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December 27, 2012

Darrell Nitschke  
Director of Administration/Executive Secretary  
North Dakota Public Service Commission  
State Capitol  
600 East Boulevard, Dept. 408  
Bismarck, ND 58505-0408

**RE: Otter Tail Power Company's 2012 Sample Meter Test Performance Report**

Dear Mr. Nitschke:

Pursuant to North Dakota Rule 69-09-02-28(3), enclosed, as Attachment 1, are the results from the 2012 single-phase kWh sample meter test program for Otter Tail Power Company ("Otter Tail"). There were six groups of meters selected for the 2012 sample test. Criterion for selecting the groups was based on the time period the meters were purchased, manufacturer and model of meters. The meters were grouped as follows:

1. GE and SI meters purchased from 2003 to present.
2. GE meters purchased from 1969 to 2002.
3. SI meters purchased from 1969 to 2002.
4. LG meters purchased from 1969 to 2002.
5. ABB model D4S meters purchased from 1975 to 1982.
6. GE model I50S meters.

The results of this year sample test indicate that the ABB model D4S meters purchased from 1975 to 1982 did not pass the sample test. In 2013 a second and larger sample of this group will be taken. In 2009, the ABB meters manufactured from 1990 to 1998 did not pass the sample test. In 2011, the ABB model DS4 meters manufactured from 1969 to 1974 did not pass the sample test. These two groups of meters are being removed from service.

All other groups of meters that have not passed the sample test in prior years have been removed from service.

Darrell Nitschke  
December 27, 2012  
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An electronic copy of this filing is being sent to you at [dnitschk@nd.gov](mailto:dnitschk@nd.gov) and to [ndpsc@nd.gov](mailto:ndpsc@nd.gov). These items are filed for your information. If you have any questions, please contact me at (218) 739-8395 or [jfyhrie@otpc.com](mailto:jfyhrie@otpc.com).

Sincerely,

/s/ JESSICA FYHRIE  
Jessica Fyhrie  
Tariff Specialist, Tariff Application and Compliance

wao  
Enclosures  
By electronic filing



SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: 2012 Sample #1 GE I210, SI C1S purchased 2003 to present

(Table A-2)

LOT SIZE 25106 N = SAMPLE SIZE 100 SAMPLED 112 AQL 2.5

FL BAR X 100.015 FL SIGMA 0.077
LL BAR X 99.989 LL SIGMA 0.075

ESTIMATE OF LOT ABOVE 102.0%

FL QU = (102 - FL BAR X) / FL SIGMA = (102 - 100.015) / 0.077 = 1.985 / 0.077 = 25.78

table 5 calculations
0.000
0.000

LL QU = (102 - LL BAR X) / LL SIGMA = (102 - 99.989) / 0.075 = 2.011 / 0.075 = 26.81

Calculations % from table B-5 = 0.00 % PU FL above 102.0%
0.00 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = (FL BAR X - 98) / FL SIGMA = (100.015 - 98) / 0.077 = 2.015 / 0.077 = 26.17

table 5 calculations
0.000
0.000

LL QL = (LL BAR X - 98) / LL SIGMA = (99.989 - 98) / 0.075 = 1.989 / 0.075 = 26.52

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %
0.00 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL = 0.00 + 0.00 = 0.00
Light Load P = PU LL + PL LL = 0.00 + 0.00 = 0.00

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) = 100.015 + 0.308 = 100.323
LFL = FL BAR X - (4 x FL Sigma) = 100.015 - 0.308 = 99.707
ULL = LL BAR X + (4 x LL Sigma) = 99.989 + 0.3 = 100.289
LLL = LL BAR X - (4 x LL Sigma) = 99.989 - 0.3 = 99.689

Lot is acceptable x Lot is unacceptable

Tested & Reported by: Steve Ness Approved:



SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: 2012 Sample #2 Ge Meters purchased 16969 to 2002

(Table A-2)

