Grayson Rural Electric Cooperative Corporation

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October 1, 2009

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

RE: Case No. 2009-00103

Dear Sir:

Please find attached our revised sample meter testing plan requested in your Order dated September 25, 2009.

Sincerely,

Don M. Combs
Mgr. Finance & Accounting

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
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Walton, Kentucky

Revised
September 28, 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.

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) N/A.

(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

	Manufacturer	Type	Population
1	ABB	AB1	1,627
2	Schlumberger	C1S	4,452
3	GE	I210	100
4	Landis & Gyr	MX	5,433
5	Landis & Gyr	MX	3,606
6	Landis & Gyr	MS	45

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

PROCEDURE(cont.)

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.

Table A-1
AQL Conversion Table

For specified AOL 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[1]
Sample Size Code Letters[2]

Lot Size			Inspection Levels				
			Special		General		
			S3	S4	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]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.

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

PROCEDURE(cont.)

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 and Light 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. If a group does not meet the AQL standards for the group size, the entire group will be tested within 18 months.

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	0.225	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	
		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.

COST SAVINGS/CONCLUSION

A substantial reduction in cost will be achieved by implementing the sample meter test method. Once the program is established, only a small percentage of the present labor and testing efforts will be required. This reduction results in a cost savings without compromising single-phase revenue metering accuracy.

Cost Savings to Grayson RECC due to a change to Sample Metering

Assumptions:
Needing to test 300 sample meters annually
- this can be accomplished over one month
Current practice is to test approximately 5000 meters over three years
- this requires a full year to accomplish

Current Annual Costs

Labor	# units	Hours	Cost / hour	Benefits		
	2	2,080	$ 23.65	77.11%	$	174,247.90
Transportation	1	774	$ 21.91		$	16,958.34
					$	191,206.24
Costs for 3 years during the 8 year cycle					**$**	**573,618.73**

Potential Annual Costs

Labor	# units	Hours	Cost / hour	Benefits		
	2	173	$ 23.65	77.11%	$	14,520.66
Transportation	1	65	$ 21.91		$	1,413.20
					$	15,933.85
Costs during the 8 year cycle					**$**	**127,470.83**
Savings over the 8 year cycle					**$**	**446,147.90**