

# Grayson Rural Electric Cooperative Corporation

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March 4, 2009

Mr. Jeff Derouen, Executive Director  
Kentucky Public Service Commission  
P. O. Box 615  
Frankfort, KY 40602-0615

RECEIVED  
MAR 5 2009  
PUBLIC SERVICE  
COMMISSION

RE: Request for Deviation from  
807 KAR 5:041, Section 15 (3)

Dear Mr. Derouen:

2009-00103

Please find the attached request to allow Grayson Rural Electric Cooperative to begin a sample meter testing program. The program will follow all rules and regulations indicated in KAR 5:041 E, Section 16.

The statistical methods in American National Standard ANSI/ASQC Z1.9-2003 (Sampling Procedures and Tables for Inspection) will be used to analyze the test results. Future testing levels will be determined from this methodology.

A sample meter test program will allow our cooperative to reduce operational costs with no sacrifice of meter testing accuracy or integrity. Along with our fully-automated meter reading program, this sample test program will further improve our revenue metering efficiency.

Sincerely,

GRAYSON RURAL ELECTRIC  
COOPERATIVE CORPORATION



Carol Hall Fraley  
President

CHG/bcg

Enclosure

Cc: Randy Blevins, Manager of Power Use and Metering

**REQUEST TO ADOPT SAMPLE TESTING  
METHOD FOR GRAYSON RURAL  
ELECTRIC COOPERATIVE  
CORPORATION'S SINGLE-PHASE  
METERS**

**Grayson Rural Electric Cooperative Corporation  
Grayson, Kentucky**

**Prepared by  
James D. Bridges, P.E.  
Distribution System Solutions, Inc.  
Walton, Kentucky**

**February 6, 2009**

## **PROPOSAL FOR SINGLE-PHASE SAMPLE METER TESTING**

### **INTRODUCTION**

Grayson Rural Electric Cooperative Corporation (GRECC) is an electric distribution cooperative located in northeastern Kentucky. GRECC is presently on schedule with its eight-year meter testing program. Since 2004, GRECC has been fully automated in single-phase meter reading. By adopting a sample meter testing program, GRECC will take another significant step towards maximizing efficiency in the single-phase meter reading and testing area of their operation. It is the purpose of this proposal to demonstrate the methods used and the cost savings achieved in sample testing.

### **RULES AND REGULATIONS**

Kentucky Public Service Commission (PSC) rules and regulations outline the required method and techniques of sample meter testing. GRECC will comply with **PSC KAR 5.041E, Section 16** when implementing its sample meter testing program.

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*Section 16. Sample Testing of Single Phase Meters. A utility desiring to adopt a scientific sample meter testing plan for single phase meters shall submit its application to the commission for approval. Upon approval the sample testing plan may be followed in lieu of the periodic test prescribed in Section 15(3) of this administrative regulation. The plan shall include the following:*

*(1) Meters shall be divided into separate groups to recognize differences in operating characteristics due to changes in design, taking into consideration date of manufacture and serial number.*

*(2) The sampling procedure shall be based upon accepted statistical principles.*

*(3) The same sampling procedure shall be applied to each group.*

*(4) Each utility authorized to test meters by sample meter testing plan shall comply with the following conditions:*

*(a) The number of meters in addition to the sample shall be taken from those meters in each group longest in service since last test unless a particular meter type is known to be increasing the percentage of meters requiring test for the sample group. In such a case where a particular meter type is increasing the percentage of meters requiring test in any group, these meters may be selected first regardless of test date with any additional tests as required for that group coming from those in that group longest in service since last test. Each year the utility shall use the following table to determine the percentage of the total meters in each group to be tested.*

<i>Percentage of Meters Within Limits of 2% Fast or Slow (Indicated by Sample)</i>		<i>Percentage of Meters to be Tested the Next Year</i>
99.0	100.0	2
98.0	98.9	4
97.0	97.9	6
96.0	96.9	8
95.0	95.9	10
93.0	94.9	12
91.0	92.9	14
Less than	91.0	16

*(b) Provided, however, that no meter shall remain in service without periodic test for a period longer than twenty-five (25) years.*

*(5) Whenever a meter is found to be more than two (2) percent fast or slow, refunds or back billing shall be made for the period during which the meter error is known to have existed or if not known for one-half (1/2) the elapsed time since the last test but in no case to exceed three (3) years. This provision shall apply only when sample testing of single phase meters has been approved by the commission and utilized by the utility.*

**PROCEDURE**

As shown in the table below, meters will be divided into various **test groups** based upon manufacturer and type. Similar meters may be further divided by serial number break points.

**METER GROUPS**

<b>Group</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Population</b>	<b>Sample</b>
1	ABB	AB1	1,627	33
2	Schlumberger	C1S	4,452	89
3	GE	I210	100	2
4	Landis & Gyr	MX	9,068	181
5	Landis & Gyr	MS	45	1

The statistical meter sample testing will follow *American National Standard ANSI/ASQC Z1.9-2003(Sampling Procedures and Tables for Inspection)*.

Each test group will be randomly sampled by a computerized process. The GRECC billing computer system will be used for this process.

Part A7. Sample Selection, from the above standard, states that **Inspection Level II** shall be used for the discrimination level. Unless otherwise required by the PSC, this level will be in effect for the GRECC program.

The **Acceptance Quality Level (AQL)** is defined as the quality level that is the worst tolerable product average when a continuing series of lots is submitted for acceptance sampling.

Due to the  $\pm 2\%$  limits, the sample groups shall be tested using an AQL of 2.5. This value can be found in Table A-1.

Newly installed meters will be added to the proper group and will be eligible for sample testing the following year. New meters from a different manufacturer or with different characteristics/features will require the formation of a new group. As new meters are purchased in lots, a sample test group will be established just for the new meter testing. An AQL of 1.0 will apply to the new meter testing.

ANSI/ASQ Z1.9-2003

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
0.670	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 6.69	6.5
7.00	to 10.9	10.0

*Table A-2<sup>1</sup>*  
**Sample Size Code Letters<sup>2</sup>**

Lot Size	Inspection Levels				
	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

<sup>1</sup>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.

<sup>2</sup>Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

Randomly selected meters (lot) from each group will be sent the meter shop. All non-registering meters will be replaced by another random selection. The meters will be tested under full load, light load and 50% power factor.

For each lot, calculations will be based on the Double Specification Limit Variability Unknown-Standard Deviation Method.

Full Load test results will be evaluated. **Example B-4** in *ANSI/ASQC Z1.9-2003* demonstrates this calculation method. **Table B-3** is included in this proposal.

The results from each group's test lot will be examined to determine meter accuracy. The results for the average load (using the 4% bandwidth guideline) will determine the percentage of meters to be sample tested the following year.

*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	Acceptance Quality Limits (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	0.223	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	
Acceptance Quality Limits (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 k value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

