



Portland General Electric Company
121 SW Salmon Street • Portland, Oregon 97204
PortlandGeneral.com

September 1, 2010

Public Utility Commission of Oregon
Attn: Filing Center
550 Capitol Street, N.E., Suite 215
Salem, OR 97301-2551

RE: Revision to Amend Meter Test and Inspection Policy after Completion of AMI Deployment.

Enclosed for filing is the Amended Meter Testing and Inspection Policy which incorporates an updated test and inspection policy as required by Order No. 08-377. For convenience, a red-lined version is included.

This revised Meter Test and Inspection Policy establishes the meter testing program to be employed upon completion of the Advanced Metering Infrastructure (AMI) deployment by the end of this year. PGE's current plan reduced or suspended certain meter test activities during the AMI deployment since nearly all meters were being replaced in a short time period.

Should you have any questions regarding this filing, please contact me at (503) 464-7891.

Please direct all formal correspondence and requests to the following email address pge.opuc.filings@pge.com

Sincerely,

Doug Kuns
Manager, Pricing and Tariffs

Enclosures

cc: UE 189 Service List

PORTLAND GENERAL ELECTRIC ELECTRIC METERING TEST AND INSPECTION POLICY

PROCEDURES FOR MAINTAINING THE ACCURACY OF PORTLAND GENERAL ELECTRIC CO STANDARDS, STANDARDIZING EQUIPMENT, METERS AND METERING SYSTEMS

Revised June 18, 2008
Revised September 1, 2010

1. Scope

This document outlines the procedural requirements of Portland General Electric's (PGE) scheduled electric metering test and verification programs. This policy is submitted to satisfy the Electric Utility Metering Policy issued on July 20, 2000 by the Oregon public Utility Commission.

This policy revision incorporates changes reflecting PGE's OPUC-approved Advanced Metering Infrastructure (AMI) deployment program which installed new solid-state electronic meters all of which have been tested by the manufacturer prior to shipment and a fixed two-way communications system that allows the automated collection of metering data and for sending signals to the meter.

All (100%) AMI meters have been tested by the manufacturer prior to shipment, and approx 3% were additionally tested by the Company prior to deployment and installation. The installation of AMI meters began in 2008 and concluded at the end of 2010.

~~This policy revision incorporates changes reflecting PGE's OPUC approved Advanced Metering Infrastructure (AMI) deployment program which provides for the installation of new solid-state electronic meters all of which have been tested by the manufacturer and a fixed two-way communications system that allows the automated collection of metering data and for sending signals to the meter. Installation of AMI meters begins in 2008 with meter deployment to conclude in 2010. PGE will submit a revised meter test policy by September 2010 applicable to the post-deployment time period.~~

2. General

The intent of PGE's metering policies, procedures and practices is to properly apply, install and maintain meters and metering devices to ensure the accuracy of customer metering. No meter or metering device shall be placed in service, or allowed to remain in service, that has an incorrect register constant or, watt-hour constant, gear ratio, ~~or dial train~~, that is mechanically or electrically defective, incorrectly

connected, installed, or applied, or that is outside acceptable performance levels. No device shall be placed on or in a meter or metering system that could adversely affect the accuracy or performance of the meter or metering circuit.

PGE's standards, practices and procedures for maintaining the accuracy of electric meters and metering systems are based on accepted national metering and quality standards, and are maintained in compliance with applicable regulatory requirements and rules.

The company has established practices/programs for continuing surveillance of its metering systems and customer service facilities to determine and take appropriate action concerning hazards, failures and defects associated with metering systems and customer service facilities.

All company employees and company contractors who perform work associated with customer metering systems shall be trained and be alert in the normal course of their daily work to identify and report safety, security, revenue and other metering defect issues.

3. References

This document references the following documents:

- The Company's METER SERVICES PRACTICES shall be used to communicate and implement metering policies, standards and procedures internal to the company and to applicable contractors.
- ORS 757.250 and OAR 860-023-0015 shall be used as minimum legal standards for metering system compliance.
- ANSI C12.1-1995 Code for Electricity Metering shall be used as a minimum maintenance standard for accuracy performance for standardizing equipment and in-service tests and metering devices.
- ANSI/ASQC Z1.9-1993-2008 Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming shall be used as a minimum standard for sample testing.
- PGE's Oregon Electric Service Requirements booklet will be used at the minimum standard for new metering and service installations.
- Public Utility Commission of Oregon Order No. 08-245 in UE 189.

4. Definitions

- (a) Defective Meter Group – An identified homogeneous group of meters, or distinct subdivision thereof that has an unacceptable level of performance.
- (b) Homogeneous Meter Group (HMG) – A group of meters produced by the same manufacturer, having related type designation, of the same design and the same relationship of parts.
- (c) Metering System – The entire metering circuit and installation including all sensing, measuring, conversion, totalizing, registering and communication devices as well as enclosures, wiring and communication links.

