

PENNSYLVANIA
PUBLIC UTILITY COMMISSION
P.O. Box 3265, Harrisburg, PA 17105-3265

Public Meeting held March 31, 1999

Commissioners Present:

John M. Quain, Chairman
Robert K. Bloom, Vice Chairman
David W. Rolka
Nora Mead Brownell
Aaron Wilson, Jr.

**Final Adoption of the Advanced Meter
Standards Set Forth in the Advanced Meter
Standards Report Pursuant to
52 Pa. Code § 57.254(b).**

Docket No. M-00991219

FINAL ORDER

BY THE COMMISSION:

INTRODUCTION

On February 11, 1999 The Public Utility Commission (Commission) adopted a Proposed Order at this docket approving the Metering Committee Advanced Meter Standards Report. The Proposed Order and Advanced Meter Standards Report (Attachment 1) was published on March 13, 1999 in the *Pennsylvania Bulletin* at 29 Pa.B. 1458 with a 10 (ten) day comment period. The Proposed Order and the Advanced Meter Standards Report was also duly served upon all jurisdictional Electric

Distribution Companies (EDCs), Electric Competition Legislative Stakeholders and the Metering Working Group Members.

Written comments were received from Duquesne Light Company (Duquesne). Duquesne requests that the Commission recognize that 52 Pa Code §56.2 (relating to standards and billing practices) specifically excludes devices that permit “direct interrogation” of the meter from the definition of “remote reading device”. Duquesne notes that readings provided by advanced meters and meter-related devices which are capable of “direct interrogation” are in fact the actual readings and are therefore not “remote reading devices” under the definition in 52 Pa Code §56.2. Duquesne argues that such devices are not subject to the requirements of a physical reading once every five years as required by 52 Pa. Code §56.12(5)(i). The Commission concurs with Duquesne’s contention in this regard. These concepts are clearly articulated in 52 Pa Code §56.2 and 52 Pa Code §56.12(5)(i). The Commission notes that 52 Pa Code §57.255(e) (relating to EDC responsibilities regarding advanced metering) references these provisions.

Duquesne further contends that data recorded and/or communicated by a qualified Advanced Meter Product through “remote interrogation” is the same as an actual/physical reading and thus satisfies applicable regulatory requirements for obtaining actual meter readings. The Commission disagrees. The Commission believes that “remote interrogation” is not the same concept as “direct interrogation” and is therefore not

subject to the physical meter reading exclusion under 52 Pa Code §56.2 and 52 Pa Code §56.12(5)(i). The Commission emphasizes that an advanced meter or meter-related device capable of “direct interrogation” must be able to obtain a direct reading of the meter’s register without the secondary accumulation and storage of any data. An advanced meter or meter-related device not capable of “direct interrogation” will remain subject to 52 Pa Code §56.2, 52 Pa Code §56.12(5)(i) and 52 Pa Code §57.255(e) provisions.

The Commission therefore concludes that no changes in this regard are necessary to the **Advanced Meter Standards Report** since the above-referenced provisions are clearly stated in 52 Pa.Code §56.2, 52 Pa Code §56.12(5)(i) and 52 Pa Code §57.255(e). The Commission notes that 52 Pa Code §57.255(e) references 52 Pa Code §56.2 and 52 Pa Code §56.12(5)(i).

Duquesne also recommends that the words “successfully conducted in accordance with applicable standards” be added to Section III.1.4 of the **Advanced Meter Standards Report** for clarification purposes. The Commission disagrees. Section III.1.4 specifies that “no Advanced Meter Product and metering equipment shall be installed before all tests, as outlined in this section, are conducted”. The Commission concludes that this wording as agreed to by the Metering Working Group is clear.

