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October 14, 2011

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 2011 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 2011 single-phase kWh sample meter test program for Otter Tail Power Company ("Otter Tail"). There were seven groups of meters selected for the 2011 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 2001 to present.
2. GE, model I70S meters purchased from 1969 to 2001.
3. SI model J4S, J5S meters purchased from 1969 to 2001.
4. LG model MS, MX meters purchased from 1969 to 2001.
5. ABB model D4S meters purchased from 1969 to 1974.
6. ABB model D4S meters purchased from 1975 to 1982.
7. GE model I50S meters.

Otter Tail's 2011 sample meter test results show that groups 1 through 4, 6 and 7 all passed the sample tests. Based on the 2010 sample meter tests, Otter Tail selected a larger group of meters for groups 5 and 6 because these two groups did not pass Otter Tail's 2010 sample test. The 2011 test results for group 5 show that this group of meters did not pass the 2011 sample test. These meters are ABB model D4S meters manufactured from 1969 to 1974 and there are approximately 8,000 of these meters in service. The meters in this group are being removed from service. Group 6 which are ABB model D4S meters manufactured from 1975 through 1982 passed Otter Tail's 2011 sample test. Otter Tail's 2009 sample test indicated the ABB model D5S meters manufactured from 1990 to 1998 did not pass the sample test. In 2008, the ABB Model AB1 meters did not pass the sample test. These two groups of meters are being removed from service.

Darrell Nitschke  
October 14, 2011  
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All other groups of meters that have not passed the sample test in prior years have been removed from service.

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 METERS IN THIS SAMPLE: 2011 Sample #1.2

LOT SIZE 200 SAMPLE SIZE 191 AQL 2.5

**FL BAR X** 99.886 **FL SIGMA** 0.514  
**LL BAR X** 99.685 **LL SIGMA** 0.495

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.886}{0.514} = \frac{2.114}{0.514} = \underline{4.11}$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.685}{0.495} = \frac{2.315}{0.495} = \underline{4.68}$$

From Table B-5 = 0 % PU FL above 102.0%

0 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.886 - 98}{0.514} = \frac{1.886}{0.514} = \underline{3.67}$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.685 - 98}{0.495} = \frac{1.685}{0.495} = \underline{3.40}$$

From table B-5 = 0.01 % PL FL below 98.0 %

0.028 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0 + 0.01 = 0.010

Light Load P = PU LL + PL LL 0 + 0.028 = 0.028

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.4

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.886 + 2.056 UFL = 101.942

LFL = FL BAR X - (4 x FL Sigma) 99.886 - 2.056 LFL = 97.83

ULL = LL BAR X + (4 x LL Sigma) 99.685 + 1.98 ULL = 101.665

LLL = LL BAR X - (4 x LL Sigma) 99.685 - 1.98 LLL = 97.705

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #2.1

LOT SIZE 100 SAMPLE SIZE 94 AQL 2.5

**FL BAR X** 99.951 **FL SIGMA** 0.459  
**LL BAR X** 99.635 **LL SIGMA** 0.462

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.951}{0.459} = \frac{2.049}{0.459} = 4.46$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.635}{0.462} = \frac{2.365}{0.462} = 5.12$$

From Table B-5 = 0 % PU FL above 102.0%

0 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.951 - 98}{0.459} = \frac{1.951}{0.459} = 4.25$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.635 - 98}{0.462} = \frac{1.635}{0.462} = 3.54$$

From table B-5 = 0 % PL FL below 98.0 %

0.013 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0 + 0 = 0.000

Light Load P = PU LL + PL LL 0 + 0.013 = 0.013

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.951 + 1.836 UFL = 101.787

LFL = FL BAR X - (4 x FL Sigma) 99.951 - 1.836 LFL = 98.115

ULL = LL BAR X + (4 x LL Sigma) 99.635 + 1.848 ULL = 101.483

LLL = LL BAR X - (4 x LL Sigma) 99.635 - 1.848 LLL = 97.787

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #3

LOT SIZE 100 SAMPLE SIZE 100 AQL 2.5

**FL BAR X** 99.900 **FL SIGMA** 0.430  
**LL BAR X** 99.699 **LL SIGMA** 0.549

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.9}{0.43} = \frac{2.100}{0.43} = 4.88$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.699}{0.549} = \frac{2.301}{0.549} = 4.19$$

From Table B-5 = 0 % PU FL above 102.0%

0 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.9 - 98}{0.43} = \frac{1.900}{0.43} = 4.42$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.699 - 98}{0.549} = \frac{1.699}{0.549} = 3.09$$

From table B-5 = 0 % PL FL below 98.0 %

0.079 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0 + 0 = 0.000

Light Load P = PU LL + PL LL 0 + 0.079 = 0.079

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.900 + 1.72 UFL = 101.62

LFL = FL BAR X - (4 x FL Sigma) 99.900 - 1.72 LFL = 98.18

ULL = LL BAR X + (4 x LL Sigma) 99.699 + 2.196 ULL = 101.895

LLL = LL BAR X - (4 x LL Sigma) 99.699 - 2.196 LLL = 97.503

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #4.1

LOT SIZE 100 SAMPLE SIZE 77 AQL 2.5

**FL BAR X** 99.980 **FL SIGMA** 0.435  
**LL BAR X** 99.558 **LL SIGMA** 0.698

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.98}{0.435} = \frac{2.020}{0.435} = 4.64$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.558}{0.698} = \frac{2.442}{0.698} = 3.50$$

