1).

Step 2: Take square root of Step 1

1.3.2.1.5. Calculate high and low range factors.

Calculate high and low range factors (HRF and LRF) for each of the 3 usage ranges within a geographic area. The mean is used to calculate estimated reads, and the high and low range factors are used in this validation check. 2.8 and 3.5 are used in the below example to represent the range deviation factor and will allow for an appropriate meter read error rate. This factor can be changed to control the error rate.

High Range Factor Formula:

HRF = 1 + {(2.8X Modified Standard Deviation X Number of meters) / (Sum of Current month's ADU)}

Low Range Factor Formula:

LRF = 1 - {(3.5 X Modified Standard Deviation X Number of meters) / (Sum of Current month's ADU)}

1.3.2.2. As each meter is read, perform the following using the values calculated from the previous meter reading days' data.

1.3.2.2.1. Determine the usage from the preceding billing month and the preceding billing reading for the customer and site.

1.3.2.2.2. Calculate low limit for this month's usage by multiplying the preceding month's usage by the low range factor determined above.

1.3.2.2.3. Calculate high limit for this month's usage by multiplying the preceding month's usage by the high range factor determined above.

1.3.2.2.4. If the current usage is between the low and high limit calculated in the previous two steps, the data passes the High/Low check.

1.4. Estimating Usage

1.4.2. Method 2 - Based on historical usage and similar customers

1.4.2.1. For the residential meter population (i.e., same geographic area and customer class), utilize the following determinants as determined in 3.3.2:

· ADU Low Range Factor (3.3.2.1.3.4)

· ADU High Range Factor (3.3.2.1.3.4)

· Low Range Modified Mean Factor (3.3.2.1.4.1)

· Medium Range Modified Mean Factor (3.3.2.1.4.1)

· High Range Modified Mean Factor (3.3.2.1.4.1)

1.4.2.2. Calculate the ADU from last month's billing period for that customer.

1.4.2.3. Calculate the modified ADU for a specific meter by multiplying last month's ADU (from step 4.1.2.2) by yesterday's medium range modified mean factor (above) for that geographical area.

1.4.2.4. Determine if the modified ADU is in yesterday's low, medium, or high range.

· If the modified ADU is less than the ADU low range factor, yesterday's low range modified mean factor is used to calculate estimated ADU in the succeeding steps.

· If the modified ADU is equal to or greater than ADU low range factor but less than the ADU high range factor, yesterday's medium range modified mean factor is used to calculate estimated ADU in the succeeding steps.

· If the modified ADU is greater than or equal to the ADU high range factor, yesterday's high range modified mean factor is used to calculate estimated ADU in the succeeding steps.

1.4.2.5. Multiply the prior ADU by the modified mean factor determined in 4.1.2.4. This becomes the new estimated ADU.

1.4.2.6. Continue with steps 4.1.1.2, and 4.1.1.3 using the estimated ADU calculated in the preceding step.

Spreadsheet Calculations:

# of Meters 19
# of Days in Month 30

Meter Number	Current Usage	(1) Current ADU	Last Month Usage	(3) Last Month ADU	Meter Reading	(4) Current ADU * Last Month ADU	(2) Current ADU Squared	(5) Last Month ADU Squared	(6) Range Grouping
1	125	4.17	135	4.50	3731	18.75	17.36	20.25	Low
2	275	9.17	250	8.33	7475	76.39	84.03	69.44	High
3	114	3.80	142	4.73	3697	17.99	14.44	22.40	Low
4	178	5.93	165	5.50	4888	32.63	35.20	30.25	Medium
5	254	8.47	260	8.67	7358	73.38	71.68	75.11	High
6	299	9.97	189	6.30	6835	62.79	99.33	39.69	High
7	178	5.93	190	6.33	5278	37.58	35.20	40.11	Medium
8	158	5.27	136	4.53	4176	23.88	27.74	20.55	Medium
9	165	5.50	140	4.67	4329	25.67	30.25	21.78	Medium
10	235	7.83	255	8.50	7033	66.58	61.36	72.25	High
11	218	7.27	235	7.83	6500	56.92	52.80	61.36	High
12	110	3.67	119	3.97	3286	14.54	13.44	15.73	Low
13	98	3.27	105	3.50	2912	11.43	10.67	12.25	Low
14	85	2.83	129	4.30	3117	12.18	8.03	18.49	Low
15	169	5.63	110	3.67	3913	20.66	31.73	13.44	Medium
16	200	6.67	168	5.60	5221	37.33	44.44	31.36	High
17	147	4.90	178	5.93	4688	29.07	24.01	35.20	Low
18	165	5.50	201	6.70	5281	36.85	30.25	44.89	Medium
19	180	6.00	135	4.50	4446	27	36.00	20.25	Medium
Sum	(7)	111.77		108.07		681.63	727.99	664.82	

Assume yesterday's ADU low range factor was 4.95 and the ADU high range factor was 6.4.

Mean (8) 5.88
Std Dev (9) 1.98
ADU Low Range Factor (10) 5.03
ADU High Range Factor (11) 6.73

Ranges	Low	High
Low	0	5.03
Medium	5.03	6.73 (12)
High	6.73	or higher

	13 Meters	15 Curr ADU	14 Last mo ADU	16 Curr * Last Mo ADU	18 Curr Mo sqrd	17 Last Mo ADU Sqd
Low	6	22.63	26.93	103.97	87.95	124.33
Medium	7	39.77	35.90	204.26	226.38	191.27
High	6	49.37	45.23	373.40	413.66	349.22

	19 Modified Mean	20 Mod Std Deviation	22 Low Range Factor	21 High Range Factor
Low	0.84	0.45	0.58	1.33
Medium	1.07	1.17	0.28	1.58
High	1.07	1.70	0.28	1.58

(END OF ATTACHMENT 1)

ATTACHMENT 2

Rule XX
PLUG-IN ELECTRIC VEHICLE SUBMETERING

The following terms and conditions apply to Utility, Customers, and all providers of plug-in electric vehicle (PEV) submetering services that require Utility Customer billing and usage data. PEV submetering services shall be coordinated by a Meter Data Management Agent providing PEV submetering services (MDMA-S) as defined in this document. The services to be provided by the MDMA-S may include but not be limited to data transfer, data validation, provisioning of submeter with the Utility, and request of submeter billing service on behalf of the Customer. All MDMA-S providing PEV submetering services shall be registered with the California Public Utilities Commission (CPUC). The Utility, Customer or any third party may elect to offer MDMA-S or Meter Service Provider (MSP) PEV submetering services. An existing MDMA providing Direct Access Services may serve as an MDMA-S upon additional registration with the Commission and agreement to provide the additional MDMA-S services not provided for in the MDMA role as defined in Rule 1. The MDMA-S will be responsible for sending data from the Customer PEV submeter to the Utility MDMA-S server in compliance with this Rule. The MDMA-S shall obtain authority from the Customer to provide PEV submetering services under this Rule and coordinate with the Customer and or the Customer's selected MSP to ensure that the PEV submeter is functioning and certified per this Rule. The MDMA-S will request PEV submetering billing from the Utility. The PEV submeter may be owned by the Customer or another party including a MSP. The meter must meet all requirements specified in this Rule and in documents referenced in this Rule. The MDMA-S shall also comply with all provisions of the PEV Submetering Protocol (PEVSMP) and the PEV Submetering Handbook.