HISTORY OF PROCEEDING

On October 16, 1998 The Public Utility Commission (Commission) adopted a revised final rulemaking order on Advanced Meter Deployment for Electricity Providers at Docket No. L-00970128, 52 Pa Code §§57.251-57.259. The regulations were published as final on December 26, 1998 in the *Pennsylvania Bulletin* at 28 Pa.B. 6302. Pursuant to 52 Pa Code §57.254(b) (relating to advanced meter standards), a qualified advanced meter, meter-related device or network shall be the customer's billing meter and shall meet the standards adopted by the Commission from time to time after consideration of the recommendations of the Metering Committee.¹

The Advanced Meter Standards Report under final consideration contains recommendations of the Metering Committee for certain standards which will govern advanced metering services in the Commonwealth of Pennsylvania. (See Attachment 1).

¹ The Metering Committee is a smaller subset of the Metering Working Group consisting of, to the extent possible, a balanced number of electric distribution companies (EDCs) and electric generation suppliers (EGSs) as well as representatives of an EDC electrical worker union, consumer and environmental representatives. The Metering Working Group is composed of seventy-six (76) stakeholders on advanced metering issues. The Metering Working Group provided proposals and comments to the Metering Committee. See Section V of the Advanced Meter Standards Report for a Membership Listing.

The recommended standards seek to maintain accuracy, performance, and safety of advanced meter services while simultaneously facilitating technical innovation. As conditions change in the future, the Metering Committee indicated that it will, after receiving input from the Metering Working Group, recommend modifications to the Commission as necessary. The Advanced Meter Standards Report supplements the standards prescribed by this Commission in 52 Pa Code §57.254.

In compliance with 52 Pa Code §57.254(b), the Metering Committee (in conjunction with the Metering Working Group) met on September 25, 1998 to hear presentations on suggested advanced meter standards from various Metering Working Group Members including Schlumberger, ITRON, ENRON, Strategic Energy Limited, CellNet Data Systems, and the Pennsylvania Electric Association . The various presentations exhibited numerous commonalties which are reflected in the Metering Committee Advanced Meter Standards Report. The Metering Working Group exchanged proposals and comments and subsequently agreed on the contents of the Advanced Meter Standards Report. The Metering Committee incorporated the proposals into its Advanced Meter Standards Report.

The Advanced Meter Standards Report is divided into five sections: I. Summary of Advanced Meter Standards; II. Table of Tests in ANSI C12.1 and C12.20; III. Certification Testing Requirements; IV. Registration and Centralized Database for Compliant Meter Type; and V. List of Metering Working Group and Metering Committee Members.

Section I summarizes the various American National Standards Institute (ANSI) Standards, the Edison Electric Institute (EEI) Metering Handbook, the National Electric Code (NEC) and local requirements, and applicable Federal Communications Commission (FCC) Regulations. This section also stresses that products and systems presently deemed used and useful by the State's utilities should be "grandfathered" for future use to avoid the prospect of premature removal of a product from service. Section II provides a checklist for various tests associated with ANSI C12 compliance. Section III describes the certification testing requirements to be met by advanced meter products used in Pennsylvania. Section IV requires manufacturers to file with the Commission a self-certification document for their type of meter which avers compliance with applicable Pennsylvania testing requirements. Section V lists the Metering Working Group and Metering Committee Membership.

The Commission concurs with the Metering Committee Advanced Meter Standards Report and hereby adopts the recommendations therein as final to establish the standards an advanced meter product must satisfy prior to its inclusion in the Advanced Meter Catalog (Catalog) pursuant to 52 Pa Code §57.253(a)(2). The Commission emphasizes that the Advanced Meter Standards Report supplements the standards already prescribed under 52 Pa Code §57.254.

The Commission therefore requires that a proposed advanced meter product must satisfactorily pass the tests in the Advanced Meter Standards Report and comply with the requirements of 52 Pa Code §57.254 prior to its inclusion in the Catalog. In order to

ensure that such testing is performed in strict accordance with the described testing criteria, an application for an advanced meter product submitted to the Commission for inclusion in the Catalog must include test results and a self-certification document regarding compliance with the Advanced Meter Standards Report and 52 Pa Code §57.254 requirements.² The Commission further directs the Metering Committee, after receiving input from the Metering Working Group, to submit recommendations, as necessary in the future, for modifications to the Advanced Meter Standards Report pursuant to 52 Pa Code §57.254(b).

