FLEMING-MASON ENERGY
COOPERATIVE, INC.

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September 2, 2004

Ms. Beth O'Donnell
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, KY 40602-0615

RE: Case No. 2004-00173
Revised amended sample meter testing plan updating the August 30, 2004 filing.

Dear Ms. O'Donnell:

The attached document is a revised amended version of the proposed sample meter testing plan that is meant to supersede the amended plan submitted on August 30, 2004. The requirements concerning the inspection level and additional load test are included. Please accept this application and upon approval, we would like to begin this program as soon as possible.

If you or your staff has any additional questions, please contact me at (606) 845-1235 or cperry@fmenergy.net.

Sincerely,

Chris Perry, PE

Chris Perry, PE
Manager of Engineering

REVISED AMENDED SAMPLE METER TESTING FOR SINGLE PHASE METERS

CASE NO. 2004-00173

Prepared for
Beth O'Donnell
Executive Director
Kentucky Public Service Commission

Prepared by
Chris Perry, PE
Manager of Engineering
Fleming-Mason Energy

September 2, 2004

CONTENTS

LIST OF ILLUSTRATIONS

Revised Sample Meter Testing for Single Phase Meters

INTRODUCTION

Fleming-Mason Energy Cooperative Corporation (FMECC) is currently testing single phase meters in accordance with PSC KAR 5:041E, Section 15. The cooperative is currently up-to-date with its eight year meter testing cycle. In the spring of 1996 the cooperative began reading meters monthly with contract meter readers and will continue to do so. By adopting a sample meter testing procedure in compliance with PSC KAR 5:041E, Section 16, the costs associated with testing single phase meters will be greatly reduced.

PSC RULES AND REGULATIONS

The Kentucky Public Service Commission (PSC) rules and regulations clearly identify provisions under which single phase meters can be statistically tested. FMECC will comply with all the rules outlined in PSC KAR 5:041E, Section 16 with its sample meter testing program.

The PSC requires any electrical utility statistically testing meters to separate it meters into groups to recognize the different operating characteristics. FMECC will divide its meters into groups based on manufacturer and type as identified in Figure 1.

New meters purchased and installed over the course of a given year will be added to the appropriate meter population or group for random sampling the following year. Similarly, new meter types other than those listed in Table 1 or new meters of an existing type with substantive changes in design and/or operating characteristics will be segregated into new meter populations.

Each group in Figure 1 will be statistically tested by randomly selecting meters according to the American National Standard ANSI/ASQC Z1.9-1993 technique. The performance of the meters will also be based on criteria within this standard. The minimum number of meters to be tested shall be based on Inspection Level II with an Acceptable Quality

Level (AQL) of 2.5. The tables for the Inspection Levels and AQL are attached to this document.

Lot performance shall be deemed acceptable if the full load performance and light 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 of 98% using Table B-3 (See attachment).

The utility 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 a utility, then the utility should file a request for deviation. This sampling technique has been chosen to comply with section 16(2) and section 16(3) of PSC KAR 5:041E.

Section 16(4b) of PSC KAR 5:041E states that no meter shall remain in service without periodic test for a period longer than twenty-five years. FMECC will test all meters with a last test date older than twenty-five years, regardless of manufacturer and type, in addition to the yearly sample.

NEW METERS

All new meters are purchased in a lot of 200 meters and will be statistically tested by randomly selecting meters according to the American National Standard ANSI/ASQC Z1.9-1993 technique. The performance of the meters will also be based on criteria within this standard. The minimum number of meters to be tested shall be based on Inspection Level II with an Acceptable Quality Level (AQL) of 1.0. The tables for the Inspection Levels and AQL are attached to this document.

Lot performance shall be deemed acceptable if the full load and light 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 of 98% using Table B-3 (See attachment).

Fleming-Mason Energy has received a quote from the meter manufacturers to receive the factory test to be used for comparison to the sample meter tests under this proposal. The additional cost will be $.25 per meter. Under this plan for a lot size of 200 meters, only 15 meters will be part of the random sample.

The utility 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 a utility, then the utility should file a request for deviation. This sampling technique has been chosen to comply with section 16(2) and section 16(3) of PSC KAR 5:041E.

Meter Manufacturers and Groups

Code	Manufacturer	Type Code	Description	Population	Initial Sample
1	Duncan	11	MSII	195	15
		13	MFS	10	3
2	GE	22	I60S	125	10
		23	I70S	5227	75
		27	I70S 2Wire	49	5
3	Westinghouse	30	CS	41	5
		32	D4S	2152	50
4	Sangamo	40	J5 2Wire	24	4
		41	J4S	236	15
		42	J5S	3121	50
		44	Load Control	60	7
		48	J5S	1720	50
5	Landis & Gyr	51	MSII	2065	50
		52	MX	2035	50
6	ABB	62	D5S	366	20
7	Siemens	73	Altimus AL	57	7
8	Landis & Gyr	81	MX	2311	50
		82	MX 2S	2467	50

Figure 1. Groups segregated by manufacturer and type.