If a Customer wishes to install, or have installed, a PEV Submeter and the data from the PEV Submeter will not be used for Utility billing purposes, then this Rule does not apply.

A. Eligibility for PEV Submetering

1. Who May Elect Submetering Services

All Customers, as defined in Rule 1, who have received and are being billed through a Smart Meter or an Utility approved interval meter, and have not otherwise elected to be served on a net-metered or virtual net metered rate schedule, shall be eligible to receive PEV submetering services and may elect to receive PEV submetering services.

Submeters being used for Utility billing must meet the standards defined in the PEVSMP to be eligible for this schedule.

The PEV submeters will interact with the Utility revenue services system. "Billing" options are described in Section K, Billing Service Options and Obligations.

2. Frequency

Customers may only elect to change their PEV submetering selection once every calendar year.

B. General Terms

1. Definitions

The definitions of principal terms used in this Rule are found either herein or in Electric Rule 1, Definitions. Unless otherwise stated, all references to "Customer" in this Rule will refer to a Utility Customer who has elected PEV submetering services.

The descriptive headings of the various sections of this Rule have been inserted for convenience of reference only and shall in no way define, modify or restrict any of the terms and provisions thereof.

a. EVSP: Electric Vehicle Service Provider, Per D.11-07-029, Electric Vehicle Service Providers or EVSPs are providers of electric vehicle charging services and could include owners of stand-alone electric vehicle charging spots. (D.10-07-044 at 3.)

b. MDMA-S: Meter Data Management Agent - Submetering (MDMA-S): the entity that takes raw outputs from a PEV submeter, substantiates them using CPUC approved validation, editing and estimating rules, adds corollary information needed to characterize the Customer, and makes this information available to {Utility} for billing purposes. Regardless of whether the MDMA-S, the Customer, or other third party owns the submeter, the MDMA-S is responsible for obtaining authorization from the Customer and coordinating with the Customer and/or submeter owner to ensure that the submeter complies with this Rule and that communications between the submeter and the appropriate {Utility} billing interface are established and ongoing. The MDMA-S may also submit a Submeter Service Request on behalf of the Customer if the MDMA-S provides the Utility with documented authorization from that Customer for the MDMA-S to act as the Customer's agent.

c. MSP: As defined as in Rule 1

d. Primary Meter: Utility meter which is electrically connected in series with the submeter and records the PEV Submeter loads in addition to other premise loads

e. PEV Submeter: A device electrically connected in series to the Utility Primary Meter and that is capable of reading and storing electric consumption and demand data at specified time intervals of no greater than one hour as required to bill applicable Utility tariffs. For Customers on demand-metered rate schedules, data shall be measured in 15-minute intervals for the purposes of calculating demand charge revenue. An MDMA-S, a Customer or other third party may supply a PEV Submeter. The PEV Submeter must meet all requirements of the PEVSMP.

f. Subtractive billing refers to the process through which a utility can bill Electric Vehicle usage separately from other usage

2. General Obligations of Utility

a. Non Discrimination

Utility shall discharge its responsibilities under this tariff in a neutral manner as to providers of PEV submetering services. Unless otherwise authorized by the CPUC, the Federal Energy Regulatory Commission (FERC), or the affiliate transaction rules, Utility shall not give preferential treatment to:

(1) Utility Customers either electing or not electing PEV submetering services

(2) Any MDMA-S over another MDMA-S except as provided for in this Rule with respect to providing service according to "place in line" established per this Rule.

(3) Utility Customers electing PEV submetering services from a MDMA-S or from Utility.

b. Requests for Submetering Services

Utility shall process requests for services, such as Submeter Service Requests (SMSR), in the same manner and within the same period for all MDMA-S and their respective Customers.

c. Timeliness and Due Diligence

Consistent with state law and CPUC decisions, Utility shall exercise due diligence in meeting its obligations and deadlines under this tariff so as to facilitate Customer election of PEV submetering services as quickly as possible.

d. Integration With Utility Billing

Subject to the terms of the PEV Submetering Service Agreement, and applicable tariffs, Utility will provide subtractive billing services using the Utility billing system to allow separation of PEV consumption and demand from the rest of a Customer's consumption and demand as recorded on the Primary Meter.

3. General Obligations of an MDMA-S Providing PEV Submetering Services

a. Timeliness and Due Diligence

The MDMA-S shall exercise due diligence in meeting its obligations and deadlines under this tariff so as to facilitate Customer election of PEV submetering as quickly as possible.

b. Arrangements with Direct Access (DA), Community Choice Aggregation (CCA) or Cerritos Community Aggregation (CA) Customers

Any existing billing arrangements under DA, CCA, or CA service remain in effect and are not changed by PEV submetering. An MDMA-S shall be solely responsible for having appropriate contractual or other arrangements with DA, CCA, or CA Customers and their generation service providers necessary to implement PEV submetering consistent with all applicable laws, CPUC requirements, and this tariff. Utility shall not be responsible for monitoring, reviewing, or enforcing such contracts or arrangements between MDMA-S Customers and the MDMA-S.

c. If authorized by the Customer, the MDMA-S will serve as the sole representative of the Customer in coordinating PEV submetering services with the Utility. The MDMA-S may contract with other parties such as a MSP in order to provide service to a Customer.

d. Unusual Field Conditions

The MDMA-S, working with a MSP or the Customer, is responsible for immediately reporting to the Utility any unusual field conditions with PEV Submeters that could in any way affect the safety and performance of Utility facilities connected to the PEV Submeter.

e. The MDMA-S will comply with all applicable rules and tariffs of the California Public Utilities Commission requiring the protection of the privacy of the Customer, including rules restricting the use and disclosure of the Customer's energy consumption data and other Customer specific information.

4. General Obligations of the Customer

a. Set up submeter account through SMSR

b. Establish or maintain credit for new PEV load in accordance with Rules 6 and 7

c. Ultimately responsible for payment of both primary and submetering bills

d. Authorize the release of Customer specific information beyond Section C.3.c in this Rule

e. Provide for, install and maintain a conforming PEV submeter for EV subtractive billing purposes

5. Transfer of Cost Obligations between the MDMA-S and Customers

Nothing in this tariff is intended to prevent the MDMA-S and Customers from agreeing to reallocate between them any costs for PEV submetering services that are designated in Utility's tariffs to be paid by either the MDMA-S or the Customer.