Accordingly, pursuant to 52 Pa Code §57.254(b) the Commission hereby adopts the advanced meter standards set forth in the Advanced Meter Standards Report;

THEREFORE,

² The Commission notes that a Secretarial Letter adopting the Metering Committee Reference Manual on Advanced Meter Qualification and Review Procedures will be issued on or about the date of entry of this Final Order adopting the Advanced Meter Standards Report. The Reference Manual contains a self-certification application form to be completed by an interested party desiring inclusion of an advanced meter product in the Commission's Advanced Meter Catalog.

IT IS ORDERED:

1. That the Secretary shall duly certify this Final Order and Advanced Meter Standards Report and deposit with the Legislative Reference Bureau for final publication in the *Pennsylvania Bulletin*.
2. That this Final Order and Advanced Meter Standards Report shall be served forthwith upon all jurisdictional electric utilities, Electric Competition Legislative Stakeholders and Metering Working Group Members.
3. That this Final Order and Advanced Meter Standards Report shall become effective upon the date of final publication in the *Pennsylvania Bulletin*.
4. That the contact persons for this proceeding are Charles F. Covage, Bureau of Conservation, Economics and Energy Planning, (717) 783-3835 (technical) and Stephen E. Gorka, Law Bureau, (717) 772-8840 (legal).

BY THE COMMISSION:


James J. McNulty,
Secretary

(SEAL)

Order Adopted: March 31, 1999

Order Entered: APR -1 1999

ATTACHMENT 1

REPORT
TO THE PENNSYLVANIA PUBLIC UTILITY COMMISSION
ON
ADVANCED METER STANDARDS

Pursuant to 52 Pa Code §57.254(b)
Advanced Meter Deployment for Electricity Providers

APPROVED:
MARCH 31, 1999 PUBLIC MEETING

METERING COMMITTEE

JANUARY 1999

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INTRODUCTION

This report contains recommendations of the Metering Committee to the Pennsylvania Public Utility Commission (Commission) for certain standards which will govern advanced metering services in the Commonwealth of Pennsylvania.¹ The recommended standards seek to maintain accuracy, performance, and safety of advanced meter services while simultaneously facilitating technical innovation. As conditions change in the future, the Metering Committee will, after receiving input from the Metering Working Group, recommend modifications to the Commission as necessary.

The Metering Working Group met on September 25, 1998 to hear presentations on suggested advanced meter standards from various members including Schlumberger, ITRON, ENRON, Strategic Energy Limited, CellNet Data Systems, and the Pennsylvania Electric Association (PEA). The various presentations exhibited numerous commonalities which are reflected in this report. After an exchange of comments on the report between Metering Working Group Members via E-Mail, the Metering Committee agreed to incorporate these proposals into its recommendations to the Commission.

This report is divided into five sections: I. Summary of Advanced Meter Standards; II. Table of Tests in ANSIC12.1 and C12.20; III. Certification Testing Requirements; IV. Registration and Centralized Database for Compliant Meter Type; and V. List of Metering Working Group and Metering Committee members.

Section I summarizes the various American National Standards Institute (ANSI) Standards, Edison Electric Institute (EEI) Metering Handbook, National Electric Code (NEC)/ Local Requirements, and applicable Federal Communications (FCC) Regulations. The section also stresses that products and systems deemed used and useful by the State's utilities today should be "grandfathered" for use going forward in order to avoid the prospect of premature removal of a product from service. Section II provides a checklist for various tests associated with ANSI C12 compliance. Section III describes the certification testing requirements that advanced meter products used in Pennsylvania must comply with. Section IV. requires manufacturers to file with the Commission their meter type self-certification document to state compliance with applicable testing requirements. Section V lists the Metering Working Group and Metering Committee membership.