- (d) NIST – National Institute of Standards and Technology, under US Dept. of Commerce.
- (e) Periodic Meter Group (PMG) – A group of metering systems tested, inspected, and verified in a specific year that are on the same test frequency in a Periodic Meter Test Program.
- (f) Uniquely Defective Meter – A meter selected for random sampling with accuracy performance characteristics greater than $\pm 5\%$ resulting from unique physical experience or unique electrical experience and is not representative of other in-service meters in its HMG.
- (g) Sample Meter Test Program – An established random pattern of testing meters belonging to a HMG whereby each meter has an equal opportunity to be selected for testing each year.
- (h) Periodic Meter Test Program – An established scheduled pattern of meter testing and site verification where each site will be selected according to a designated regular time-interval.
- (i) Company – Portland General Electric.
- (j) AMI Meter – a solid-state electronic meter which provides for two-way communications to allow the automated collection of metering data and for sending signals to the meter.

5. Watt-hour Standards and Standardizing Equipment

(a) PURPOSE:

To ensure that watt-hour measurement equipment, used to test the accuracy of billing meters, is correctly calibrated and traceable to the National Institute of Standards Technology (NIST).

(b) RESPONSIBILITY:

Portland General Electric maintains a Standards Laboratory that is responsible for the certification of all portable watt-hour standards used within PGE.

(c) SUMMARY OF METHOD:

PGE uses three Transport Primary Watt-hour Standards. Each Primary standard is shipped directly to Radian Research, Inc on an annual basis for NIST traceable certification. Request for certification is initiated by PGE and takes an average of 30 days. The three Transport Primary Watt-hour Standards are returned from Radian with applicable correction factors and certification documents. These documents are kept on file in the Standards Laboratory. The Transport Primary Watt-hour Standard is stored in a temperature-controlled room.

Portable Secondary Watt-hour Standards are certified every six months by PGE's Standards Laboratory by comparison with a Transport Primary Watt-hour Standard. "Calibration-Due" Notification is sent to the assigned personnel approximately 2 weeks before certification is due. A certified Portable Secondary Watt-hour Standard is provided to the personnel on a temporary basis until certification is complete. A certification tag is applied to the standard in a visible location, with the date and the initials of laboratory personnel who performed the certification. Certification documentation is kept in the Standards Laboratory.

Applicable correction factors are sent with the Secondary Standard. Portable watt-hour standards are replaced when they can no longer be calibrated.

6. ~~New~~ Meter Quality Assurance

(a) PURPOSE :

To assure ~~purchased meters~~ meet PGE accuracy requirements before acceptance or installation in accordance to ANSI C12.1 – 1995, by random sample testing of meter shipments.

(b) RESPONSIBILITY:

Meter Services is responsible for testing all ~~new meters~~ and meter equipment, with the exception of substation metering. The company requires 100% testing of all new meters or meters that were removed from service and returned to stock.~~purchased.~~ The meter manufacturer shall test all new single-phase and three-phase meters before being shipped to PGE. The manufacturer shall also provide certified test data for all new meters received by PGE.

(c) SAMPLING METHOD:

Sample testing of new single-phase, self-contained, non-demand meters is accomplished by randomly selecting 2 pallets from each shipment of 20 pallets received. In the case of shipments of fewer than 20 pallets, 10% of the shipment is randomly selected for testing. Testing is then done in accordance with the American National Standard Code for Electricity Metering (ANSI) C12.1 - 1995, Section 5. If none of the sample tests are outside the PGE specifications on either heavy load or light load tests, the shipment will be accepted without further testing.

~~For sample testing of new AMI meters that are replacing existing meters under the OPUC approved AMI meter deployment program¹ beginning in 2008 and continuing through December 2010, PGE will require that all (100%) new AMI meters be tested by the manufacturer prior to delivery to the Company to ensure that the meters meet or exceed the full load and light load accuracy requirements of +/- 0.3%. PGE will sample test meters using ANSI Z1.9 inspection level "General II - Normal" and AQL of 2.5% and the procedures outlined in Section B, Part II. Any inspection lot found to be outside acceptable accuracy limits will be held until repaired or recalibrated.~~

~~Sample testing of all other new meters is accomplished by selecting a sample of the shipment. The sample members are randomly selected from the shipment by the Meter Database, (MTR/2). The size of the sample will be derived from ANSI/ASQC Z1.9, Table B-3, Normal Inspection. Statistical analysis of the sample test results will follow ANSI/ASQC Z1.9, Section B, Part II.~~

¹ OPUC Order No. 08-245.

In the case of small shipments or when the meters represent new technology (~~other than AMI meters~~) or special use devices, PGE may elect to test ~~100%~~ more than 10% of the shipment.