6. Utility Not Liable for Non-Utility MDMA-S Services

To the extent the Customer receives services from an MDMA-S other than Utility, Utility has no obligations to the Customer with respect to the services provided by the MDMA-S. The MDMA-S is obligated to carry out the responsibilities associated with the services provided. Utility will not perform subtraction of usage for a DA, CCA, or, CA account, which will require a MDMA-S and ESP billing data relationship. As noted elsewhere in this Rule, DA, CCA, and CA Customers may participate in PEV submetering if their generation supplier agrees to participate and signs an agreement requiring subtraction from the generation component of the bill.

7. MDMA-S Not Liable for Utility Services

The MDMA-S shall have no responsibility for the proper furnishing of subtractive billing services to the Customer by the Utility once the PEV Submeter has been successfully provisioned in the Utility billing system per this Rule and the PEVSMP. Utility is responsible for providing the Customer with the appropriate bill based on the Primary Meter and PEV Submeter usage.

8. Split Loads Not Allowed

Customers requesting PEV submetering services may not partition the electric loads of a service account between primary meter and the submeter(s). The entire load of a service account must be nominated to only one of the ESPs available to Customers.

9. Multiple MDMA-S Allowed

Customers requesting PEV submetering services may request that Utility provide subtractive billing services relating to more than one PEV Submeter using the Utility billing system. A Customer may also request that multiple MDMA-S be established as long as each MDMA-S is registered and the PEV Submeters are successfully provisioned. Each submeter shall only be associated with one Primary meter.

10. PEV Submetering: Submetering or Subtractive Estimates of Consumption and Demand

Utility will only accept Customer consumption or demand data, if applicable, directly from the MDMA-S.

11. Master Metered Customers

Individual master metered Customers who provide submetered tenant billings may participate in PEV submetering as a single account. The master metered Customer shall be solely responsible for partitioning PEV submetering consumption and demand among multiple tenants, users. Utility shall have no responsibility for partitioning of billing amounts under Rule 18 or other applicable tariffs. Rule 18 shall not apply to the PEV submetering load partitioned to multiple users who are Customers or tenants of the master metered Customer.

12. Service Fees and Other Charges

a. Service fees for the establishment and ongoing integration of PEV Submeters shall be established by Utility to fully recover the costs of the PEV Submetering Services solely from the Customers requesting subtractive billing services. These fees will be included in the appropriate Utility rate schedule(s).

b. Fees for PEV Submetering services are described in Schedule TBD.

c. Meter read or information delivery errors due to non-conforming non-Utility owned submetering equipment are the responsibility of the Customer. Utility will not automatically rebill PEV submetered accounts as a result of malfunctioning or non-conforming PEV submetering equipment. However, if the Customer or its MDMA-S wishes to facilitate a rebill of its charges due to such an error, the Utility may elect to provide this service for a fee as designated in XXXX tariff.

14. Franchise Fees And Other Charges (if applicable)

PEV Submetering Customers continue to be responsible to pay all applicable fees, surcharges and taxes as authorized by law. Any volumetric charges will be applied to the entire amount shown on the Utility Primary Meter for electricity consumption and demand. Utility shall not prorate any fees based on submetering. For Bundled Utility Customers, Utility will bill for Franchise Fees, Utility User Tax (UUT) if applicable and State Tax. If Customer is DA, CCA, or CA Service, the ESP, CCA or CA will bill for Generation Municipal Surcharge (GMS) (ESP equivalent to Franchise Fees), UUT if applicable, and State Tax. Billing of State Tax is the responsibility of the entity providing Generation.

15. Liability In Connection With PEV Submetering Services

a. In this Section, "damages" shall include all losses, harm, costs, and detriment, both direct and consequential, suffered by the Customer.

b. Utility shall not be liable to the Customer or MDMA-S for any damages caused by Utility conduct in compliance with, or as permitted by, Utility tariffs, the PEV Submetering Service Agreement and associated legal and regulatory requirements related to PEV submetering service.

c. The CPUC shall have initial jurisdiction to interpret, add, delete or modify any provision of this tariff or the PEV Submetering Service Agreement, and to resolve disputes regarding Utility performance of its obligations under Utility tariffs, the PEV Submetering Service Agreement and requirements related to PEV submetering service.

d. Utility shall not be liable to the Customer for any damages caused by the MDMA-S's failure to perform any commitment to the Customer. The MDMA-S shall not be liable to the Customer for any damages caused by Utility failure to perform any commitment to the Customer.

e. An MDMA-S is not Utility agent for any purpose. Utility shall not be liable to the Customer for any damages resulting from any acts, omissions, or representations made by the MDMA-S in connection with soliciting Customers for PEV submetering service or performing any of its functions in rendering PEV submetering service.

C. Customer Inquiries And Data Accessibility

1. Customer Inquiries

For Customers requesting information on PEV submetering, Utility shall provide basic factual information per the tariffs and may refer the Customer to the CPUC's website and to (Utility website) for additional information. Utility shall not express any opinions regarding the Customer's decision to elect or not elect PEV submetering service.

2. Customer Request To Initiate Service

To initiate submetering service, a MDMA-S must be authorized by the Customer and complete a Submeter Service Request.

3. Access to Customer Usage Data

Subject to applicable tariffs on the governance of Customer data privacy and 3rd party access, Utility will provide Customer-specific PEV submetered usage data to either the Utility Customer or a party that the Customer authorizes subject to the following provisions:

a. Except as provided in Section E, the inquiring party must have written authorization from the Customer to release such information to the inquiring party only. At the Customer's request, this authorization may also indicate if Customer information may be released to other parties as specified by the Customer.

b. Subject to Customer authorization, Utility may provide a MDMA-S with a monthly electronic statement of submetering consumption and demand, if applicable, on a schedule specified in the PEV Submetering Handbook

c. By electing to take PEV submetering service from a MDMA-S, the Customer consents to the release the PEV Submeter data to Utility as required for billing.

4. Customer Inquiries Concerning Billing-Related Issues

   a. Customer inquiries concerning Utility charges should be directed to Utility.

   b. Customer inquiries concerning the MDMA-S charges or services should be directed to the MDMA-S.

D. MDMA-S Service Establishment for Submetering Services

The MDMA-S must satisfy the following requirements before MDMA-S can provide PEV Submetering services in Utility service territory:

1. All MDMA-S providing submetering services must submit an executed standard PEV Submetering Service Agreement, Form 14-XXX.

