



# SALT RIVER ELECTRIC

111 West Brashear Avenue • Bardstown, Kentucky 40004  
(502) 348-3931 • (502) 955-9732 • Fax. (502) 348-1993

December 14, 2005

RECEIVED

DEC 15 2005

PUBLIC SERVICE  
COMMISSION

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

*Case No. 2005-00536*

Re: Application to adopt a sample meter testing program

Dear Ms. O'Donnell:

Please find enclosed an original and ten (10) copies of the Sample Meter Test Plan for Salt River Electric Cooperative Corporation, which is respectfully submitted for review and approval by the Commission in accordance with KAR 5:041, Section 16.

Salt River Electric is currently up-to-date with its eight-year meter testing cycle. In 1998 the cooperative began implementing a "Turtle" automated meter reading system, which required all meters to be removed and tested. Salt River Electric will be required to start testing these single-phase meters in accordance with PSC KAR 5.041E Section 15 in 2006. Salt River Electric will significantly reduce its costs associated with testing single-phase meters by adopting a sample meter testing program that is in compliance with PSC KAR 5:041E Section 16.

We propose to implement the Sample Meter Test Plan for calendar year 2006.

Should you need further information regarding our proposed plan, please contact me at either the address listed above or by telephone at 502-350-1605.

Respectfully,

Tim Sharp, P.E.  
Vice President of Operations



**REQUEST TO ADOPT SAMPLE METER  
TESTING METHOD FOR CLASS 200  
SINGLE-PHASE METERS**

*Case No. 2005-00536*

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PUBLIC SERVICE  
COMMISSION

**SALT RIVER ELECTRIC COOPERATIVE  
CORPORATION**

**Prepared by  
Tim Sharp, P.E.  
Vice President of Operations**

**December 7, 2005**

## TABLE OF CONTENTS

INTRODUCTION .....	3
PSC RULES AND REGULATIONS .....	3
NEW METERS .....	4
COSTS AND BENEFITS.....	5
TABLE I - METER MANUFACTURERS AND GROUPS.....	6
TABLE II – AVOIDED COSTS FOR 2006 .....	7
ANSI/ASQC Z1.9-1993 Table A-1 and Table A-2 .....	8
ANSI/ASQC Z1.9-1993 Table B-3.....	9

# **SAMPLE METER TESTING PLAN FOR SINGLE PHASE METERS**

## **INTRODUCTION**

Salt River Electric Cooperative Corporation (SRE) is currently up-to-date with its eight year meter testing cycle. In 1998 the cooperative began implementing a "Turtle" automated meter reading (AMR) system, which required all meters to be removed and tested. SRE will be required to start testing these single-phase meters in accordance with PSC KAR 5.041E, Section 15 in 2006. SRE will significantly reduce its costs associated with testing single-phase meters by adopting a sample meter testing program that is in compliance with PSC KAR 5:041E Section 16.

## **PSC RULES AND REGULATIONS**

The Kentucky Public Service Commission (PSC) rules and regulations clearly identify provisions under which single phase meters can be sample tested. SRE will comply with all rules outlined in PSC KAR 5.041E, Section 16 with its sample meter testing program.

The PSC requires any electrical utility sample testing meters to separate its meters into groups to recognize the different operating characteristics. SRE will divide its meters into groups based on manufacturer and type as identified in Table I.

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 I or new meters of an existing type with substantive changes in design and/or operating characteristics will be segregated into new meter populations.

Meter groups will be limited to 5,000 meters or the meter count by type on December 31, 2005 whichever is greater. When this limit is reached, a new meter group by type and purchase date will be established. All new groups will be limited to 5,000 meters.

Each group in Table I will be sample tested by randomly selecting meters in accordance with 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 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 the utility, then the utility should file a request for deviation. This sampling technique has been chosen to comply with section 16(2) and 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. SRE 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 384 meters and will be sampled 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 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).

Under this plan for a lot size of 384 meters, only 20 meters will be part of the random sample.

The utility must replace or test all meters in a failed test lot prior to installing any meters from this lot. This sampling technique has been chosen to comply with section 16(2) and 16(3) of PSC KAR 5:041E.

## **METHODOLOGY**

SRE will sample its meter population each year based on manufacturer and type as shown in Table I. The meters will be chosen randomly resulting in statistics conforming to the normal distribution curve. Each year SRE will perform the following steps for each group.

