JACKSON ENERGY COOPERATIVE

A Touchstone Energy Cooperative

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McKee, Kentucky 40447
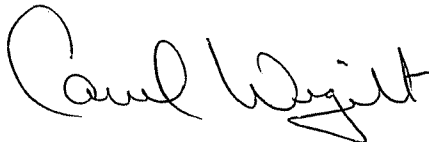Telephone (606) 364-1000 ● Fax (606 364-1007)

May 4, 2012

Director of Engineering
Kentucky Public Service Commission
211 Sower Blvd.
PO Box 615
Frankfort, KY 40602-0615

Re: Jackson Energy Cooperative: Sample Meter Testing Plan

Jackson Energy Cooperative respectfully submits a revised Sample Meter Testing Plan.

Please inform me if any further information is required.

Sincerely,

Carol Wright
Chief Operations Officer

RECEIVED

MAY -7 2012

PUBLIC SERVICE
COMMISSION

Jackson Energy   *Working for You*

Jackson Energy Cooperative

Sample Meter Testing Plan

Revised May 1, 2012

I. **New Metering Device Tests**

1. New metering devices will be either 100% tested by Jackson Energy Cooperative or 100% tested by the manufacturer.

2. New meters tested by the manufacturer will be sample tested by Jackson Energy Cooperative prior to being placed in service.

3. Jackson Energy Cooperative shall obtain a watt-hour reference standard from each meter manufacturer that supplies them with meters, and performs the required testing of those meters, and send it to a certified testing facility for annual testing.

4. Jackson Energy Cooperative will provide certified test results, of all new meters received, to the Commission upon request.

5. National Institute of Standards and Technology comparison test results will be provided from all manufacturers that are performing 100 percent testing as well as traceability charts.

II **Standards for In-Service Performance of Watt-hour Meters and Electronic Registers**

    A. Purpose

        1. This section shall establish accuracy limits, test plans and inspection procedures for alternating-current revenue watt-hour meters.

        2. Watt-hour meters placed into service or returned to service shall meet the provisions set forth in this Section of the plan.

3. All watt-hour meters and their associated equipment shall be thoroughly inspected at the time of installation to assure safe and accurate operation.

B. <u>Accuracy Requirements</u>

    1. <u>Testing Equipment and Standards</u>

        a. All working electronic watt-hour standards when regularly used shall be compared with a master standard annually. Working watt-hour standards infrequently used shall be compared with a master standard before they are used.

        b. All working indicating instruments that affect the customer's quality of service shall be checked against master indicating instruments annually. If the working instrument is found appreciably in error at zero, or in error by more than one (1) percent of indication at commonly used scale deflections, it shall be adjusted. A calibration record shall be maintained for each instrument showing all pertinent data and name of the person performing tests.

    2. <u>Test Loads</u>

Full load test shall be at approximately 100% of test amperes at unity power factor, light load test at approximately 10% of test amperes at unity power factor and power factor test at approximately 100% of test amperes at 50% lagging power factor. For meters used with current transformers, full load shall be

approximately 100% of either meter test amperes or the secondary current rating of the current transformers, light load shall be approximately 10% of the selected full load current.

3. Acceptable Performance

The performance of all in-service watt-hour meters is considered to be acceptable when the percent of registration is not less than 98% or more than 102% as determined in paragraph D(5) of this section.

4. Adjustment limits

Watt-hour meters shall be adjusted when the error in registration exceeds 1% at either light load test or full load test, or when the error in registration exceeds 2% at the power factor test.

5. Acceptable Performance for Electronic Registers

The performance of a watt-hour meter with an electronic register, when tested for other than kilowatt-hour registration, shall be acceptable when the error measured does not exceed plus or minus 2% of the reading.

C. Tests

1. As-found Tests

As-found tests are performed to determine the watt-hour meter accuracy before recalibration.

2. As-left Tests

As-left tests shall be conducted after all adjustments are completed and are in accordance with paragraph B(3) in this section.