2. The MDMA-S must represent and warrant to Utility that the MDMA-S has registered with the CPUC.

3. The MDMA-S must satisfy applicable CPUC data communication requirements, as specified in the PEVSMP.

4. All subtraction and billing transactions shall be done as specified in the PEVSMP. Other transactions not specified in the PEVSMP shall not be supported by Utility.

E. Submeter Service Request (SMSR)

1. Submeter Service Requests (SMSRs) must be submitted electronically (unless Utility has also approved of some alternative means of submittal) to Utility by the Customer's authorized MDMA-S or the Customer if it is acting as its own MDMA-S. The SMSR process described herein is used for Customer PEV submetering elections and service termination. MDMA-S providing PEV submetering services must execute the PEV Submetering Service Agreement before submitting SMSRs.

2. SMSR forms will be available through electronic means (e.g., Utility website).

3. Each MDMA-S must submit a separate SMSR. A separate SMSR is required for each Primary Meter account. A single SMSR may apply to more than one submeter assigned to a single Primary Meter.

4. SMSRs must identify the Service Account participating in PEV submetering, the billing elections for the Primary Meter usage and the PEV Submeter usage, and the PEV Submeter and data communication provisioning information. An SMSR that does not contain this information is materially incomplete.

5. Utility will provide an acknowledgment of its receipt of the SMSR to the MDMA-S within XX business day of its receipt. Utility will exercise best efforts to provide, within XX working days thereafter (and no later than XX working days), the MDMA-S and the Customer with a SMSR status notification informing them as to whether the SMSR has been accepted.

6. In accordance with the provisions of Rule 3, Utility has the right to deny the MDMA-S request for service if the information provided by the applicant is false, incomplete, or inaccurate in any material respect.

7. If a submitted SMSR complies with the SMSR requirements and the PEV Submeter is in compliance with the PEVSMP, the SMSR will be accepted and the Customer's PEV Submeter will be scheduled for integration into the Utility billing system.

8. SMSRs shall be processed on a first come, first served basis.

9. The PEV Submeter and the Utility Primary Meter shall be time synchronized for meter reads based on the Primary Meter.

10. The PEV Submeter shall have no less granular time periods than the Utility Primary Meter.

11. Customers terminating PEV submetering service will follow the same process and timing as SMSRs to establish PEV submetering service. A Customer terminating PEV submetering service will be responsible to disconnect the PEV Submeter per the time schedule detailed in the PEV Submetering Handbook.

12. Utility will have the ability to assess a charge for accepted SMSRs only, and only if such a fee is approved by the CPUC in Schedule XXX. This charge will be billed to the MDMA-S unless the Customer is requesting to terminate PEV submetering service, in which case the charge will be billed to the Customer.

13. Billing options, and metering options other than for PEV submeters, for DA, CCA, and CA Customers (including designation of a billing agent) and metering options must be requested through Rule 22 and Rule 23. DA, CCA, and CA Customers will default to their current billing option. ESPs, CCAs, and CAs are under no CPUC obligation to accommodate PEV Submeters or MDMA-S services as part of their agreement with their Customers.

G. PEV Submetering Services

1. Meter Specifications

The MDMA-S is responsible for the conformance of all PEV submeters to the meter performance standards set forth in the PEVSMP. No PEV submeter will be used by Utility for billing purposes unless it meets the requirements set forth in the PEVSMP. Any party may test its own submeter or those owned by its Customers for conformance to the meter performance standards set forth in the PEVSMP. Any party may request the other party to test its submeter. The requesting party will receive notification of the test date, and written test results from the testing party. The requesting party will have the right to witness the testing. If the submeter is found to be within the standards set forth in the PEVSMP, the requesting party shall pay the testing party for all expenses related to the test.

If a manufacturer's sealed meter has not previously been set and the meter was tested within the last year and found to comply with the PEVSMP, the meter shall be deemed in compliance with such standards without further testing. Subsequent to initial installations each meter must be tested for accuracy prior to being used again. All parties will be subject to the testing standards set forth in the PEVSMP. Records of testing shall be provided within five (5) working days of a request to any party.

2. Installation and Registration

All PEV Submeters will be installed according to the standards set forth in the PEVSMP. Upon registration, the MDMA-S will provide Utility with the results of the meter calibration test as specified in the PEVSMP.

If Utility has reason to believe a MDMA-S installation does not satisfy the standards set forth in the PEVSMP, Utility retains the right to refuse to integrate the submeter with its systems until the MDMA-S provides acceptable proof of compliance with the PEVSMP.

3. Meter Calibration and Testing

The MDMA-S shall be responsible for ensuring that all PEV Submeters are calibrated in accordance with the PEVSMP. Records of calibrations must be provided to the Utility within five (5) working days of a request.

4. Meter Reading Services

Submeter data for PEV Submetering Customers shall be read and transferred to Utility pursuant to the PEVSMP.

5. Failure to Comply With PEVSMP For PEV Submeters or PEV Submeter Services

a. Failure is defined as the circumstance wherein the apparent absence of appropriate usage data or testing, conducted by any party, reveals non-conformance with any applicable PEVSMP standard governing meters or meter services.

b. Upon the occurrence of undisputed failure, the MDMA-S responsible for the non-complying PEV submeters or Submetering service must make corrections within XX business days.

c. Failure to make corrections within XX business days will result in involuntary termination of PEV Submetering billing integration by Utility and return of the Customer to a single, non-partitioned bill, with the entire usage amount being billed at the tariffed rate assigned to the Primary Meter. In this event, Utility will notify the MDMA-S and the Customer of this action.

d. Whenever the non-Utility MDMA-S or Utility becomes aware of any non-conforming PEV Submeter, Primary Meter, or errors in the provision of meter services affecting billing, it shall immediately notify the Customer, Utility, and the MDMA-S, as applicable.

e. Bills found to be in error due to non-conforming or malfunctioning PEV Submeters or errors in PEV Submeter services are the responsibility of the Customer. The Customer remains liable for the total costs associated with electricity usage recorded on the Utility Primary Meter.

6. Charges for PEV Submetering Services

Utility may charge the Customer's MDMA-S for recovery of the costs of services in support of PEV submetering.

H. Submeter Reading Data Obligations

The requirements for Timeliness of Validated Meter Reading Data are set forth in the PEVSMP.

1. Requirements for accuracy of all PEV Submeters are set forth in the PEVSMP

a. Usage data will be deemed accurate unless otherwise indicated. Data known to be inaccurate or missing will be estimated and flagged as unavailable or corrupt. Utility will apply its meter estimation policy and practices.

b. The MDMA-S will provide an infrastructure that supports retrieval of all data currently available to an MDMA-S subtractive billing client within a XX hour window.