1. SRE 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 meters meeting the standard and ship them for testing. The supervisor will randomly select and test a different meter for all non-registering meters originally chosen.
3. The meters will be tested under full load and light load.
4. The metering supervisor will calculate the weighted average for each meter in the sample. The weighted average accuracy of the meter shall be determined by adding the registration at light load (10 percent of test current) multiplied by 20 percent and the registration at full load (100 percent of test current) multiplied by 80 percent.
5. The metering supervisor will compute the sample mean and standard deviation for the calculated weighted averages.
6. Based on the performance of the lot, the metering supervisor will apply the method outlined in the standard to determine lot accuracy.
7. 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.
8. Lot performance for new and existing meters shall be deemed acceptable if the weighted average of load performance within the lot meets the acceptability criteria of the ANSI/ASQC Z1.9-1993.

## **COSTS AND BENEFITS**

SRE is committed to reducing costs while working to improve reliability. There is no sacrificing accuracy in metering and it is believed that none would be experienced by switching to a sample meter testing program.

Significant costs will be avoided starting in 2006 from the sample testing of the new meters. The current rate to test new meters is \$2.15 per meter. SRE purchases approximately 2,300 new meters per year which equates to a total meter testing cost of \$4,945 per year. By using sample meter testing, this cost will be reduced to \$1,408 per year. This number is derived by testing 120 meters by sampling and receiving the factory test for each meter at an additional cost of \$0.50 per meter.

The cost savings that can be attributed to existing meters with a sampling program are considerably more significant and outlined in Table II.

**TABLE I**

<b>METER MANUFACTURERS AND GROUPS</b>				
<b>Group</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Population</b>	<b>Initial Sample</b>
1	ABB / Westinghouse	AB1	6851	75
2	Westinghouse	D4S	1141	35
3	ABB / Westinghouse	D5S	4832	75
4	GE	I70S	16678	100
5	Sangamo / Schlumberger	J5S	1713	50
6	Duncan / Landis & Gyr	MS	138	10
7	Duncan / Landis &Gyr	MSII	938	35
8	Landis & Gyr	MX	10792	100
<b>Total</b>			<b>43,083</b>	<b>480</b>

Meter groups will be limited to 5,000 meters or the meter count by type on December 31, 2005 whichever is greater. When this limit is reached, a new meter group by type and purchase date will be established. All new groups will be limited to 5,000 meters.

**TABLE II**

<b>AVOIDED COSTS FOR 2006</b>		
Equipment, transportation, and personnel needed to change the additional 4,935 meters	4,910 X \$37.50	\$184,125
Cost to have laboratory test the additional 4,935 meters at \$5.15 per meter	4,910 X \$5.15	\$25,286
New meter factory tests	2,300 X \$0.50	(\$1,150)
Reduced cost to test new meters	2,180 X \$2.15	\$4,687
<b>Total Avoided Costs For 2006</b>		<b>\$212,948</b>

The figures used in the table are based on actual data from changing out a single phase meter for Salt River Electric at a cost of \$37.50 per meter. The figure used for meter testing is the current contract price of the laboratory performing the meter testing for Salt River Electric. The number of periodic tests required will be 5,390 in 2006. The number of tests required using a sample meter testing program will be 480 meters. The cost savings in years 2007 and beyond will be similar.

## ANSI/ASQC Z1.9-1993 Table A-1 and Table A-2

**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<sup>2</sup>**  
Sample Size Code Letters<sup>1</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>Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

<sup>2</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.

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)													

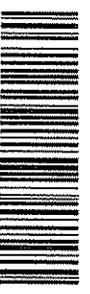
All AQL values are in percent nonconforming. T denotes plan used exclusively on tightened inspection and provides symbol for identification of appropriate OC curve.

↓ 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.

ANSI/ASQC Z1.9-1993 Table B-3

ppp

7002 3150 0006 4841 1208



**SR** SALT RIVER ELECTRIC  
111 West Boulder Avenue  
Bardonia, Kentucky 40004

TO:

Ms. Elizabeth O'Donnell  
Executive Director  
Public Service Commission  
211 Sower Boulevard  
Frankfort KY 40602

FIRST CLASS MAIL