D.   Performance Tests

1.   General

The performance of watt-hour meters will be verified by an annual test program such as one of the plans listed below. Records shall be maintained on each watt-hour meter tested. Subsequently, an analysis of the test results for each group of watt-hour meters shall be made and appropriate action shall be taken. The plans for testing are:

a.   Periodic Interval Plan

b.   Statistical Sampling Plan

2.   Objectives

The primary purpose of testing is to provide information on which Jackson Energy Cooperative may base a program to maintain meters in an acceptable degree of accuracy throughout their service life.

3.   Test Plans

The Periodic Interval Plan is a schedule of testing for watt-hour meters at various set intervals. The Statistical Sampling Plan provides for the division of watt-hour meters into homogeneous groups. The annual selection process is random, where each watt-

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hour meter within each group has an equal chance of being selected for testing.

a.   Periodic Interval Plan

The selected periodic interval for testing a watt-hour meter depends on the size of the service, complexity of the metering system, reliability of the type of watt-hour meter and/or manufacturer's recommendations. The plan listed below is a detailed periodic testing schedule by watt-hour meter and attachments:

b.   Statistical Sampling Plan

The Statistical Sampling Plan used will conform to
accepted principles of statistical sampling based on either
variables or attributes methods. Meters shall be divided
into homogeneous groups, or lots. Meter lot composition
will be based on manufacturer and model, assuming like
design and construction, with individual lot population not
to exceed 15,000 meters. For meter model populations of
like design exceeding 15,000 units, multiple lots will be
established, with meter age determining lot composition.
For example, the first 15,000 meters purchased will
comprise Lot #1, the second 15,000 meters purchased will
comprise Lot #2, etc. This process will continue until the
meter model population is exhausted. Jackson Energy
Cooperative will have the option of using a smaller lot
composition.

The number of meters to be selected in a Sample Test shall
be based on the American National Standard ANSI/ASQC
Z1.9-1993. The performance of the meters will also be
based on criteria within this standard.

The minimum quantity of meters pulled will be based on
Inspection Level II, AQL = 1.0 (Attachment No. 1) and
Table B-3 (attachment No. 2) for new meters tested by the

manufacturer. For meters that are in-service, the minimum quantity of meters pulled will be based on Inspection Level II, AQL = 2.5 (Attachment No. 1) and Table B-3 (attachment No. 2).

Lot performance shall be deemed acceptable if the full load performance of the meters within the lot meet the acceptability criteria of the ANSI/ASQC Z1.9-1993 based on an upper limit of 102% and a lower limit 98% using Table B-3 (Attachment No. 2).

Jackson Energy Cooperative must replace or test all meters in a failed test group within 18 months of the annual report to the Commission. If this requirement should pose an operational hardship on Jackson Energy Cooperative, then Jackson Energy Cooperative will file a request for deviation.

4. <u>Test Records</u>

The data to be recorded for the sample tests shall include:

(a) the number of meters in each group at the beginning of the test year

(b) the number of meters tested

(c) the analyzed test results

5. <u>Determination of Billing Accuracy</u>

The percentage registration of a watt-hour meter is, in general, different at light loads than at full loads, and may have still other values at other loads. The determination of the average percentage of a watt-hour meter involves the characteristics of the meter and the loading. The accuracy of meters is more closely associated with the Full Load (FL) test accuracy for most loads since the Light Load (LL) accuracy is only representative of the meter's performance at very small load conditions.

Average percentage registration is the average of the percentage registration at Light Load (LL) and at Full Load (FL):

Percentage Registration = (FL + LL)/2

III   Mechanical and Thermal Demand Registers and Pulse Recorders

A.   Accuracy Requirements

1.   Acceptable Performance

The performance of a mechanical or lagged demand register shall be acceptable when the error in demand registration does not exceed plus or minus 4% in terms of full-scale value when tested at any point between 50% and 100% of full-scale.

Under usual operating conditions, the performance of a pulse recording device shall be acceptable when the kilowatt-hours

calculated from the pulse count do not differ by more than 2% from the corresponding kilowatt-hour meter registration.

2.   Test Points

Mechanical or lagged demand registers should be tested at load points or above 50% of full scale.