METHODOLOGY

FMECC will sample its meter population each year based on manufacturer and type as shown in Figure 1. The meters will be chosen randomly resulting in statistics conforming to the normal distribution curve. For more information on normal distribution curves please refer to the Appendix. Each year FMECC will perform the following steps for each group.

1. FMECC will test all meters with a last test date older than twenty-five years, regardless of manufacturer and type. The group sample will not include these test results.

2. The metering supervisor will randomly select the number of the meters meeting the standard and ship them to the meter shop for testing. The supervisor will randomly select and test a different meter for all nonregistering meters originally chosen.

3. The meter shop will test all meters under full load, light load, and at 50% power factor.

4. The metering supervisor will calculate the average of the full load test for each meter in the sample.

5. The metering supervisor will calculate the average of the light load test for each meter in the sample.

6. The metering supervisor will compute the sample mean and standard deviation for the calculated averages.

7. Based on the performance of the lot, the metering supervisor will apply the method outlined in the standard to determine lot accuracy.

8. The metering supervisor will compute the percentage of meters, based on sample mean standard deviation, that are within the 4% bandwidth (98% to 102%) allowed by the PSC

COSTS AND BENEFITS

FMECC is committed to keeping costs down while working to improve reliability. There is no sacrificing accuracy in metering and it is believed that none would be experienced by switching to sample meter testing. One of the important tasks that FMECC wants to begin working on is using infrared thermography as a means to detect potential problems before they occur. This proactive move is going to help catch hot spots on distribution substations and equipment. Once detected, the equipment will be scheduled for repair or replacement before it becomes the cause of a sustained outage.

The use of the infrared camera is a very technical and sophisticated procedure. To get the maximum benefit from this equipment, FMECC is getting training for the metering supervisor. By freeing up time by using meter sampling, it is possible for personnel to schedule routine inspection at large commercial and industrial customers, substations, and distribution feeders.

Significant cost savings will be derived from the sample testing of the new meters. The current rate to test new meters is $3.00 per meter. Fleming-Mason Energy purchases approximately 1,200 new meters per year which equates to a total cost of $3,600 per year. By using sample meter testing, this cost will be reduced to $480 per year. This number is from only testing 90 meters by sampling and receiving the factory test for each meter throughout the year at $.25 per meter.

The direct cost savings that can be attributed to the new sampling program are also significant and outlined in Table 1.

Cost Savings Using Meter Sampling		
Item		**Savings**
Equipment and personnel needed to change the additional 2,184 meters	2,184 x $52.00	$113,568.00
Personnel required to test the additional 2,184 meters	2,184 x $5.80	$12,667.20
New meter factory tests	1,200 x $0.25	($300.00)
Reduced amount of new meters to test	1,110 x $3.00	$3,330.00
Total		**$129,265.20**

Table 1. Cost savings by switching to sample meter testing.

The figures used in the table are based on actual data from changing out a single phase meter for FMECC of $52.00 per meter. The figure used for the meter testing was derived from the average number of meters tested by FMECC staff and the associated costs. The current number of periodic tests required by FMECC is about 2,700 per year and the number that would be tested using sampling would be 516 meters.

APPENDIX

Tables from ANSI/ASQC Z1.9-1993

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	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

[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

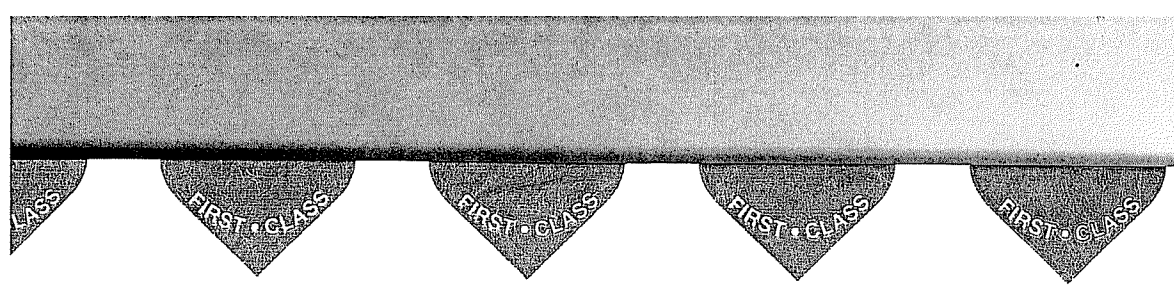
Standard Deviation Method

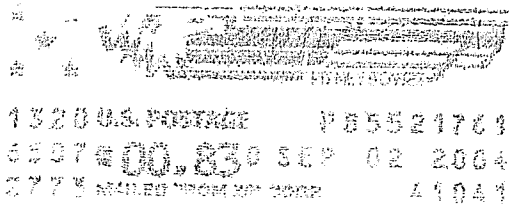
Master Table for Normal and Tightened Inspection for Plans Based on Variability Unknown
(Double Specification Limit and Form 2—Single Specification Limit)

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.





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