LOT SIZE 30938 N = SAMPLE SIZE 100 SAMPLED 116 AQL 2.5

FL BAR X 99.886 FL SIGMA 0.228
LL BAR X 99.487 LL SIGMA 0.450

ESTIMATE OF LOT ABOVE 102.0%

FL QU = (102 - FL BAR X) / FL SIGMA = (102 - 99.886) / 0.228 = 2.114 / 0.228 = 9.27

table 5 calculations
0.000
0.0000

LL QU = (102 - LL BAR X) / LL SIGMA = (102 - 99.487) / 0.45 = 2.513 / 0.45 = 5.58

Calculations % from table B-5 = 0.00 % PU FL above 102.0%
0.00 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = (FL BAR X - 98) / FL SIGMA = (99.886 - 98) / 0.228 = 1.886 / 0.228 = 8.27

table 5 calculations
0.000
0.000

LL QL = (LL BAR X - 98) / LL SIGMA = (99.487 - 98) / 0.45 = 1.487 / 0.45 = 3.30

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %
0.03 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.00 + 0.00 = 0.00
Light Load P = PU LL + PL LL 0.00 + 0.03 = 0.03

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.886 + 0.912 UFL = 100.798
LFL = FL BAR X - (4 x FL Sigma) 99.886 - 0.912 LFL = 98.974
ULL = LL BAR X + (4 x LL Sigma) 99.487 + 1.8 ULL = 101.287
LLL = LL BAR X - (4 x LL Sigma) 99.487 - 1.8 LLL = 97.687

Lot is acceptable x Lot is unacceptable

Tested & Reported by: Steve Ness Approved:



SAMPLE METER TEST CALCULATION FORM  
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: **2012 Sample #3 SI model J4S,J5S 1969-2002 OUTLIER REMOVED**

(Table A-2)

LOT SIZE **33081** N = SAMPLE SIZE **100** SAMPLED **113** AQL **2.5**

FL BAR X **99.935** FL SIGMA **0.359**  
LL BAR X **99.914** LL SIGMA **0.553**

ESTIMATE OF LOT ABOVE 102.0%

FL QU =  $\frac{102 - FL \text{ BAR X}}{FL \text{ SIGMA}} = \frac{102 - 99.935}{0.359} = \frac{2.065}{0.359} = 5.75$

table 5 calculations
0.000
0.0000

LL QU =  $\frac{102 - LL \text{ BAR X}}{LL \text{ SIGMA}} = \frac{102 - 99.914}{0.553} = \frac{2.086}{0.553} = 3.77$

Calculations % from table B-5 = 0.00 % PU FL above 102.0%  
0.00 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL =  $\frac{FL \text{ BAR X} - 98}{FL \text{ SIGMA}} = \frac{99.935 - 98}{0.359} = \frac{1.935}{0.359} = 5.39$

table 5 calculations
0.000
0.000

LL QL =  $\frac{LL \text{ BAR X} - 98}{LL \text{ SIGMA}} = \frac{99.914 - 98}{0.553} = \frac{1.914}{0.553} = 3.46$

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %  
0.02 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.00 + 0.00 = 0.00  
Light Load P = PU LL + PL LL 0.00 + 0.02 = 0.02

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **4.69**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.935 + 1.436 UFL = 101.371  
LFL = FL BAR X - (4 x FL Sigma) 99.935 - 1.436 LFL = 98.499  
ULL = LL BAR X + (4 x LL Sigma) 99.914 + 2.212 ULL = 102.126  
LLL = LL BAR X - (4 x LL Sigma) 99.914 - 2.212 LLL = 97.702

Lot is acceptable x Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness Approved: \_\_\_\_\_



SAMPLE METER TEST CALCULATION FORM  
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: **2012 Sample #4 LG model MS,MS 1969-2002 OUTLIER REMOVED**

(Table A-2)

LOT SIZE **16850** N = SAMPLE SIZE **75** SAMPLED **113** AQL **2.5**

FL BAR X **100.011** FL SIGMA **0.333**  
LL BAR X **99.649** LL SIGMA **0.831**

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 100.011}{0.333} = \frac{1.989}{0.333} = 5.97$$

table 5 calculations
0.000
0.0019

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.649}{0.831} = \frac{2.351}{0.831} = 2.83$$

Calculations % from table B-5 = 0.00 % PU FL above 102.0%  
0.19 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{100.011 - 98}{0.333} = \frac{2.011}{0.333} = 6.04$$

table 5 calculations
0.000
0.022

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.649 - 98}{0.831} = \frac{1.649}{0.831} = 1.98$$