2. Retention and Format For Submeter Reading Data

a. Submeter reading data will remain posted on the MDMA-S server for (3) three business days and will be recoverable for at least (3) three years.

b. Meter reading data posted to the MDMA-S server will be stored in the MDMA-S data exchange format as approved by the CPUC and defined in the PEVSMP.

I. Billing Service Options and Obligations

1. Bundled Service Customers

A bundled service Customer with a Utility-Owned Primary Meter and a Non-Utility -Owned PEV Submeter may be billed where the total consumption registered to the Primary Meter, minus the Non-Utility-Owned PEV submetered usage, will be billed at an applicable Residential or Commercial rate schedule. The Non-Utility-Owned PEV Submeter usage will be billed at an applicable EV rate schedule, presented to the Customer as one Summary Bill.

2. The MDMA-S will not be separately billed unless the MDMA-S is the Customer of Record for the Primary Meter.

3. DA, CCA, and CA Customers

DA, CCA, and CA Customers that participate in PEV submetering with the agreement of their generation service providers will be billed in the same fashion as provided in the applicable rules. The billing for DA, CCA, and CA Customers will proceed as generally outlined below and per the procedures in the PEV Submetering Handbook.

a. Dual Billing

(1) MDMA-S reads meter and provides Utility with PEV Submeter data

(2) Utility subtracts the PEV Submeter kWh to determine amount to be billed to end-use Customer

(3) Utility calculates end-use Customer charges based on the subtractive kWh

(4) Utility bills end-use Customer for subtractive kWh

(5) Utility bills MDMA-S for usage associated with PEV Submeter

(6) Utility posts total usage for the Service Account (SA) as Channel 1 and usage for the PEV Submeter as Channel 2 in the data file posted electronically to the MDMA-S server for ESP retrieval

(7) ESP retrieves data file and is responsible for subtracting the value of Channel 2 from the value of Channel 1 data in order to bill the end-use Customer

(8) ESP calculates end-use ESP Customer charges based on subtractive kWh

(9) ESP bills ESP end-use Customer for subtractive kWh

b. Utility Distribution Company (UDC) Consolidated Billing

(1) Utility reads Primary Meter and MDMA-S provides Utility with PEV Submeter data.

(2) Utility calculates the Primary Meter usage and demand, if applicable, and the PEV Submeter associated usage and demand that will be billed to the Customer.

(3) Utility calculates UDC Customer Bill based on the Primary Meter and PEV Submeter kWh.

(4) Utility posts total usage for the Service Account (SA) in the data file posted electronically to the MDMA-S server for ESP retrieval.

(5) ESP calculates ESP Customer Bill based on the Primary Meter and PEV Submeter kWh.

(6) ESP submits its Customer charges to Utility for inclusion on the Utility Customer bill.

(7) Utility sends consolidated bill to the Customer.

b. ESP Consolidated Billing

(1) Utility reads the Primary Meter and MDMA-S provides Utility with PEV Submeter data

(2) Utility calculates the Primary Meter usage and demand and the PEV Submeter associated usage, and demand, if applicable that will be billed to the Customer

(3) Utility calculates UDC Customer charges based on the Primary Meter and PEV Submeter kWh

(4) Utility submits UDC charges to ESP for inclusion on ESP Customer bill

(5) Utility posts total usage for the Service Account (SA) in the data file posted electronically to the MDMA-S server for ESP retrieval

(6) ESP calculates end-use ESP Customer charges based on the Primary Meter and PEV Submeter kWh

(7) ESP sends consolidated bill to Customer

J. Payment And Collection Terms

Customer

a. The Customer of Record must remit payment in full to Utility for Utility charges due within the terms of sale as provided for in CPUC rules.

b. If the Customer disputes a Utility charge, the Customer may pursue the dispute in accordance with Rule 10 – Disputed Bills.

L. Involuntary Service Changes

1. Service Changes

The Customer who elects PEV submetering service may have their PEV submetering services terminated involuntarily in the following circumstances:

a. The MDMA-S registration has been revoked by the CPUC or in the event Utility receives a CPUC order that otherwise prohibits the MDMA-S from serving that Customer;

b. The MDMA-S has materially failed to meet its obligations under the terms of the MDMA-S Service Agreement (including applicable tariffs) and Utility exercises a contractual right to terminate the agreement, and discontinue receiving and processing data from a PEV submeter

Notices of involuntary service changes or termination in PEV Submetering will be sent to the MDMA-S and to the Customer under contract as described in this section, and to the CPUC.

2. Change of Service Election Absent Exigent Circumstances

In the event Utility finds that a MDMA-S has materially failed to meet its obligations under this tariff or PEV Submetering Service Agreement such that Utility seeks to invoke its remedies under this Section N, Utility shall notify the MDMA-S and the affected Customer of such finding in writing stating specifically:

a. The nature of the alleged non-performance;

b. The actions necessary to cure it;

c. The consequences of failure to cure it and the remedy Utility proposes to invoke in the event of a failure to cure; and

d. The name, address and telephone number of a contact person at Utility authorized to discuss resolution of the problem.

The MDMA-S shall have 30 days from receipt of such notice to cure the alleged non-performance or reach an agreement regarding it with Utility. If the problem is not cured or an agreement is not reached following this 30 day period, Utility may initiate the SMSR process set forth in this tariff to accomplish the remedy set forth in the notice; provided that Utility shall suspend the exercise of such remedy if, before the end of the cure period, the MDMA-S has filed an application with the CPUC requesting an order from the CPUC that the MDMA-S is entitled to continue the MDMA-S Service Agreement and Utility is not entitled to exercise the remedy identified in its notice. The status of the MDMA-S shall not change pending the CPUC's review of Utility's request provided that an emergency, as described in Section N.2 does not arise. Unless expressly ordered by the CPUC, these provisions do not disconnect electric service provided to the Customer. Utility's action to defer the exercise of its remedies in accordance with this section does not constitute a waiver of any rights.

5. Termination of PEV-MSP Submetering Services

Utility will terminate a MDMA-S's eligibility to provide PEV Submetering services in Utility's service territory if the MDMA-S fails to comply with industry-accepted standards approved for Utility by the CPUC for PEV Submetering services. Utility shall provide the MDMA-S with 15 days written notice prior to such termination. MDMA-S failure to comply is defined in Section G, PEV Submetering Services. The MDMA-S or the affected Customer shall have the right to seek an order from the CPUC restoring the MDMA-S's eligibility to provide PEV Submetering services.

7. Action in the Event of Termination

Upon termination of MDMA-S submetering services pursuant to this Section L, the Customer will be returned to default Utility Service without submetering services, unless the Customer has previously selected another MDMA-S under the procedures set forth in Section E. The Customer shall thereafter have the right at any time to select another MDMA-S pursuant to Section E.