From Table B-5 = 0 % PU FL above 102.0%  
0.015 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.98 - 98}{0.435} = \frac{1.980}{0.435} = 4.55$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.558 - 98}{0.698} = \frac{1.558}{0.698} = 2.23$$

From table B-5 = 0 % PL FL below 98.0 %  
1.212 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0 + 0 = 0.000  
 Light Load P = PU LL + PL LL 0.015 + 1.212 = 1.227

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.980 + 1.74 UFL = 101.72  
 LFL = FL BAR X - (4 x FL Sigma) 99.980 - 1.74 LFL = 98.24

ULL = LL BAR X + (4 x LL Sigma) 99.558 + 2.792 ULL = 102.35  
 LLL = LL BAR X - (4 x LL Sigma) 99.558 - 2.792 LLL = 96.766

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011 Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #5.2

LOT SIZE 200 SAMPLE SIZE 193 AQL 2.5

**FL BAR X** 99.982 **FL SIGMA** 0.543  
**LL BAR X** 99.462 **LL SIGMA** 1.165

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.982}{0.543} = \frac{2.018}{0.543} = 3.72$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.462}{1.165} = \frac{2.538}{1.165} = 2.18$$

From Table B-5 = 0.008 % PU FL above 102.0%

1.42 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.982 - 98}{0.543} = \frac{1.982}{0.543} = 3.65$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.462 - 98}{1.165} = \frac{1.462}{1.165} = 1.25$$

From table B-5 = 0.01 % PL FL below 98.0 %

10.55 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.008 + 0.01 = 0.018

Light Load P = PU LL + PL LL 1.42 + 10.55 = 11.970

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.4

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.982 + 2.172 UFL = 102.154

LFL = FL BAR X - (4 x FL Sigma) 99.982 - 2.172 LFL = 97.81

ULL = LL BAR X + (4 x LL Sigma) 99.462 + 4.66 ULL = 104.122

LLL = LL BAR X - (4 x LL Sigma) 99.462 - 4.66 LLL = 94.802

Lot is acceptable \_\_\_\_\_

Lot is unacceptable **X**

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #6-4

LOT SIZE 200 SAMPLE SIZE 181 AQL 2.5

**FL BAR X** 99.996 **FL SIGMA** 0.429  
**LL BAR X** 99.590 **LL SIGMA** 0.876

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.996}{0.429} = \frac{2.004}{0.429} = \underline{4.67}$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.59}{0.876} = \frac{2.410}{0.876} = \underline{2.75}$$

From Table B-5 = 0 % PU FL above 102.0%

0.277 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.996 - 98}{0.429} = \frac{1.996}{0.429} = \underline{4.65}$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.59 - 98}{0.876} = \frac{1.590}{0.876} = \underline{1.82}$$

From table B-5 = 0 % PL FL below 98.0 %

3.4 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0 + 0 = 0.000

Light Load P = PU LL + PL LL 0.277 + 3.4 = 3.677

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.4

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.996 + 1.716 UFL = 101.712

LFL = FL BAR X - (4 x FL Sigma) 99.996 - 1.716 LFL = 98.28

ULL = LL BAR X + (4 x LL Sigma) 99.590 + 3.504 ULL = 103.094

LLL = LL BAR X - (4 x LL Sigma) 99.590 - 3.504 LLL = 96.086

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11

**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 METERS IN THIS SAMPLE: 2011 Sample #7

LOT SIZE 100 SAMPLE SIZE 95 AQL 2.5

**FL BAR X** 100.054

**FL SIGMA** 0.586

**LL BAR X** 100.032

**LL SIGMA** 0.563

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 100.054}{0.586} = \frac{1.946}{0.586} = \underline{3.32}$$

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 100.032}{0.563} = \frac{1.968}{0.563} = \underline{3.50}$$

From Table B-5 = 0.032 % PU FL above 102.0%

0.015 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{100.054 - 98}{0.586} = \frac{2.054}{0.586} = \underline{3.51}$$

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{100.032 - 98}{0.563} = \frac{2.032}{0.563} = \underline{3.61}$$

From table B-5 = 0.015 % PL FL below 98.0 %

0.01 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.032 + 0.015 = 0.047

Light Load P = PU LL + PL LL 0.015 + 0.01 = 0.025

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 100.054 + 2.344 UFL = 102.398

LFL = FL BAR X - (4 x FL Sigma) 100.054 - 2.344 LFL = 97.71

ULL = LL BAR X + (4 x LL Sigma) 100.032 + 2.252 ULL = 102.284

LLL = LL BAR X - (4 x LL Sigma) 100.032 - 2.252 LLL = 97.78

Lot is acceptable X Lot is unacceptable \_\_\_\_\_

Tested & Reported by: Steve Ness 8-16-2011

Approved: Wes Evavold 8-16-11