¹ The Metering Committee is a smaller subset of the Metering Working Group consisting of, to the extent possible, a balanced number of electric distribution companies (EDCs) and electric generation suppliers (EGSs) as well as representatives of an EDC electrical worker union, consumer and environmental representatives. The Metering Working Group is composed of seventy-six (76) stakeholders on advanced metering issues. The Metering Working Group provided proposals and comments to the Metering Committee. See Section V for a Membership Listing.

I. SUMMARY OF STANDARDS FOR ADVANCED METER PRODUCTS*

[Note: Use of most current version is implied unless otherwise indicated]

*** 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.

I.1 ANSI C12 Standards

I.1.1 ANSI C12.1- Code for Electricity Metering

Establishes acceptable performance criteria for new types of ac watt-hour meters, demand meters, demand registers, pulse devices, instrument transformers, and auxiliary devices. It states acceptable in-service performance levels for meters and devices used in revenue metering.

I.1.2 ANSI C12.6- Marking & Arrangement of Terminals for Phase Shifting Devices used in Metering

Applies to phase-shifting devices designed to provide the proper lagged voltages required for kvar and kva measurement.

I.1.3 ANSI C12.7- Watt-hour Meter Socket [Where applicable]

This standard covers the general requirements and pertinent dimensions applicable to watt-hour meter sockets rated up to and including 600 V and up to and including 320 continuous duty per socket opening.

I.1.4 ANSI C12.8 (R1997), Test Blocks and Cabinets for Installation of Self-Contained A-Based Meters

This standard covers the dimensions and functions of test blocks and cabinets used with self-contained A-base watt-hour meters. General requirements are specified for: spacings, temperature rise, assembly bolts, connectors, test clips, barriers, and mounting holes. Test-block dimensions and configurations, as well as test-block cabinets are also included.

I.1.5 ANSI C12.9-1993, Test Switches for Transformer-Rated Meters

This standard covers the dimensions and functions of meter test switches used with transformer-rated watt-hour meters in conjunction with instrument transformers. Some general requirements covered include: material and workmanship, name plates, moveable parts, alternate switch arrangements, insulating barriers, wiring terminals, mounting, spacings, and dimensions.

I.1.6 ANSI C12.10- Electromechanical Watt-hour Meters

Covers the physical aspects of both detachable and bottom connected watt-hour meters and associated registers. These include ratings, internal wiring arrangements, pertinent dimensions, markings, and other general specifications.

I.1.7 ANSI C12.13- Electronic TOU Registers for Electricity Meters

This standard covers electronic time-of-use registers for use in conjunction with electricity meters. It includes the following features of this register: 1) Numbers and format of displays, 2) Voltage, frequency, and temperature ratings, 3) Demand intervals, 4) Multiplying constants, 5) Timing systems, 6) Other general features, and 7) Communication requirements. Specifications for the watt-hour meter are not covered in this standard but can be found in ANSI C12.1-1988 [1] and ANSI C12.10-1987 [2]. The dates of the C12.1 and C12.10 standard are what they were when C12.13-1991 was approved. Both have been updated.

I.1.8 ANSI C12.18- Type 2 Optical Port

Details the criteria required for communications with an electronic metering device by another device via an optional port. The other device could be a handheld reader, a laptop or portable computer, a master station system, a power metering device, or some other electronic communications device. This document provides details for a complete implementation of an OSI-7 layer model. The protocol was designed to transport data in table format.

I.1.9 ANSI C12.20- 0.2% & 0.5% Accuracy Class Meters

Gives requirements for accuracy performance, under various conditions, for accuracy class 0.2 and 0.5. Standard also calls for additional testing outlined in ANSI C12.1-1995.

