PERMANENT STANDARDS WORKING GROUP

APPENDIX A

REQUIREMENTS FOR METER PRODUCTS USED IN DIRECT ACCESS

July 29, 1998

VOTING RESULTS: 100% AGREEMENT

For: 28	Against: 0	Abstain: 0
ABB		
Applied Metering Technologies		
California Energy Commission		
CPUC-ORA		
Cellnet		
Coalition of California Utility Employees		
E-Mon		
ENRON		
EPRI		
eT Communications		
Firstpoint		
GE		
Institute of Gas Technology / IEEE		
ITRON		
LADWP		
NERTEC		
Pacificorp		
PG&E		
Phaser		
QST (by EMS)		
SCE		
Schlumberger		
SDG&E		
Sierra Pacific Power		
So. Cal. Gas		
Southern Company		
Star Data		
TeCom		

PSWG APPENDIX A: Requirements for Meter Products Used in DA

I. TABLES OF STANDARDS

Definitions of Terms

Meter Product: A device which measures, calculates, records and/or communicates energy consumption data for the purpose of determining the financial obligation for an entity consuming energy. Shall include any optional circuit boards, devices, or modules enclosed within the meter cover.

The following Tables provide a list of standards for meter products. Table I-1 lists standards which shall be requirements for meter products used in Direct Access. Table I-2 lists standards which shall not apply to meter products used in Direct Access and therefore are not requirements.

Table I-1: Standards Required for Meter Products Used in Direct Access

Standards	Applicable for DA?	Required in CPUC's D97-12-048	DA Requirements?	Effective date	Comments
ANSI C12.1-1995, Code for Electricity Metering	Yes	Yes	Conditional "yes" as noted in Comments column	Now	To be used in conjunction with Section II below
ANSI C12.7-1993, Watt-hour Meter Socket	Yes	Yes	Conditional "yes" as noted in Comments column	Now	Applies only to socket meters
ANSI C12.8-1981 (R1997), Test Blocks and Cabinets for Installation of Self-Contained A-Based Meters	Yes	Yes	Yes	Now	
ANSI C12.9-1993, Test Switches for Transformer-rated Meters	Yes	Yes	Yes	Now	
ANSI C12.10-1997, Electromechanical Watt-hour Meters	Yes	Yes	Yes	Now	
ANSI C12.11-1987 (R1993), Instrument Transformers for Revenue Metering, 10 kV-350 kV BIL (0.6-69 kV NSV)	Yes	Yes	Yes	Now	
ANSI C12.13-1991, Electronic TOU Registers for Electricity Meters	Yes	Yes	Yes	Now	
ANSI C12.20-1998, 0.2% & 0.5% Accuracy Class Meters (approved but not yet published)	Yes	Yes	Conditional "yes" as noted in Comments column	2 years from publication date	To be used in conjunction with Section II below
ANSI C37.90.1-1989 (R1994), Surge Withstand Capability (SWC) Test	Yes	Yes	Yes	Now	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	No	Yes	Now	
ANSI C12.18-1996, Protocol Specification for ANSI Type 2 Optical Port	Yes	No	Conditional "yes" as noted in Comments column	June 1, 1999	Applies only to Type 2 Optical Port
Applicable FCC Regulations	Yes	Yes	Yes	Now	

Table I-2: Standards Not Required for Meter Products Used in Direct Access

Standards	Applicable for DA?	Required in CPUC's D97-12-048	DA Requirements	Effective date	Comments
ANSI C12.4-1984 (R1996), Mechanical Demand Registers	No	No	No	None	Obsolete technology
ANSI C12.5-1978 (R1996), Thermal Demand Meters	No	No	No	None	Obsolete technology
ANSI C12.6-1987 (R1996), Marking & Arrangement of Terminals for Phase Shifting Devices used in Metering	Yes	Yes	No	None	Not applicable in Direct Access
ANSI C12.14-1982 (R1993), Magnetic Tape Pulse Recorders for Electricity Meters	No	No	No	None	Obsolete technology
ANSI C12.15-1990, Solid State Demand Registers for Electromechanical Watt-hour Meters	No	No	No	None	Standard discontinued and replaced by C12.1 and C12.10
ANSI C12.16-1991, Solid State Electricity Meters	No	No	No	None	Standard discontinued and replaced by C12.1 and C12.20
ANSI C12.17-1991, Cartridge-Type Solid State Pulse Recorder for Electricity Metering	No	No	No	None	Obsolete technology
MTR1-96 Specification for ISO Applications (not required for all meters used in DA)	Yes	Yes	No	None	Functionally applicable only to meters connected to transmission

Table I-3 on the next page 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 of Certification Testing Requirements for Meter Products used in Direct Access. This list also shows the eight tests required to be performed in series.