M. Service Disconnections And Reconnections

1. Non-Payment of PEV Submeter Usage and Demand Charges

a. Service disconnection and reconnection shall proceed with respect to the Primary Meter. The Customer is responsible for the payment of both its main account and any separately identified submetered usage for its EV. Non-payment of submetered usage will be deemed to be non-payment of a portion of its primary account and subject the Customer to termination under the conditions of Rule 11.

b. Utility will reconnect electric service for a CPUC-authorized service fee when the criteria for reconnection, as specified in Rule 11, Discontinuance of Service, have been met.

(END OF ATTACHMENT 2)

ATTACHMENT 3

October 22, 2012

President Michael R. Peevey
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, California 94102

Re: R.09-08-009 - Joint Investor-Owned Utility (IOU) Strawman Proposal for EV Submetering for Subtractive Billing Tariff and Technical Requirements

Dear President Peevey:

We represent Coulomb Technologies, Ecotality, and Better Place, companies that manufacture electric vehicle (EV) service equipment (EVSE) and provide related services to EV users in California. As active participants in the California market, and stakeholders in the EV Rulemaking (R.09-08-009), we appreciate the Commission's ongoing efforts to encourage and support EV use. We also appreciate the Commission's leadership in establishing a regulatory structure that encourages customer choice in EV charging infrastructure, rates and services. We write to request that the Commission reject the "strawman" submetering protocol and rule recently submitted by Southern California Edison Company, Pacific Gas and Electric Company, and San Diego Gas & Electric Company (Strawman Proposal) and take immediate steps to ensure the timely implementation of a viable submetering rule for California EV users.

Background

The Commission's Phase 2 Decision (D.11-07-029) focused on establishing "policies to overcome barriers to electric vehicle deployment" for California consumers. With respect to metering, the Commission adopted goals aimed at promoting customer choice, adequate data and technological functionality, innovation and accommodating technological advances, common standards, and minimizing costs. The Phase 2 Decision was clear and unequivocal in requiring the *expeditious* development of a submeter protocol that would ensure consumer choice by supporting submeters located in EVSE, and thereby provide EV users lower cost alternatives to a costly second meter for EV charging purposes.

Following up on this instruction, the Energy Division organized a series of workshops for the exchange of information about EV submeters, and options for expeditiously implementing submetering rules and subtractive billing for the benefit of EV users. Our companies attended the workshops and provided input and comments on key issues. The IOUs asked for, and were

granted, an extension of time to submit a proposal to implement the submetering policies established in the Phase 2 Decision.

On October 1, 2012, the IOUs submitted a "Strawman tariff and submetering technical requirements document." The Joint IOUs describe their proposal as a "reasonable starting point" for developing statewide EV submetering technical and tariff requirements. The undersigned parties disagree.

The Commission should reject the IOU Strawman Proposal as unresponsive and out of compliance with the Phase 2 Decision

We write today because we are concerned that the Commission needs to provide further clarification of its intent and specific direction in order to ensure that the directives in Decision 11-07-029 regarding EV submetering are implemented without further delay by the IOUs. The Strawman Proposal submitted on October 1, 2012, after a year and a half of effort and discussion, does not address appropriate standards for EVSE submeters, does not enable billing to providers of EV services, and includes burdensome and inappropriate certification, testing and data management rules that are unnecessary for EVSE submeters. The Commission should reject the proposal as unresponsive and out of compliance with the Phase 2 Decision.

- The Strawman Proposal does NOT provide a reasonable starting point for discussion. The proposal does not include standards for embedded EVSE submeters, does not include appropriate rules for customers using EVSE submeters, and expressly prohibits separate billing to EV service providers for customer usage measured through an EVSE submeter**.**
- The IOUs' proposal is not responsive to the express mandate in the Phase 2 Decision to develop a submetering protocol and rules designed *at a minimum* to support the use of submeters *located in electric vehicle service equipment* and to accomplish other specified tasks. [1]
- The undersigned do *not* believe that the informal stakeholder process described in the IOUs' October 1st letter will be productive because the Strawman Proposal does not provide a reasonable starting point. The Commission should not accept, or require stakeholders to spend time and effort discussing, a proposal that is not compliant with the Commission's express order.

The Commission should support an alternative protocol that is more in line with the competitive market envisioned in the Phase 1 and 2 decisions and AB 631, and designed to enable consumer choice and lower costs of EV adoption

We suggest below that the Commission issue a ruling and take other appropriate action to put this proceeding back on track. EVSE submeters are designed to applicable industry standards and incorporate state-of-the-art software to enable consumers to optimize charging and provide load management benefits. Delay in implementing reasonable EV submetering rules and

[1] See D.11-07-029 at 44.

subtractive billing is unfair to customers that have invested in EVs and in EV charging stations that are designed to help them lower charging costs while minimizing impacts on the electricity grid. Delay undermines customer choice and sends the wrong message to the emerging market. It is simply unreasonable to expect consumers to wait another year or more for reasonable submetering rules, while stakeholders discuss a proposal that is fundamentally flawed.

Request for Commission Ruling

We respectfully request that the Commission issue a ruling that reaffirms the EVSE submetering and subtractive billing requirements adopted in the Phase 2 Decision, and establishes a process that will result in timely development and adoption of a reasonably simple and workable submetering protocol. Specifically, the Commission needs to clarify that:

- The submetering protocol must include appropriate standards for submeters embedded in EVSE.
- The submetering protocol must include a straightforward process for EVSE submeter certification and testing that is appropriate for the technology and purpose, and that is not unduly burdensome and expensive for EV users and EV service providers, such as a process implemented by the Bureau of Weights and Measures.
- The submetering protocol must enable customers to split bills from a single premise meter and EVSE submeter, and allow EV service providers to separately pay the submetered portion of the bill or the entire premise bill, subject to appropriate authorization by the consumer.
- The submetering protocol should include reasonable consumer safeguards, including requirements for customer authorization and indemnification, and ensure that lines of communication and dispute resolution are clear and defined.
- The submetering protocol should be framed as revisions to the IOU's existing submetering rules (or as additions to those rules) per the Commission's instruction on page 44 of the Phase 2 Decision. The rules should be tailored to the limited purpose of facilitating EV submetering and subtractive billing.

We are willing and able to provide further input to the Commission on appropriate technical performance standards and reasonable rules to accomplish EVSE submetering. We are prepared to discuss workable models for subtractive billing, but in the near term, all that is needed is a simple, straightforward line item on the bill. The Commission can use as a starting point the same consumer friendly model that it has adopted for the telephone industry, where customers are served by a local monopoly carrier and long distance from a different carrier, with the bill from the local company showing a line item for the long distance portion of the bill.

