PROPOSED SAMPLE METER TESTING PLAN FOR NOLIN RURAL ELECTRIC COOPERATIVE CORPORATION'S SINGLE PHASE METERS

Nolin Rural Electric Cooperative Corporation
Elizabethtown, Kentucky

2nd Revision

Initial Plan
June 19, 2016

PROPOSAL FOR SINGLE-PHASE CLASS 200 AND 320 SAMPLE METER TESTING

INTRODUCTION

Nolin Rural Electric Cooperative Corporation (Nolin) is an electric distribution cooperative located in central Kentucky. In case 2016-00275, the Kentucky Public Service Commission approved a sample meter testing plan. Prior to the approval of a sample meter testing plan, Nolin was on schedule with its eight-year meter testing program. It is the purpose of this proposal to seek amendments to the previously approved plan to better align with regulatory requirements and make general text updates. In this proposal, we demonstrate the methods used and thcost savings achieved in sample testing plan.

RULES AND REGULATIONS

Kentucky Public Service Commission (PSC) rules regulations outline the required method and techniques of sample meter testing. Nolin will implement the sample meter testing plan as submitted in this application.

PROCEDURE

No meter shall remain in service without periodic test for a period longer than twenty-five (25) years.

The statistical meter sample testing will follow **American National Standard Institute ANSI/ASQC Zl. 9-2003 (Sampling Procedures and Tables for Inspection)**. Each test group will be randomly sampled by a computerized process.

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**. The upper and lower 2% limits require the use of the Double Specification Limit method as outlined in this ANSI Standard.

Meters will be divided into separate homogeneous groups to recognize differences in operating characteristics based upon manufacturer, size, and type. Similar meters may be further divided by serial number break points. Newly purchased and/or installed meters will be added to the proper group and lot and will be eligible for sample testing the following year. New lots may be added to maintain lot size limitation of 1,000 meters. **Table A-2** provides the Sample Size Code Letters that are then to be referenced in **Table B-3**. The "Normal Inspection" portion of the **Table B-3** is then used to determine the sample size for each test group.

PROCEDURE (cont.)

The meters subject to this sample plan shall be grouped as follows:
-Single-Phase, CL200
-Single-Phase, CL320

***The Groups listed above will be divided into lots of 1,000.**

In addition to the groups above, meters with a different manufacturer or product line name will be considered a separate group for purposes of lot determination.

Randomly selected meters (lot) from each lot will be tested. If damaged or non-registering meters have issues that are not a manufacturer's defect or meter was exposed to abnormal conditions, these meters will be replaced by another random selection.

The meters will be tested under full load, and light load. When found to exceed allowed tolerances, meters shall be retired and refunds or back billing shall be made per regulatory requirements.

For each lot, calculations will be based on the Double Specification Limit Variability Unknown-Standard Deviation Method. Full Load and light load test results will be evaluated. **Example B-4** in **ANSI/ASQC Zl. 9-2003** demonstrates this calculation method. **Table B-3** is included in this proposal.

An annual report (showing each group's performance) and a copy of the manufacturer's new meter test data will be provided.

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** standard.

PROCEDURE (cont.)

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

Table A-1[1]
AQL Conversion Table

[1] From **ANSI/ASQ Z1.9-2003 (R2013) – SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY VARIABLES FOR PERCENT NONCONFORMING**

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[2]
Sample Size Code Letters

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

[2] From **ANSI/ASQ Z1.9-2003 (R2013) – SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY VARIABLES FOR PERCENT NONCONFORMING**

PROCEDURE (cont.)

Table B-3[3]
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)											

[3] From **ANSI/ASQ Z1.9-2003 (R2013) – SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY VARIABLES FOR PERCENT NONCONFORMING**

COST SAVINGS/CONCLUSION OF INITIAL 2016 PLAN

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 Nolin RECC due to a change to Metering Sample Testing

Assumptions:

Current practice is to test approximately 4,510 meters annually
Contract pricing to test single-phase meter $6
One full time Nolin RECC meter tech supports meter testing
Test 1,365 sample meters annually
Test 2% meters to insure all meters tested within 25 years
In field testing is $35 per meter

Current Annual Costs

	Quantity	Cost to Test	Annual Cost
Number of meters	4,510	$6.00	$27,060.00
Full time Meter Tech fully burdened cost			147,201.60
Annual Cost of Testing meters			$174,261.60
Cost of Testing meters over 8 year cycle			$1,304,092.80

Proposed Sample Testing Costs

	Quantity	Cost to Test	Annual Cost
Number of meters for Sampling Plan	1295	$35.00	$45,325.00
2% oldest meters in population	722	$35.00	$25,270.00
Annual Cost of Testing meters			$70,595.00
Cost of Testing meters over 8 year cycle			$ 564,760.00
Potential Savings over 8 year cycle			**$829,332.80**

COST SAVINGS/CONCLUSION

Current costs of sample testing plan, and projected savings if the 2% of oldest meters were to be removed from testing requirement.

Current Annual Costs under sample plan

	Quantity	Cost to Test	Annual Cost
Number of meters for Sampling Plan	1,559	$56.54	$88,145.86
2% oldest meters in population	896	$56.54	$50,659.84
Annual Cost of Sample Testing meters			$138,805.70

*Removing the additional 2% oldest meters in population from testing would reduce expenses by approximately $50,659.84 annually.