The PGE accuracy requirement for new meters at light and full loads is as follows: ~~$\pm 0.5\%$ for induction type meters and $\pm 0.3\%$ for electronic meters.~~ Any sample test lot found to be outside acceptable accuracy limits would be held from service until repaired or recalibrated.

7. In-Service Random Sample Meter Testing

(a) PURPOSE:

The purpose of this test program is to detect inaccurate meter groups and yield statistical information on which to base future maintenance and testing.

The in-service testing program will include watt-hour meters of the following types:

Self-contained

- Single-phase non-demand
- Network non-demand
- Polyphase non-demand

(b) METHOD:

~~For the years 2008 through 2010, in-service random sample meter testing will not be performed for meters being replaced under the OPUC approved AMI meter deployment program.~~

~~Exceopt as described above, a r~~Random sample of meters will be drawn annually from each applicable Homogeneous Meter Group using PGE's Meter Asset Database, for the sample lots that are scheduled for testing. Sample lots will be created and ~~scheduled~~ tested in the following manner:

~~Meters will be grouped by PGE equipment type, manufacturer, and model having the same design and relationship of parts. All meters meeting the defined criteria will represent a lot and will be given a lot name and lot year. From this lot a random sample and alternates will be drawn. All meters in the lot will have the same chance of being selected as a sample item~~

As a general rule meters will be grouped by PGE equipment type, manufacturer, and model having the same design and relationship of parts. Exception to the rule will be large homogeneous meter group (HMG) over than 150,000 meters. Large HMG's will be divided into sub-groups no larger than 100,000 meters by serial number range. All meters meeting the defined criteria will represent a lot and will be given a lot name and lot year. From this lot a random sample and alternates will be drawn. All meters in the lot will have the same chance of being selected as a sample item.

Each group's sample size will be based on a table derived from ANSI/ASQC Z1.9-~~1993~~-2008 Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming. The statistical sampling method shall be based upon ANSI/ASQC Z1.9, Section B, Part II Double Specification Limit. An Acceptable Quality Level (AQL) is a nominal value expressed in terms of the percent of meters tested outside the specification limits. An acceptable AQL used for analysis will be 2.5 %. The Maximum Allowable Percent Defective (M) for each meter sample lot will be determined from ANSI/ASQC Z1.9, Table B-3, "Normal Inspection". Sub-lots for a single lot will not be created unless a lot fails. In the instance of a failed lot, the lot will be divided not to exceed 5% into groups sub-lots by chronological age or geographic area. ~~in blocks not to exceed 5 years during the following test year.~~ This will be done to determine and localize the failing serial number range. This sub-lot method will continue for all subsequent years until all sub-lots pass the analysis and/or the failed sub-lot(s) are removed from service.

The test results of uniquely defective meters will be excluded from the statistical analysis only if the cause of the error can be attributed to external causes or outside forces (i.e., vandalism, tampering, lightning, corrosive environment, etc).

(c) TEST RESULTS ANALYSIS:

Sample plan test results will be analyzed by a mathematical method based on ANSI/ASQC Z1.9-~~1993~~-2008. If the analysis of the sample indicates the Estimated Lot Percent Defective exceeds the Maximum Allowable Percent Defective (M), the unacceptable lot may be further subdivided by age, geographic location, or other factors that might affect accuracy. Additional samples will be drawn on any sub lot that is unacceptable. The other sub lots will require no further testing.

Those sub-lots where the Estimated Lot Percent Defective exceeds the Maximum Allowable Percent Defective (M) on the second sample test will require re-calibration or retirement within four years unless the lot fails due to meters running fast. Fast running meter lots will be removed from service at a more accelerated rate.

The company shall evaluate annually the uniquely defective meters found for each HMG during the previous year sample-testing program. The evaluation will recognize meters with design or manufacturing deficiencies that demonstrate an excessive number of premature failures or are developing a history of poor performance.

8. In-Service Periodic Meter Testing

(a) PURPOSE:

The purpose of this testing and verification program is to identify and correct inaccurate and defective metering systems. Additionally, this program is to detect inaccurate meter groups and yield statistical information on which to base future maintenance and testing.

This in-service program includes watt-hour and demand meters that are self-contained and instrument transformer rated meters equipped with demand registers, including multi-function demand.

(c) METHOD:

~~For the years 2008 through 2010, in-service periodic meter testing will not be performed for meters being replaced under the OPUC approved AMI meter deployment program.~~

~~Except as described above, M~~meters and metering systems covered under this test program will be tested and inspected at minimum of 12-year intervals in accordance with ANSI C12.1-1995. Large Commercial/Industrial customers served by substation metering will receive annual meter testing and inspection. Commercial/Industrial customers that have an average load greater than 1 Mw will receive bi-annual meter testing and inspection. The meters on services with an average load between 500 kW and 1 Mw will be tested and inspected every 5 years. Meters will be divided into groups based on PGE equipment type and manufacturer.