We recognize that it may be necessary to expeditiously implement interim submetering rules while exploring longer-term issues. At this point, however, Commission guidance and facilitation is needed in order to avoid further waste of time and resources, and to ensure that a workable near term approach to submetering is adopted in a timely manner.

Thank you for your consideration of this request.

Sincerely,

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(END OF ATTACHMENT 3)

ATTACHMENT 4

CPUC's Energy Division Proposal for the Development of Electric Vehicle Submetering (R.09-08-009)

March 2013

Background

D.11-07-029 required California's investor-owned utilities (IOUs) to develop a plug-in electric vehicle (PEV) submetering protocol for customer-owned submeters, and required the IOUs to submit a set of rules for submetering to the Commission by July 2012. In December 2011, the IOUs released a proposed roadmap, identifying submetering use cases and a timeline for implementing these use cases. In July 2012, the IOUs requested an extension to July 2013. This request was supported by stakeholders. IOUs and stakeholders agreed to revisions to the roadmap document and agreed that the IOUs would release a draft protocol document in October 2012. In response to the draft protocol, several parties filed letters to the CPUC that criticized the draft's approach for the timing and development of the submetering use cases and requested that CPUC intervene in the process.

In January CPUC held a workshop to clarify a path forward for electric vehicle submetering. During this workshop parties provided input on the direction of the development of the protocol, the prioritization of submetering use cases, and a phased approach for piloting submeter billing and communications. CPUC staff revised the proposal presented in January and now seek party input.

Goals of PEV Submetering

Electric vehicle submetering allows the electric vehicle to be billed off of a meter installed downstream of the primary customer meter. This is believed to be important in facilitating PEV charger installation in apartment buildings and multiple-dwelling units (MDUs). Submetering can provide the following benefits:

- Reduce metering infrastructure and billing costs for customers
- Access to PEV tariffs while maintaining other non-PEV loads on tiered rates
- Allow multiple electric vehicle service providers (EVSPs) and PEVs to operate under a single primary meter
- Maintain utility disconnection capabilities over all Customers of Record

Key Scenario Characteristics

Submetering can be characterized by two characteristics: 1) number of Customers of Record (COR) associated with a given primary meter and 2) the type of submeter.

Customer of Record (COR): The Customer of Record is defined that the entity or individual that is responsible for the usage for a given meter. The Customer of Record is legally responsible for paying for usage and is recognized as the account holder by the utility.

Types of Submeter: A submeter can either be utility grade or not. A utility grade submeter meets utility requirements for billing. The submetering protocol is intended to outline rules for utility grade submeters. A non-utility grade submeter cannot be used by the utility to measure billable loads, however, it can be used by an entity that is compensating the utility on behalf of a customer, or a customer on behalf of a PEV driver.

Four Submetering Scenarios

Based on these two characteristics, there are four submetering scenarios:

1. Single COR with no submeter
2. Single COR with a non-utility grade submeter
3. Single COR with a utility grade submeter
4. Multiple COR with a utility-grade submeter

The first scenario is a baseline case used for comparison purposes.

There are three customer types that have unique characteristics relative to submetering. Under these different customer types, the relevant actors (PEV owner, electric utility account holder, and property owner) have different relationships to one another.

Single Family Home: A single family home is a residential setting where the owner of the property is assumed to be the same as the PEV owner. Additionally, it is assumed that this individual is also the Customer of Record on the account.

Multi-Dwelling Unit (MDU): A residence within a multi-dwelling unit where the PEV owner is not the same as the property owner. While many California apartment buildings have utility metering for each unit, this customer type assumes that the PEV is not located in proximity to their unit's utility meter and that the PEV does not have the option of charging off of the account associated with the unit. The PEV is assumed to be charging off of an account held by the property owner.

Commercial Facility: A non-residential facility where the property owner, the account holder, and the PEV driver are all different actors and the PEV charging is served from a common area unassociated with any individual tenant's electricity account.

Distinctions between Customer Types	Single Family Home	Multi-Dwelling Unit	Commercial Facility
Is the Owner of the Property the same as the PEV Driver?	Yes	No	No

Is the PEV Driver the same as the Account holder where the vehicle is charging?	Yes	No	No
Is the Property Owner the Customer of Record where the vehicle is charging?	Yes	Yes	No

The four submetering scenarios apply to the following customer types:

	Single Family Home	Multi-Dwelling Unit	Commercial Facility
1. Single COR with no submeter	X	X	X
2. Single COR with non-utility grade submeter	X	X	X
3. Single COR with utility grade submeter	X	X	X
4. Multiple COR with utility grade submeter		X	X

Billing Models

EVSPs can provide submetering services under four different types of billing models. Under each of these billing models, the EVSP takes on different liability and has different responsibilities related to the utility.

Vending Machine Model: The Customer of Record bills the PEV owner for charging a PEV on their utility account. The Customer of Record retains sole liability for the bill, but is reimbursed by the PEV owner for load associated with charging on their premises. The Customer of Record may or may not separately meter the PEV load. If they do separately meter the PEV load, they could install their own metering equipment or contract an EVSP to meter the PEV load. In any of the three cases the PEV owner agrees to be billed for charging services on a rate determined by the Customer of Record. No barriers exist to using this approach, though there are opportunities for Customers of Record (landlords) to increase tenant or visitor access to PEV charging infrastructure at their premises.

Remittance Model: The EVSP meters and pays the bill associated with PEV load on behalf of the Customer of Recordby sending a payment to the utility for the Customer of Record's account. In this case a non-utility grade submeter may be used, subject to the agreement between the EVSP and the PEV owner using it. As a result, the EVSP is not liable to the utility for the bill nor do they collect billing data from the utility. The Customer of Record retains sole liability for the electric (primary) account. The Customer of Record may have an agreement with the EVSP to address liability between the two parties. No barriers exist to using this approach, though there may be opportunities for the utilities to simplify the process and make it easier to scale. The customer's load and that of their PEV would be billed according to their currently applicable tariff. The EVSP could charge whatever rate the customer agrees

to for the PEV usage. **Single Customer of Record (COR) Model:** The primary meter customer is also the Customer of Record for the submeter. The EVSP cannot be the COR in this case. The customer could apply to the Remittance Model, but the Single COR Model would allow the customer to separately meter the PEV load and bill it on a separate tariff if the customer uses a utility grade submeter. To access a separate tariff the Single COR Model requires that the metering meet utility grade billing specifications and use of a communication protocol to facilitate the reporting of submetered usage to the utility. This model avoids the complexity of having two Customers of Record. However, the entire bill is the responsibility of one customer, which may reduce the administrative complexity of billing and dispute settlement.