I.1.10 IEC 61000-4-4 Or ANSI C37.90- Fast Transient Test. [Manufacturer's Choice as to Which Standard to Apply]

Relates to the immunity requirements and test methods for electrical and electronic equipment to repetitive electrical fast transients. Additionally defines ranges of test levels and establishes test procedures. The object of this standard is to establish a common and reproducible basis for evaluating the performance of electrical and electronic equipment when subjected to repetitive fast transients (bursts), on supply, signal and control ports. The test is intended to demonstrate the immunity of electrical and electronic equipment when subjected to types of transient

disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce, etc.). The standard defines: - test voltage waveform; - range of test levels; - test equipment; - test set-up; - test procedure.

I.1.11 ANSI Z1.4- Sampling Procedures and Tables for Inspection

This standard, which corresponds to MIL-STD-105, establishes sampling plans and procedures for inspection by attributes. Its tables and procedures are completely compatible with MIL-STD-105. It is also interchangeable with BSR/ASQC Z1.9-19XX for variable inspection.

I.1.12 ANSI Z1.9- Sampling Procedures and Tables for Inspection

This standard, establishing sampling plans and procedures for inspection by variables, corresponds to the military standard MIL-STD-414 and is interchangeable with ISO/DIS 3951. It contains tables and procedures of MIL-STD-414, suitably modified to achieve correspondence with ISO/DIS 3951 and matching with MIL-STD-105 and BSR/ASQC Z1.4-19XX.

I.2 EEI Electricity Metering Handbook, Current Edition

I.3 National Electrical Code [NEC] and Local Requirements

I.4 Applicable FCC Regulations

I.5 A non-ratcheted, bi-directional meter capable of reverse operation in a net-metering application must undergo testing for accuracy measuring reverse operation, such as self-generation output, comparable to the requirements outlined in the Advanced Meter Regulations, 52 Pa Code §§57.251-57.259 and the Advanced Meter Standards Report, as they relate to forward operation.

FOOTNOTES:

1. Output Contacts if provided on a metering device shall be either Form "A" or form "C". Form "C" is required if the output contacts are mechanical. The purpose of a mechanical form "C" contact closure is to provide a means to verify the operation of the contacts by checking for "bounce" or defective closure of the switch.
2. If Instrument Transformers are utilized, ANSI C12.11 and ANSI C57.13 govern their design and use. Such transformers should comply as appropriate with these standards covering requirements for transformers, conformance and field testing of them, and the grounding of their secondaries and cases.
3. ANSI C12.19 and the pending ANSI C12.21 are considered to be premature for adoption at this time but will be considered for subsequent adoption in future years.
4. Devices and systems in use currently by any Pennsylvania utility (EDC) will continue to be valid for use for the length of their commercial life, assuming they generate the billing parameters required by the marketplace in a timely and appropriate fashion. Nothing in these standards is to be construed so as to obviate the use or procurement of existing devices and systems in the future or to create a 'technically' stranded asset.

II. TABLE OF TESTS IN ANSI C12.1 AND C12.20 STANDARDS

Table II.1 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 III of Certification Testing Requirements for Advanced Meter Products used in Pennsylvania. This list also shows the eight tests required to be performed in series.

Table II.1: List of Tests in ANSI C12.1 and C12.20 Standards

Tests performed in series (Sections III.1.6., III.5. & III.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	N/A
	Effect of Polyphase Loading	Not applicable	Test #11
	Effect of Tilt	Test #12	N/A
	Stability of Performance	Test #13	N/A
	Independence of Elements	Test #14	N/A
✓	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

III. CERTIFICATION TESTING REQUIREMENTS

This Section describes the certification testing requirements that Advanced Meter Products used in Pennsylvania must comply with. 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.

III.1 General

III.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.

III.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 Advanced Meter Products meet the certification testing requirements as stated in this section.