An acceptable meter shall be defined as one that yields an as-found average accuracy of

100 ± 2 percent. ANSI C12.1-1995, Method 1, will be the basis of calculations for weighted percent registration.

All meters with an error greater than ± 5 % in as-found testing will be declared uniquely defective and removed from service. The test results of these meters will be excluded from the statistical analysis only if the cause of the error can be attributed to external causes or outside forces (i.e., vandalism, tampering, lightning, corrosive environment, etc).

9. Metering Transformers

(a) PURPOSE:

To ensure that metering transformers are accurate in accordance to ANSI C12.1-1995 and ANSI C57.13.

(b) RESPONSIBILITY:

Meter Services is responsible for testing Current and Voltage transformers that are used for revenue metering. Only personnel who have thorough practical and theoretical knowledge and adequate training in the use of transformers shall conduct the tests. Transformer test equipment accuracy will be traceable to National Institute of Standards Technology (NIST).

(c) SUMMARY OF METHOD:

The company requires 100% testing of all transformers, new or returned from service. New transformers will have certified test results from the manufacturer and will be sample tested for quality assurance. The sample will be 10% for all

secondary transformers with no less than 4 transformers of any lot to be tested. New primary metering transformers will be 100% tested when received.

(d) TESTING:

Shop Tests will comply with ANSI C12.1-1995, SECTIONS: 5.3.2.1 and 5.3.2.2. Metering Transformers will be 0.3 accuracy or better. Transformers that fail ANSI tests will be retired or returned to the manufacturer.

- ANSI C12.1-1995: 5.3.2.1---Pre-installation Test
- ANSI C12.1-1995: 5.3.2.2---Transformers Removed from Service

Field Testing will comply with ANSI C12.1-1995, SECTION: 5.3.3.2, 5.3.3.3, and 5.3.3.4. These tests will be performed at each meter test. If a transformer fails these tests they will be removed from service as soon as possible and tested in the shop.

- ANSI C12.1-1995: 5.3.3.2---In-Service Inspection
- ANSI C12.1-1995: 5.3.3.3---Heavy Burden Test
- ANSI C12.1-1995: 5.3.3.4---Secondary Voltage Test

10. Testing and Verification Methods

(a) RESPONSIBILITY:

Meter Services is responsible for operating, maintaining, and revising as necessary this metering test and verification program. Meter Services, or an approved contractor for PGE, will perform the tests and verifications (in-field and in-shop) on selected metering systems and record results.

(b) TESTING:

Meters may be field tested or removed and brought back to the Meter Shop for testing. Meter covers shall not be removed prior to an as-found meter test, if possible. The meter tester shall handle meters with care during testing. Watt-hour tests are performed at 100 percent of nameplate test current (FL) and 10 percent of nameplate test current (LL) in accordance with ANSI C12.1-1995.

An acceptable meter shall be defined as one that yields an as-found average accuracy of 100 ± 2 percent. ANSI C12.1-1995, Method 1, will be the basis of calculations for weighted average percent registration.

(c) CALIBRATION:

Mechanical meters shall be adjusted if the as-found average deviation of watt-hour meter test results exceed ± 1 %.

When adjusted, meters shall be re-calibrated to within a ± 0.5 % error tolerance at full and light load.

(d) VERIFICATION:

Meter system verifications will be performed on all metering installations when tested; this includes periodic and sample tests along with new, transformer service installations 90 days after the service was energized. The purpose of the

verification is to assure the correctness of the meter installation and associated records, it will include the following when applicable:

- A. Meter testing
- B. Demand register testing
- C. Correctness of meter application
- D. Meter loading
- E. Correctness of billing constant (i.e., multiplier)
- F. Correctness of wiring
- G. Condition of wiring
- H. Current transformer sizing
- I. Quality and ratio of instrument transformers(verify nameplate data)
- J. Current transformer burden tests
- K. Voltage measurements
- L. Current measurements
- M. Phase angle test
- N. Instantaneous power factor measurements
- O. Security of the metering system and components
- P. Accessibility of the meter and other metering devices
- Q. Safety of the metering system and site
- R. Safety and condition of the electric distribution system
- S. Current diversion
- T. Revenue implications (i.e., customer under-billing or over-billing)

11. Security and Revenue Protection

PGE will maintain documented procedures to insure and verify the physical security and safety of metering installations through: training of personal, control of sealing and locking devices, and installation of seals and locking devices for meter system security and integrity. Additional controls will be used for meter information technology security. Password protections will be maintained for programmable meters to prevent unauthorized adjustment, programming or data acquisition.

Revenue validation and protection programs will include training of field and billing personnel and high/low energy usage audits designed to trigger consumption investigations. Qualified personnel are assigned the responsibility to investigate field conditions that may have loss of revenue implications.

