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December 31, 2014



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 2014 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 2014 single-phase kWh sample meter test program for Otter Tail Power Company ("Otter Tail"). There were five groups of meters selected for the 2014 sample test. Criteria for selecting the groups were 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 2004 to present.
2. GE meters purchased from 1969 to 2003.
3. SI meters purchased from 1969 to 2003.
4. L&G meters purchased from 1969 to 2003.
5. GE model I50S meters.

Otter Tail's 2014 Sample Meter Test Performance Report does not produce results that are statistically valid. This report explains the problem that occurred and internal measures that will be implemented to address and correct the situation for next year's report.

Otter Tail experienced errors in identifying the total sample meter population of 550 meters from all the groups listed above. The problem was due to lack of training and oversight of the meter sample identification process. Exactly 205 meters out of the 550 meter sample population were correctly identified, although no single group reached its intended sample size. The remaining 345 sample meters were not correctly identified and co-mingled with other incoming meter change outs. To insure a valid statistical sample, all 550 sample meters must each be identified and tested as part of this report.

As such, the results shown in Attachment 1 are not statistically valid as described above. Nonetheless, Otter Tail did complete the sample tests using the results of 205 subsampled meters. The results, although not statistically valid, show that three of the five meter groups failed the metering performance criteria (i.e., Groups 2, 4 and 5 failed).

As reported in the 2013 filing, the following meters continue to be removed from service due to failing the metering performance criteria:

- In 2011, the ABB meters manufactured from 1969 to 1974 failed for the second time. These meters are being removed from service. There are 3,272 of these meters left in service. All will be removed by 2016.
- In 2013, the ABB meters manufactured from 1975 – 1982 failed for the second time. These meters are being removed from service. There are 10,159 of these meters left in service. All will be removed by 2018.

Otter Tail has developed the following measures to ensure the fulfillment of North Dakota Rule 69-09-02-28(3):

- Meter & Construction Services will produce an internal report that reviews current meter sample procedures and makes appropriate adjustments to ensure meter sample identity and integrity of testing.
- Regulatory Administration will require quarterly updates from Meter & Construction Services in regards to the status of North Dakota Rule 69-09-02-28(3).

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) 739-8595 or [dprazak@otpc.com](mailto:dprazak@otpc.com).

Sincerely,

*/s/ DAVID G. PRAZAK*

David G. Prazak

Supervisor, Pricing and Tariff Administration, Regulatory Administration

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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: **2014 Sample #1 GE, I210 and C1S meters purchased from 2004 to present**

LOT SIZE **29592** SAMPLE SIZE n= **43** AQL **2.5**

FL BAR X **100.005** FL SIGMA **0.062**  
LL BAR X **99.972** LL SIGMA **0.062**

ESTIMATE OF LOT ABOVE 102.0%

				Table B5 Calculations	
FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 100.005}{0.062}$	=	$\frac{1.995}{0.062}$	=	<b>32.18</b>
					QU= 32.18
					n= 43
					P= <b>0.00000</b>
LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.972}{0.062}$	=	$\frac{2.028}{0.062}$	=	<b>32.71</b>
					QU= 32.71
					n= 43
					P= <b>0.00000</b>
From Table B-5 =	<b>0.000</b>	% PU FL above 102.0%			
Calculations					
	<b>0.000</b>	% PU LL above 102.0 %			

ESTIMATE OF LOT BELOW 98.0%

				Table B5 Calculations	
FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{100.005 - 98}{0.062}$	=	$\frac{2.005}{0.062}$	=	<b>32.34</b>
					QL= 32.34
					n= 43
					P= <b>0.00000</b>
LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.972 - 98}{0.062}$	=	$\frac{1.972}{0.062}$	=	<b>31.81</b>
					QL= 31.81
					n= 43
					P= <b>0.00000</b>
From table B-5 =	<b>0.000</b>	% PL FL below 98.0 %			
Calculations					
	<b>0.000</b>	% PL LL below 98.0 %			

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL	<u>0.000</u>	+	<u>0.000</u>	=	<b>0.000</b>
Light Load P = PU LL + PL LL	<u>0.000</u>	+	<u>0.000</u>	=	<b>0.000</b>
ALLOWABLE PERCENT DEFECTIVE: TABLE B-3	<b>4.69</b>				

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	100.005 + 0.248	UFL =	<b>100.253</b>
LFL = FL BAR X - (4 x FL Sigma)	100.005 - 0.248	LFL =	<b>99.757</b>
ULL = LL BAR X + (4 x LL Sigma)	99.972 + 0.248	ULL =	<b>100.220</b>
LLL = LL BAR X - (4 x LL Sigma)	99.972 - 0.248	LLL =	<b>99.724</b>

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 METERS IN THIS SAMPLE: **2014 Sample #2 GE, I70S meters purchased from 1969 to 2003**

LOT SIZE **30696** SAMPLE SIZE n= **49** AQL **2.5**

FL BAR X **99.927** FL SIGMA **0.258**  
LL BAR X **99.493** LL SIGMA **0.535**

ESTIMATE OF LOT ABOVE 102.0%

				Table B5 Calculations	
FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 99.927}{0.258}$	=	$\frac{2.073}{0.258}$	=	<b>8.03</b>
					QU= 8.03
					n= 49
					P= <b>0.00000</b>
LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.493}{0.535}$	=	$\frac{2.507}{0.535}$	=	<b>4.69</b>
					QU= 4.69
					n= 49
					P= <b>0.00000</b>
From Table B-5 =	<b>0.000</b>	% PU FL above 102.0%			
Calculations					
	<b>0.000</b>	% PU LL above 102.0 %			