Table I-3: List of Tests in ANSI C12.1 and C12.20 Standards

Tests performed in series (Sections II.1.6., II.5. & II.6.)	Descriptions of Certification Tests	ANSI C12.1	ANSI C12.20
	No Load	Test #1	Test #1
	Starting Load	Test #2	Test #2
	Load Performance	Test #3	Test #3
	Effect of Variation of Power Factor	Test #4	Test #4
	Effect of Variation of Voltage	Test #5	Test #5
	Effect of Variation of Frequency	Test #6	Test #6
	Equality of Current Circuits	Test #7	Test #7
	Internal Meter Losses	Test #8	Test #8
	Temperature Rise	Test #9	Test #9
	Effect of Register Friction	Test #10	Test #10
	Effect of Internal Heating	Test #11	Not applicable
	Effect of Polyphase Loading	Not applicable	Test #11
	Effect of Tilt	Test #12	Not applicable
	Stability of Performance	Test #13	Not applicable
	Independence of Elements	Test #14	Not applicable
✓	Insulation	Test #15	Test #12
✓	Voltage Interruptions	Test #16	Test #13
✓	Effect of High Voltage Line Surges	Test #17	Test #14
	Effect of External Magnetic Field	Test #18	Test #15
	Effect of Variation of Ambient Temperature	Test #19	Test #16
	Effect of Temporary Overloads	Test #20	Test #17
	Effect of Current Surges in Ground Conductors	Test #21	Test #18
	Effect of Superimposed Signals	Test #22	Test #19
	Effect of Voltage Variation-secondary Time Base	Test #23	Test #20
	Effect of Variation of Amb. Temp.-second. Time Base	Test #24	Test #21
✓	Electrical Fast Transient/Burst	Test #25	Test #22
	Effect of Radio Frequency Interference	Test #26	Test #23
	Radio Frequency Conducted and Radiated Emission	Test #27	Test #24
✓	Effect of Electrostatic Discharge (ESD)	Test #28	Test #25
	Effect of Storage Temperature	Test #29	Test #26
✓	Effect of Operating Temperature	Test #30	Test #27
✓	Effect of Relative Humidity	Test #31	Test #28
	Mechanical Shock	Test #32	Test #29
	Transportation Drop	Test #33	Test #30
	Mechanical Vibration	Test #34	Test #31
	Transportation Vibration	Test #35	Test #32
	Weather Simulation	Test #36	Test #33
	Salt-spray	Test #37	Test #34
	Raintightness	Test #38	Test #35
	Test #A1: Sunlight Interference	Not yet included	Not yet included
✓	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 that Meter Products used in direct access metering must comply with. These tests are extracted and modified accordingly from the Meter Data and Communication Systems (MDCS) Workshop Report, Appendix A, filed with the California Public Utilities Commission on July 25, 1997 and the Joint Parties Letter, Appendix B, filed with the CPUC on November 24, 1997. This Section shall be used in conjunction with ANSI C12.1 and C12.20 Standards to cover issues 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 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.

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.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.

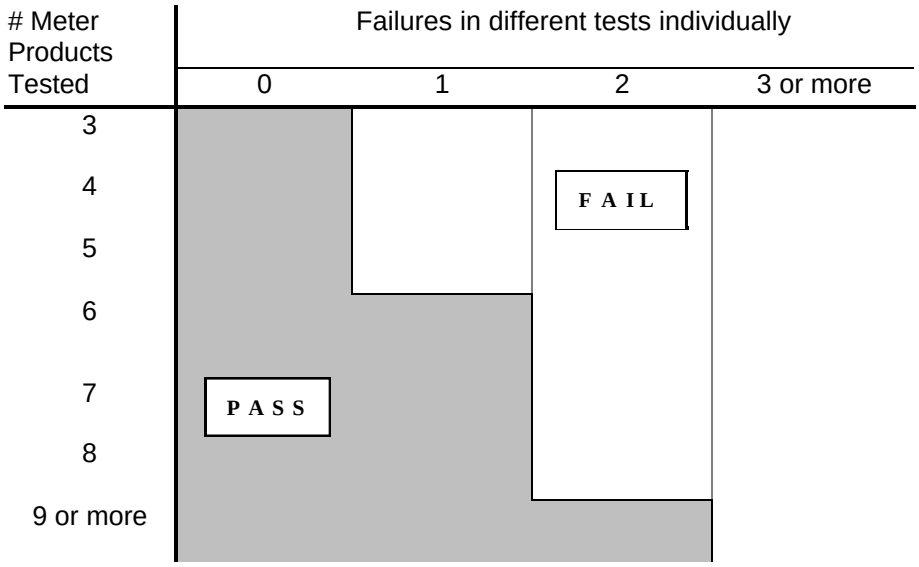
II.2.5. Failures of either hardware, firmware or software, or a combination thereof.

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



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 (not within scope of existing ANSI C12.1-1995 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, however, 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-3 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-3 above.

II.7. Test A1 - Sunlight Interference Test

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

B. The meter cover shall be removed during this test.

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

Lab Test:

D. 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.

E. 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.

F. 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.

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

Outdoor Sunlight Test:

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

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

J. 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.

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

L. 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 OF FOR DA COMPLIANT METER TYPE:

Manufacturers shall file with the CPUC their meter type self-certification document to state that their meter type meets the CPUC certification testing requirements. After the CPUC's review and approval, the CPUC will post a list of the DA-compliant meter types on a public web site. This list will not include the proprietary information of meter products.

IV. REQUIREMENTS FOR STICKERS, SEALING AND LOCKING HARDWARE:

Below are the requirements for the stickers, sealing and locking hardware used in Direct Access. Requirements for application of these devices are covered in the meter installation and maintenance section.

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. Life-support sealing hardware:

Life-support sealing hardware used for identifying a customer premise which has a life support system shall be white in color and imprinted with a red caduceus (medical symbol).

IV.3. Life-support sticker:

A life-support sticker used for identifying a customer premise which has a life support system shall be imprinted with a caduceus (medical symbol).

IV.4. 480 V sticker:

A 480 V sticker used to identify a 480 Volt service panel and meter shall be legible.

V. REQUIREMENTS FOR LABELING MANUFACTURING DATE ON NEW METER PRODUCTS:

New Meter Products shall be permanently labeled with a manufacturing date.

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 its original manufacturer or 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.

VI.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.

VI.3. Repaired Meter Product:

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