12. Electric Service Requirements

Specific applications of the Electric Utility Service Equipment Requirements Committee (EUSERC) manual are described in the PGE's, Oregon Electric Service Requirements booklet. This publication provides an important element in ensuring proper metering installations.

13. Record Keeping

Records will be maintained for all laboratory and field test standards by serial number. Records for standards will be maintained for the life of the equipment plus five years. Test records will be maintained for all meters and auxiliary transformers for the life of the equipment plus one year. All energy diversion investigations will be recorded and records will be maintained for five years.

14. Annual Metering Management Review

PGE will annually evaluate the currency of its metering policies, practices and procedures with updated national and state regulations, standards and guidelines. PGE will maintain a documented management review program to ensure compliance with OPUC regulations and established company policies and directives.

15. Annual Report and Certification to OPUC

Meter Services will submit an annual certification report to the Commission as set out in Section S of the OPUC's Electric utility Metering Policy. Included in the report are:

- A. Meter group descriptions
- B. Number of meters in the group
- C. Number of meters tested per group
- D. Mean of the as-found Average Accuracy for each group
- E. Standard deviation of the as-found Average Accuracy for each group
- F. High/low range of the as-found Average Accuracy for each group
- G. Percentage above/below 100 ± 2 % Average Accuracy for each group
- H. Number of meters uniquely defective per HMG group listed by cause and analysis of defects
- I. Proposed action for future testing and maintenance based on test results
- J. Meter Audit failures listed by cause and analysis of defects for PMG's
- K. Nonconformance Revenue Implications
- L. The number of qualified personnel employed by PGE
- M. Executive Summary of Annual Metering Management Review

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PROCEDURES FOR MAINTAINING THE ACCURACY OF PORTLAND GENERAL ELECTRIC CO STANDARDS, STANDARDIZING EQUIPMENT, METERS AND METERING SYSTEMS

Revised September 1, 2010

1. Scope

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All (100%) AMI meters have been tested by the manufacturer prior to shipment, and approx 3% were additionally tested by the Company prior to deployment and installation. The installation of AMI meters began in 2008 and concluded at the end of 2010.

2. General

The intent of PGE's metering policies, procedures and practices is to properly apply, install and maintain meters and metering devices to ensure the accuracy of customer metering. No meter or metering device shall be placed in service, or allowed to remain in service, that has an incorrect register constant or watt-hour constant, that is mechanically or electrically defective, incorrectly connected, installed, or applied, or that is outside acceptable performance levels. No device shall be placed on or in a meter or metering system that could adversely affect the accuracy or performance of the meter or metering circuit.

PGE's standards, practices and procedures for maintaining the accuracy of electric meters and metering systems are based on accepted national metering and quality standards, and are maintained in compliance with applicable regulatory requirements and rules.

The company has established practices/programs for continuing surveillance of its metering systems and customer service facilities to determine and take appropriate action concerning hazards, failures and defects associated with metering systems and customer service facilities.

All company employees and company contractors who perform work associated with customer metering systems shall be trained and be alert in the normal course of their daily work to identify and report safety, security, revenue and other metering defect issues.

3. References

This document references the following documents:

- The Company's METER SERVICES PRACTICES shall be used to communicate and implement metering policies, standards and procedures internal to the company and to applicable contractors.
- ORS 757.250 and OAR 860-023-0015 shall be used as minimum legal standards for metering system compliance.
- ANSI C12.1-1995 Code for Electricity Metering shall be used as a minimum maintenance standard for accuracy performance for standardizing equipment and in-service tests and metering devices.
- ANSI/ASQC Z1.9-2008 Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming shall be used as a minimum standard for sample testing.
- PGE's Oregon Electric Service Requirements booklet will be used at the minimum standard for new metering and service installations.
- Public Utility Commission of Oregon Order No. 08-245 in UE 189.

4. Definitions

- (a) Defective Meter Group – An identified homogeneous group of meters, or distinct subdivision thereof that has an unacceptable level of performance.
- (b) Homogeneous Meter Group (HMG) – A group of meters produced by the same manufacturer, having related type designation, of the same design and the same relationship of parts.
- (c) Metering System – The entire metering circuit and installation including all sensing, measuring, conversion, totalizing, registering and communication devices as well as enclosures, wiring and communication links.
- (d) NIST – National Institute of Standards and Technology, under US Dept. of Commerce.
- (e) Periodic Meter Group (PMG) – A group of metering systems tested, inspected, and verified in a specific year that are on the same test frequency in a Periodic Meter Test Program.
- (f) Uniquely Defective Meter – A meter selected for random sampling with accuracy performance characteristics greater than $\pm 5\%$ resulting from unique physical experience or unique electrical experience and is not representative of other in-service meters in its HMG.