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %  
2.25 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.00 + 0.00 = 0.00

Light Load P = PU LL + PL LL 0.19 + 2.25 = 2.43

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **4.87**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 100.011 + 1.332 UFL = 101.343

LFL = FL BAR X - (4 x FL Sigma) 100.011 - 1.332 LFL = 98.679

ULL = LL BAR X + (4 x LL Sigma) 99.649 + 3.324 ULL = 102.973

LLL = LL BAR X - (4 x LL Sigma) 99.649 - 3.324 LLL = 96.325

Lot is acceptable x Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness Approved: \_\_\_\_\_



SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: 2012 Sample #5ABB meters model D4S 1975-1982 OUTLIER REMOVED

(Table A-2)

LOT SIZE 10601 N = SAMPLE SIZE 75 SAMPLED 109 AQL 2.5

FL BAR X 99.982 FL SIGMA 0.408
LL BAR X 99.450 LL SIGMA 1.448

ESTIMATE OF LOT ABOVE 102.0%

FL QU = (102 - FL BAR X) / FL SIGMA = (102 - 99.982) / 0.408 = 2.018 / 0.408 = 4.95

Table with 2 rows: table 5 calculations, 0.000; 0.0380

LL QU = (102 - LL BAR X) / LL SIGMA = (102 - 99.45) / 1.448 = 2.550 / 1.448 = 1.76

Calculations % from table B-5 = 0.00 % PU FL above 102.0%
3.80 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = (FL BAR X - 98) / FL SIGMA = (99.982 - 98) / 0.408 = 1.982 / 0.408 = 4.86

Table with 2 rows: table 5 calculations, 0.000; 0.158

LL QL = (LL BAR X - 98) / LL SIGMA = (99.45 - 98) / 1.448 = 1.450 / 1.448 = 1.00

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %
15.83 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL = 0.00 + 0.00 = 0.00

Light Load P = PU LL + PL LL = 3.80 + 15.83 = 19.64

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.87

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) = 99.982 + 1.632 = 101.614

LFL = FL BAR X - (4 x FL Sigma) = 99.982 - 1.632 = 98.35

ULL = LL BAR X + (4 x LL Sigma) = 99.450 + 5.792 = 105.242

LLL = LL BAR X - (4 x LL Sigma) = 99.450 - 5.792 = 93.658

Lot is acceptable Lot is unacceptable x

Tested & Reported by: Steve Ness Approved:



SAMPLE METER TEST CALCULATION FORM  
METERS IN SERVICE AT OTTER TAIL POWER CO.

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METER IN THIS SAMPLE: **2012 Sample #6 GE I50S meters**

(Table A-2)

LOT SIZE **3805** N = SAMPLE SIZE **50** SAMPLED **117** AQL **2.5**

FL BAR X **100.052** FL SIGMA **0.299**  
LL BAR X **100.076** LL SIGMA **0.699**

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 100.052}{0.299} = \frac{1.948}{0.299} = 6.52$$

table 5 calculations
0.000
0.0021

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 100.076}{0.699} = \frac{1.924}{0.699} = 2.75$$

Calculations % from table B-5 = 0.00 % PU FL above 102.0%  
0.21 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{100.052 - 98}{0.299} = \frac{2.052}{0.299} = 6.86$$

table 5 calculations
0.000
0.001

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{100.076 - 98}{0.699} = \frac{2.076}{0.699} = 2.97$$

Calculations % from table B-5 = 0.00 % PL FL below 98.0 %  
0.10 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.00 + 0.00 = 0.00  
Light Load P = PU LL + PL LL 0.21 + 0.10 = 0.31

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **5.2**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 100.052 + 1.196 UFL = 101.248  
LFL = FL BAR X - (4 x FL Sigma) 100.052 - 1.196 LFL = 98.856  
ULL = LL BAR X + (4 x LL Sigma) 100.076 + 2.796 ULL = 102.872  
LLL = LL BAR X - (4 x LL Sigma) 100.076 - 2.796 LLL = 97.28

Lot is acceptable x Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness Approved: \_\_\_\_\_