3.   Adjustment Limits

When a test of a mechanical or lagged demand register indicates that the error in registration exceeds that specified in paragraph A(1) in this section, the demand register shall be adjusted to within plus or minus 2% of the full scale value.

B.   Instrument Transformers (Magnetic)

1.   Pre-installation Tests

Prior to installation, all new instrument transformers shall be tested for voltage withstand, ratio correction factor, and phase angle. The tests shall be performed in accordance with the criteria established in IEEE C57.13.

2.   Instrument Transformers Removed from Service

Instrument transformers removed from service will continue to be tested before they are retired or returned to service.

TABLE A-1
AQL Conversion Table

For specified AQL values falling within these ranges.	Use this AQL value
– to 0.109	0.10
0.110 to 0.164	0.15
0.165 to 0.279	0.25
0.280 to 0.439	0.40
0.440 to 0.669	0.65
0.700 to 1.09	1.0
1.10 to 1.64	1.5
1.65 to 2.79	2.5
2.80 to 4.39	4.0
4.40 to 6.99	6.5
7.00 to 10.9	10.0

TABLE A-2 [2]
Sample Size Code Letters [1]

Lot Size	Special S3 S4	General I II III
2 to 8	B B	B B C
9 to 15	B B	B B D
16 to 25	B B	B C E
26 to 50	B B	C D F
51 to 90	B B	D E G
91 to 150	B C	E F H
151 to 280	B D	F G I
281 to 400	C E	G H J
401 to 500	C E	G I J
501 to 1,200	D F	H J K
1,201 to 3,200	E G	I K L
3,201 to 10,000	F H	J L M
10,001 to 35,000	G I	K M N
35,001 to 150,000	H J	L N P
150,001 to 500,000	H K	M P P
500,001 and over	H K	N P P

[1] Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

[2] The theory governing inspection by variables depends on the properties of the normal distribution and. therefore. this method of inspection is only applicable when there is reason to believe that the frequency distribution is normal.

Table B-3

Standard Deviation Method

Master Table for Normal and Tightened Inspection for Plans Based on Variability Unknown (Double Specification Limit and Form 2—Single Specification Limit)

Sample size code letter	Sample size	Acceptable Quality Levels (normal inspection)											
		T	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00
		M	M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69
C	4	↓	↓	↓	↓	↓	↓	1.49	5.46	10.88	16.41	22.84	29.43
D	5	↓	↓	↓	↓	0.041	1.34	3.33	5.82	9.80	14.37	20.19	26.55
E	7	↓	0.005	0.087	0.421	1.05	2.13	3.54	5.34	8.40	12.19	17.34	23.30
F	10	0.077	0.179	0.349	0.714	1.27	2.14	3.27	4.72	7.26	10.53	15.17	20.73
G	15	0.186	0.311	0.491	0.839	1.33	2.09	3.06	4.32	6.55	9.48	13.74	18.97
H	20	0.228	0.356	0.531	0.864	1.33	2.03	2.93	4.10	6.18	8.95	13.01	18.07
I	25	0.250	0.378	0.551	0.874	1.32	2.00	2.86	3.97	5.98	8.65	12.60	17.55
J	35	0.253	0.373	0.534	0.833	1.24	1.87	2.66	3.70	5.58	8.11	11.89	16.67
K	50	0.243	0.355	0.503	0.778	1.16	1.73	2.47	3.44	5.21	7.61	11.23	15.87
L	75	0.225	0.326	0.461	0.711	1.06	1.59	2.27	3.17	4.83	7.10	10.58	15.07
M	100	0.218	0.315	0.444	0.684	1.02	1.52	2.18	3.06	4.67	6.88	10.29	14.71
N	150	0.202	0.292	0.412	0.636	0.946	1.42	2.05	2.88	4.42	6.56	9.86	14.18
P	200	0.204	0.294	0.414	0.637	0.945	1.42	2.04	2.86	4.39	6.52	9.80	14.11
		.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	
		Acceptable Quality Levels (tightened inspection)											

All AQL values are in percent nonconforming. T denotes plan used exclusively on tightened inspection and provides symbol for identification of appropriate OC curve.

↓ Use first sampling plan below arrow; that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.