- (g) Sample Meter Test Program – An established random pattern of testing meters belonging to a HMG whereby each meter has an equal opportunity to be selected for testing each year.
- (h) Periodic Meter Test Program – An established scheduled pattern of meter testing and site verification where each site will be selected according to a designated regular time-interval.
- (i) Company – Portland General Electric.
- (j) AMI Meter – a solid-state electronic meter which provides for two-way communications to allow the automated collection of metering data and for sending signals to the meter.

5. Watt-hour Standards and Standardizing Equipment

- (a) **PURPOSE:**

To ensure that watt-hour measurement equipment, used to test the accuracy of billing meters, is correctly calibrated and traceable to the National Institute of Standards Technology (NIST).
- (b) **RESPONSIBILITY:**

Portland General Electric maintains a Standards Laboratory that is responsible for the certification of all portable watt-hour standards used within PGE.
- (c) **SUMMARY OF METHOD:**

PGE uses three Transport Primary Watt-hour Standards. Each Primary standard is shipped directly to Radian Research, Inc on an annual basis for NIST traceable certification. Request for certification is initiated by PGE and takes an average of 30 days. The three Transport Primary Watt-hour Standards are returned from Radian with applicable correction factors and certification documents. These documents are kept on file in the Standards Laboratory. The Transport Primary Watt-hour Standard is stored in a temperature-controlled room.

Portable Secondary Watt-hour Standards are certified every six months by PGE's Standards Laboratory by comparison with a Transport Primary Watt-hour Standard. "Calibration-Due" Notification is sent to the assigned personnel approximately 2 weeks before certification is due. A certified Portable Secondary Watt-hour Standard is provided to the personnel on a temporary basis until certification is complete. A certification tag is applied to the standard in a visible location, with the date and the initials of laboratory personnel who performed the certification. Certification documentation is kept in the Standards Laboratory. Applicable correction factors are sent with the Secondary Standard. Portable watt-hour standards are replaced when they can no longer be calibrated.

6. Meter Quality Assurance

(a) PURPOSE :

To assure meters meet PGE accuracy requirements before acceptance or installation in accordance to ANSI C12.1 – 1995.

(b) RESPONSIBILITY:

Meter Services is responsible for testing all meters and meter equipment, with the exception of substation metering. The company requires 100% testing of all new meters or meters that were removed from service and returned to stock. The meter manufacturer shall test all new single-phase and three-phase meters before being shipped to PGE. The manufacturer shall also provide certified test data for all new meters received by PGE.

(c) SAMPLING METHOD:

Sample testing of new single-phase, self-contained, non-demand meters is accomplished by randomly selecting 2 pallets from each shipment of 20 pallets received. In the case of shipments of fewer than 20 pallets, 10% of the shipment is randomly selected for testing. Testing is then done in accordance with the American National Standard Code for Electricity Metering (ANSI) C12.1 - 1995, Section 5. If none of the sample tests are outside the PGE specifications on either heavy load or light load tests, the shipment will be accepted without further testing

In the case of small shipments or when the meters represent new technology or special use devices, PGE may elect to test more than 10% of the shipment.

The PGE accuracy requirement for new meters at light and full loads is as follows $\pm 0.3\%$ for electronic meters. Any sample test lot found to be outside acceptable accuracy limits would be held from service until repaired or recalibrated.

7. In-Service Random Sample Meter Testing

(a) PURPOSE:

The purpose of this test program is to detect inaccurate meter groups and yield statistical information on which to base future maintenance and testing.

The in-service testing program will include watt-hour meters of the following types:

Self-contained

- Single-phase non-demand
- Network non-demand
- Polyphase non-demand

(b) METHOD:

Random sample of meters will be drawn annually from each applicable Homogeneous Meter Group using PGE's Meter Asset Database, for the sample lots that are scheduled for testing. Sample lots will be created and tested in the following manner:

As a general rule meters will be grouped by PGE equipment type, manufacturer, and model having the same design and relationship of parts. Exception to the rule will be large homogeneous meter group (HMG) over than 150,000 meters. Large HMG's will be divided into sub-groups no larger than 100,000 meters by serial number range. All meters meeting the defined criteria will represent a lot and will be given a lot name and lot year. From this lot a random sample and alternates will be drawn. All meters in the lot will have the same chance of being selected as a sample item.

Each group's sample size will be based on a table derived from ANSI/ASQC Z1.9-2008 Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming. The statistical sampling method shall be based upon ANSI/ASQC Z1.9, Section B, Part II Double Specification Limit. An Acceptable Quality Level (AQL) is a nominal value expressed in terms of the percent of meters tested outside the specification limits. An acceptable AQL used for analysis will be 2.5 %. The Maximum Allowable Percent Defective (M) for each meter sample lot will be determined from ANSI/ASQC Z1.9, Table B-3, "Normal Inspection". Sub-lots for a single lot will not be created unless a lot fails. In the instance of a failed lot, the lot will be divided not to exceed 5% into sub-lots by chronological age or geographic area. This will be done to determine and localize the failing serial number range. This sub-lot method will continue for all subsequent years until all sub-lots pass the analysis and/or the failed sub-lot(s) are removed from service.