- III.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.
- III.1.4** No Advanced Meter Products and metering equipment shall be installed before all tests, as outlined in this section, are conducted.
- III.1.5** Advanced Meter Products selected for certification testing must be representative of production run Meter Products.
- III.1.6** The following tests shall be conducted in sequence using the same Advanced Meter Products selected as specified in III.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 Advanced Meter Products or a separate group of Advanced 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.
- III.1.7** All test Advanced Meter Products shall be kept as a certification proof for one year after the conclusion of the testing. These tests of Advanced Meter Products shall be made available during this period to any purchaser for inspection, if requested.
- III.1.8** Advanced Meter Products which fail during the test shall not be repaired or tested further, but can be analyzed to identify the cause of failure.
- III.1.9** When the Advanced Meter Products under test fail to meet these testing requirements modifications may be made to the Advanced Meter Products. After the modifications, all tests shall be restarted.

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

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

III.2. Advanced Meter Product Failure Definition

During the certification process an Advanced Meter Product shall be designated as failed if any of the following events occur :

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

III.2.2 Failure of the Advanced 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 Advanced Meter Product, and any other functions included in the Meter Product.

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

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

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

III.3 Meter Type Certification Rejection Criteria

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

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

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

# Meter Products Tested	Failures in different tests individually																											
	0	1	2	3 or more																								
3	<div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); border: 1px solid black; padding: 5px;">P A S S</div>																											
4																												
5																												
6																												
7																												
8																												
9 or more																												

Examples: The following examples explain how to apply Table III.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 III.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 Advanced 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 Advanced 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 Advanced Meter Product during one test procedure, a failure of a second Advanced 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 Advanced Meter Products have failed previously. Once such failures occur, the entire eight series tests will be started over from the beginning.

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

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

III.4 Test Setup

III.4.1 The Advanced 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.

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

III.5

ANSI C12.1 Tests

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

* 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 Advanced 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 Advanced Meter Products; however, with the understanding, however, that the same Advanced 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 III-3 above.

III.6

ANSI C12.20 Tests

All Advanced 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.

* 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 Advanced 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 Advanced Meter Products or a separate group of Advanced Meter Products; however, with the understanding that the same Advanced 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 III-3 above.

III.7 Test A1 - Sunlight Interference Test

- III.7.1** This test verifies the Advanced Meter Product accuracy and full functional operations under direct sun light.
- III.7.2** The meter cover shall be removed during this test.
- III.7.3** The Advanced Meter Product shall be exposed to both the incandescent light source (Lab Test) and sunlight (Outdoor Sunlight Test).

Lab Test:

- III.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.
- III.7.5** The Advanced Meter Product shall be exposed to the incandescent light source for a minimum of five minutes for each position of the incandescent light source.
- III.7.6** The incandescent light source shall be pointed directly toward the Advanced 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.
- III.7.7** Verify the Advanced Meter Product operations and report the direct and remote meter reads before and after each incandescent light exposure.

Outdoor Sunlight Test:

- III.7.8** The sunlight conditions shall be outdoors, clear sky, bright sunny day, and no shades over the Advanced Meter Product.
- III.7.9** The Advanced Meter Product shall be exposed to sunlight conditions for 24 hours accumulated over a two (2) to three (3) day period.
- III.7.10** The Advanced Meter Product shall be set in a position as normally installed the field. All Advanced Meter Products under test shall be exposed to the sunlight conditions at the same time and evenly face different directions starting with one Advanced Meter Product facing towards the sunrise direction.
- III.7.11** Record and compare direct and remote meter reads at every hour under the sunlight conditions.
- III.7.12** To pass this test the Advanced Meter Product shall operate as specified with no observed anomalies and have an accuracy of $\pm 0.3\%$ on both direct and remote meter reads.

IV. REGISTRATION AND CERTIFICATION DATABASE FOR COMPLIANT METER TYPE:

Manufacturers shall file with the Public Utility Commission (Commission) their meter type self-certification document to state that their meter type meets the Commission certification testing requirements. After Commission review and approval, the Commission will post a list of compliant meter types on its web site. The list will not include the proprietary information of meter products.

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