The Remittance Model and the Single COR Model are not mutually exclusive. The Remittance model could be used with Single COR model, using either a utility-grade or non-utility grade meter.

Multiple Customers of Record (COR) Model: Under this arrangement, the primary meter customer is not the Customer of Record for the submeter. The submeter and its load would be the responsibility of a third party (EVSP) or the PEV owner. As is the case with the Single COR Model in which a PEV load has access to a separate tariff, the Multiple COR Model also requires that the meter meet utility grade billing specifications and that the communication of meter data be standardized. Having two different CORs under the same primary meter introduces billing complexity and dispute settlement complexity.

Characteristics of Each Submeter Scenario

		Access to separate tariffing for PEV load	Bill multiple EVSPs and/or PEVs under one primary meter	Preserves Utility service disconnection functionality	COR Liable for Submeter load cost	Role of third-party EVSP
Single Customer of Record (COR)	1. No Submeter	No	Yes, but only using the Vending Machine Model	Yes	Primary Meter Account Holder	Provide equipment (Optional)
	2. Non-Utility Grade Submeter	No	Yes, but only using the Remittance Model	Yes	Primary Meter Account Holder	Provide equipment Separately track load for charging stations and/or different users
	3. Utility Grade Submeter	Yes	Yes, but only using the Remittance Model	Yes	Primary Meter Account Holder	Provide equipment Separately track load for charging stations and/or different users
Multiple Customers of Record (COR)	4. Utility Grade Submeter	Yes	Yes	No	Submeter Account Holder(s)	Provide equipment Separately track load for charging stations and/or different users Manage utility billing account for submeter load

Relationship between Scenarios and Use Cases

In December 2011, the IOUs submitted a report that outlined a set of 16 Use Cases related to submetering. These Use Cases focused on location of the submeter, the communication technology, and the billing methodology. The table below shows the relationship between these use cases and the CPUC staff scenarios.

	No Submeter	Non-utility Grade Submeter		Utility Grade Submeter	
		Single PEV or EVSP	Multiple PEV or EVSP	Single PEV or EVSP	Multiple PEV or EVSP
Single Customer of Record	Use Case #0			Use Case #1	Use Case #2 Use Case #3 Use Case #4
Multiple Customer of Record				Use Case #6	Use Case #7 Use Case #8 Use Case #9

Use Case #5: Can be applied to any of the Single COR scenarios.
Use Cases #10-16: can be applied to any of the Single COR or multiple COR scenarios

Phased Implementation of Electric Vehicle Submetering Pilot Demonstrations

To support the development of the submetering protocol, CPUC staff proposes that pilot projects be established to allow the testing of different levels of submetering complexity.

Phase 1: Single COR Pilot. During Phase 1, the utilities would test the use of Single Customer of Record submetering. Single Family Homes, Apartment Units, and Commercial Facilities would be allowed to use submetering under a Single Customer of Record.

Goals of the Phase 1 Pilot are to:

- Evaluate the demand for Single COR submetering in Single Family Homes, Apartment Units, and Commercial Facilities, and customer uptake prior to making larger investments.
- Estimate billing integration costs under different communication methods.
- Estimate communication costs. Ensure a positive Customer Experience while determining customer perceptions, estimating customer costs and benefits of Single COR submetering-enabled services, and smoothly transitioning between tariffs.

Prior to beginning Phase 1, the following issues need to be addressed:

- Develop temporary metering requirements determined by CPUC. Temporary metering requirements should include minimum performance requirements for the following data attributes: metering accuracy, data granularity, reporting frequency and logistics.
- Develop temporary data exchange requirement for EVSPs to communicate PEV meter data to utilities.
- Determine method for promoting the pilot and enrolling electric vehicle customers.
- Determine how the pilot will be funded.
- Determine what metrics will be used to determine the success of the pilot.

At the conclusion of Phase 1, the Commission will reconvene parties to evaluate the results of the first phase and determine when to move forward with the second phase and what modifications should be made to the schedule.

Phase 2: Multiple COR pilot. During Phase 2, the utilities will pilot the use of Multiple Customers of Record on a single primary meter. The pilot will be subject to a service territory limit that will be determined after the completion of the Phase 1 Pilot.

Goals of the Phase 2 Pilot are to:

- Evaluate the demand for Multiple COR in Single Family Homes, Apartment Units, and Commercial Facilities.
- Estimate billing integration costs under different communication methods.
- Estimate integration and administrative costs associated with submetering.
- Ensure a positive Customer Experience while determining customer perceptions, estimating customer costs and benefits of Multiple COR submetering-enabled services, and smoothly transitioning between tariffs.

Prior to beginning Phase 2, the following issues need to be addressed:

- Evaluate the need to incorporate standard communication protocol between IOUs and EVSPs based on national standards (if available).
- Incorporate national standards (if available) and revise temporary metering requirements of Phase 1, if necessary.
- Develop rules among IOUs, EVSPs, and Customers of Record to address billing disputes, data sharing, and settlement of liability in particular due to the inability to disconnect utility service in the event of non-payment.
- Evaluate jurisdiction over submetering certification and installer licensing.

- Evaluate the revision of Phase 1 for temporary metering requirements for Phase 2.
- Determine the role that different meter form factors, including mobile submeters, will play in the pilot.
- Evaluate risks of customer “gaming” of multiple tariffs and determine appropriate mitigations.

At the conclusion of Phase 2, the utilities will submit a submetering protocol to the Commission. The protocol will address the issues identified in the R.09-08-009 Phase 2 Decision 11-07-029.

Pilot Timeline

January 2013	Workshop
March 2013	CPUC releases revised staff proposal Parties file comments on proposal and staff questions
April- June 2013	Parties work with CPUC to address issues to be resolved prior to Phase 1
April 30, 2013	EVSPs submit temporary metering requirements for use during the Phase 1 pilot. Requirements are submitted to AFV proceeding service list.
July 1, 2013	Utilities submit Phase 1 Pilot Advice Letter to CPUC
September 2013	Phase 1 pilot begins, targeting a maximum enrolment of 500 customers in each utility
April 2014	Workshop to evaluate preliminary results from the Phase 1 Pilot and determine timeline for Phase 2 Pilot. Parties report on progress in developing submetering standards CPUC clarifies regulatory authority over submeters under Single COR and Multiple COR scenarios.
July 31, 2014	Phase 1 pilot ends
August 31, 2014	Utilities submit Phase 2 Pilot Advice Letter
September 2014	Phase 2 pilot begins, targeting a maximum enrolment of 500 customers in each utility territory.
August 2015	Phase 2 pilot ends
September 2015	Utilities submit Submetering Protocol and changes to utility Tariff Sheets to CPUC

(END OF ATTACHMENT 4)