The test results of uniquely defective meters will be excluded from the statistical analysis only if the cause of the error can be attributed to external causes or outside forces (i.e., vandalism, tampering, lightning, corrosive environment, etc).

(c) TEST RESULTS ANALYSIS:

Sample plan test results will be analyzed by a mathematical method based on ANSI/ASQC Z1.9-2008. If the analysis of the sample indicates the Estimated Lot Percent Defective exceeds the Maximum Allowable Percent Defective (M), the unacceptable lot may be further subdivided by age, geographic location, or other factors that might affect accuracy. Additional samples will be drawn on any sub lot that is unacceptable. The other sub lots will require no further testing.

Those sub-lots where the Estimated Lot Percent Defective exceeds the Maximum Allowable Percent Defective (M) on the second sample test will require re-calibration or retirement within four years unless the lot fails due to meters running fast. Fast running meter lots will be removed from service at a more accelerated rate.

The company shall evaluate annually the uniquely defective meters found for each HMG during the previous year sample-testing program. The evaluation will recognize meters with design or manufacturing deficiencies that demonstrate an excessive number of premature failures or are developing a history of poor performance.

8. In-Service Periodic Meter Testing

(a) PURPOSE:

The purpose of this testing and verification program is to identify and correct inaccurate and defective metering systems. Additionally, this program is to detect inaccurate meter groups and yield statistical information on which to base future maintenance and testing.

This in-service program includes watt-hour and demand meters that are self-contained and instrument transformer rated meters equipped with demand registers, including multi-function demand.

(c) METHOD:

Meters and metering systems covered under this test program will be tested and inspected at minimum of 12-year intervals in accordance with ANSI C12.1-1995. Large Commercial/Industrial customers served by substation metering will receive annual meter testing and inspection. Commercial/Industrial customers that have an average load greater than 1 Mw will receive bi-annual meter testing and inspection. The meters on services with an average load between 500 kW and 1 Mw will be tested and inspected every 5 years. Meters will be divided into groups based on PGE equipment type and manufacturer.

An acceptable meter shall be defined as one that yields an as-found average accuracy of 100 ± 2 percent. ANSI C12.1-1995, Method 1, will be the basis of calculations for weighted percent registration.

All meters with an error greater than ± 5 % in as-found testing will be declared uniquely defective and removed from service. The test results of these meters will be excluded from the statistical analysis only if the cause of the error can be attributed to external causes or outside forces (i.e., vandalism, tampering, lightning, corrosive environment, etc).

9. Metering Transformers

(a) PURPOSE:

To ensure that metering transformers are accurate in accordance to ANSI C12.1-1995 and ANSI C57.13.

(b) RESPONSIBILITY:

Meter Services is responsible for testing Current and Voltage transformers that are used for revenue metering. Only personnel who have thorough practical and

theoretical knowledge and adequate training in the use of transformers shall conduct the tests. Transformer test equipment accuracy will be traceable to National Institute of Standards Technology (NIST).

(c) SUMMARY OF METHOD:

The company requires 100% testing of all transformers, new or returned from service. New transformers will have certified test results from the manufacturer and will be sample tested for quality assurance. The sample will be 10% for all secondary transformers with no less than 4 transformers of any lot to be tested. New primary metering transformers will be 100% tested when received.

(d) TESTING:

Shop Tests will comply with ANSI C12.1-1995, SECTIONS: 5.3.2.1 and 5.3.2.2. Metering Transformers will be 0.3 accuracy or better. Transformers that fail ANSI tests will be retired or returned to the manufacturer.

- ANSI C12.1-1995: 5.3.2.1---Pre-installation Test
- ANSI C12.1-1995: 5.3.2.2---Transformers Removed from Service

Field Testing will comply with ANSI C12.1-1995, SECTION: 5.3.3.2, 5.3.3.3, and 5.3.3.4. These tests will be preformed at each meter test. If a transformer fails these tests they will be removed from service as soon as possible and tested in the shop.

- ANSI C12.1-1995: 5.3.3.2---In-Service Inspection
- ANSI C12.1-1995: 5.3.3.3---Heavy Burden Test
- ANSI C12.1-1995: 5.3.3.4---Secondary Voltage Test

10. Testing and Verification Methods

(a) RESPONSIBILITY:

Meter Services is responsible for operating, maintaining, and revising as necessary this metering test and verification program. Meter Services, or an approved contractor for PGE, will perform the tests and verifications (in-field and in-shop) on selected metering systems and record results.

(b) TESTING:

Meters may be field tested or removed and brought back to the Meter Shop for testing. Meter covers shall not be removed prior to an as-found meter test, if possible. The meter tester shall handle meters with care during testing. Watt-hour tests are performed at 100 percent of nameplate test current (FL) and 10 percent of nameplate test current (LL) in accordance with ANSI C12.1-1995.

An acceptable meter shall be defined as one that yields an as-found average accuracy of 100 ± 2 percent. ANSI C12.1-1995, Method 1, will be the basis of calculations for weighted average percent registration.

(c) CALIBRATION:

Mechanical meters shall be adjusted if the as-found average deviation of watt-hour meter test results exceed $\pm 1\%$.

When adjusted, meters shall be re-calibrated to within a $\pm 0.5\%$ error tolerance at full and light load.

(d) VERIFICATION:

Meter system verifications will be performed on all metering installations when tested; this includes periodic and sample tests along with new, transformer service installations 90 days after the service was energized. The purpose of the verification is to assure the correctness of the meter installation and associated records, it will include the following when applicable:

- A. Meter testing
- B. Demand register testing
- C. Correctness of meter application
- D. Meter loading
- E. Correctness of billing constant (i.e., multiplier)
- F. Correctness of wiring
- G. Condition of wiring
- H. Current transformer sizing
- I. Quality and ratio of instrument transformers(verify nameplate data)
- J. Current transformer burden tests
- K. Voltage measurements
- L. Current measurements
- M. Phase angle test
- N. Instantaneous power factor measurements
- O. Security of the metering system and components
- P. Accessibility of the meter and other metering devices
- Q. Safety of the metering system and site
- R. Safety and condition of the electric distribution system
- S. Current diversion
- T. Revenue implications (i.e., customer under-billing or over-billing)

11. Security and Revenue Protection

PGE will maintain documented procedures to insure and verify the physical security and safety of metering installations through: training of personal, control of sealing and locking devices, and installation of seals and locking devices for meter system security and integrity. Additional controls will be used for meter information technology security. Password protections will be maintained for programmable meters to prevent unauthorized adjustment, programming or data acquisition.

Revenue validation and protection programs will include training of field and billing personnel and high/low energy usage audits designed to trigger consumption

investigations. Qualified personnel are assigned the responsibility to investigate field conditions that may have loss of revenue implications.

12. Electric Service Requirements

Specific applications of the Electric Utility Service Equipment Requirements Committee (EUSERC) manual are described in the PGE's, Oregon Electric Service Requirements booklet. This publication provides an important element in ensuring proper metering installations.

13. Record Keeping

Records will be maintained for all laboratory and field test standards by serial number. Records for standards will be maintained for the life of the equipment plus five years. Test records will be maintained for all meters and auxiliary transformers for the life of the equipment plus one year. All energy diversion investigations will be recorded and records will be maintained for five years.

14. Annual Metering Management Review

PGE will annually evaluate the currency of its metering policies, practices and procedures with updated national and state regulations, standards and guidelines. PGE will maintain a documented management review program to ensure compliance with OPUC regulations and established company policies and directives.

15. Annual Report and Certification to OPUC

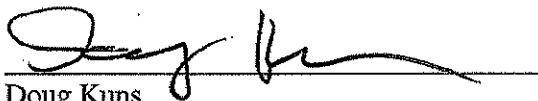
Meter Services will submit an annual certification report to the Commission as set out in Section S of the OPUC's Electric utility Metering Policy. Included in the report are:

- A. Meter group descriptions
- B. Number of meters in the group
- C. Number of meters tested per group
- D. Mean of the as-found Average Accuracy for each group
- E. Standard deviation of the as-found Average Accuracy for each group
- F. High/low range of the as-found Average Accuracy for each group
- G. Percentage above/below 100 ± 2 % Average Accuracy for each group
- H. Number of meters uniquely defective per HMG group listed by cause and analysis of defects
- I. Proposed action for future testing and maintenance based on test results
- J. Meter Audit failures listed by cause and analysis of defects for PMG's
- K. Nonconformance Revenue Implications
- L. The number of qualified personnel employed by PGE
- M. Executive Summary of Annual Metering Management Review

CERTIFICATE OF SERVICE

I hereby certify that I have this day caused **PORTLAND GENERAL ELECTRIC COMPANY'S REVISION TO AMEND METER TEST AND INSPECTION POLICY AFTER COMPLETION OF AMI DEPLOYMENT** to be served by electronic mail to those parties whose email addresses appear on the attached service list, and by First Class US Mail, postage prepaid and properly addressed, to those parties on the attached service list who have not waived paper service from OPUC Docket No. UE 189.

Dated this 1st day of September, 2010.

A handwritten signature in black ink, appearing to read 'Doug Kuns', written over a horizontal line.

Doug Kuns
Manager, Pricing & Tariffs
On behalf of Portland General Electric Company

SERVICE LIST

OPUC DOCKET NOS. UE 189

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