ESTIMATE OF LOT BELOW 98.0%

				Table B5 Calculations	
FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{99.927 - 98}{0.258}$	=	$\frac{1.927}{0.258}$	=	<b>7.47</b>
					QL= 7.47
					n= 49
					P= <b>0.00000</b>
LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.493 - 98}{0.535}$	=	$\frac{1.493}{0.535}$	=	<b>2.79</b>
					QL= 2.79
					n= 49
					P= <b>0.22500</b>
From table B-5 =	<b>0.000</b>	% PL FL below 98.0 %			
Calculations					
	<b>22.500</b>	% PL LL below 98.0 %			

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL	<u>0.000</u>	+	<u>0.000</u>	=	<b>0.000</b>
Light Load P = PU LL + PL LL	<u>0.000</u>	+	<u>22.500</u>	=	<b>22.500</b>
ALLOWABLE PERCENT DEFECTIVE: TABLE B-3	<b>4.69</b>				

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	99.927 + 1.032	UFL =	<b>100.959</b>
LFL = FL BAR X - (4 x FL Sigma)	99.927 - 1.032	LFL =	<b>98.895</b>
ULL = LL BAR X + (4 x LL Sigma)	99.493 + 2.14	ULL =	<b>101.633</b>
LLL = LL BAR X - (4 x LL Sigma)	99.493 - 2.14	LLL =	<b>97.353</b>

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 METERS IN THIS SAMPLE: **2014 Sample #3 SI, J4S, J5S C1S meters purchased from 1969 to 2003**

LOT SIZE **33126** SAMPLE SIZE n= **49** AQL **2.5**  
 FL BAR X **99.948** FL SIGMA **0.437**  
 LL BAR X **99.952** LL SIGMA **0.526**

ESTIMATE OF LOT ABOVE 102.0%

				Table B5 Calculations	
FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 99.948}{0.437}$	=	$\frac{2.052}{0.437}$	=	<b>4.70</b>
					QU= 4.70
					n= 49
					P= <b>0.00000</b>
LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.952}{0.526}$	=	$\frac{2.048}{0.526}$	=	<b>3.89</b>
					QU= 3.89
					n= 49
					P= <b>0.00300</b>
From Table B-5 =	<b>0.000</b>	% PU FL above 102.0%			
Calculations					
	<b>0.300</b>	% PU LL above 102.0 %			

ESTIMATE OF LOT BELOW 98.0%

				Table B5 Calculations	
FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{99.948 - 98}{0.437}$	=	$\frac{1.948}{0.437}$	=	<b>4.46</b>
					QL= 4.46
					n= 49
					P= <b>0.00000</b>
LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.952 - 98}{0.526}$	=	$\frac{1.952}{0.526}$	=	<b>3.71</b>
					QL= 3.71
					n= 49
					P= <b>0.00600</b>
From table B-5 =	<b>0.000</b>	% PL FL below 98.0 %			
Calculations					
	<b>0.600</b>	% PL LL below 98.0 %			

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL      0.000      +      0.000      =      **0.000**  
 Light Load P = PU LL + PL LL      0.300      +      0.600      =      **0.900**  
 ALLOWABLE PERCENT DEFECTIVE: TABLE B-3      **4.69**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)      99.948 + 1.748      UFL = **101.696**  
 LFL = FL BAR X - (4 x FL Sigma)      99.948 - 1.748      LFL = **98.200**  
 ULL = LL BAR X + (4 x LL Sigma)      99.952 + 2.104      ULL = **102.056**  
 LLL = LL BAR X - (4 x LL Sigma)      99.952 - 2.104      LLL = **97.848**

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 METERS IN THIS SAMPLE: **2014 Sample #4 LG model MS and MX meters purchased from 1969 to 2003**

LOT SIZE **17549** SAMPLE SIZE n= **16** AQL **2.5**

FL BAR X **99.949** FL SIGMA **0.351**  
LL BAR X **99.501** LL SIGMA **0.480**

ESTIMATE OF LOT ABOVE 102.0%

					Table B5 Calculations							
FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 99.949}{0.351}$	=	$\frac{2.051}{0.351}$	=	<b>5.84</b>	<table border="1" style="float: right;"> <tr><td>QU=</td><td>5.84</td></tr> <tr><td>n=</td><td>16</td></tr> <tr><td>P=</td><td><b>0.00000</b></td></tr> </table>	QU=	5.84	n=	16	P=	<b>0.00000</b>
QU=	5.84											
n=	16											
P=	<b>0.00000</b>											
LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.501}{0.48}$	=	$\frac{2.499}{0.480}$	=	<b>5.21</b>	<table border="1" style="float: right;"> <tr><td>QU=</td><td>5.21</td></tr> <tr><td>n=</td><td>16</td></tr> <tr><td>P=</td><td><b>0.00000</b></td></tr> </table>	QU=	5.21	n=	16	P=	<b>0.00000</b>
QU=	5.21											
n=	16											
P=	<b>0.00000</b>											
From Table B-5 =		<b>0.000</b>			% PU FL above 102.0%							
Calculations		<b>0.000</b>			% PU LL above 102.0 %							

ESTIMATE OF LOT BELOW 98.0%

					Table B5 Calculations							
FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{99.949 - 98}{0.351}$	=	$\frac{1.949}{0.351}$	=	<b>5.55</b>	<table border="1" style="float: right;"> <tr><td>QL=</td><td>5.55</td></tr> <tr><td>n=</td><td>16</td></tr> <tr><td>P=</td><td><b>0.00000</b></td></tr> </table>	QL=	5.55	n=	16	P=	<b>0.00000</b>
QL=	5.55											
n=	16											
P=	<b>0.00000</b>											
LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.501 - 98}{0.48}$	=	$\frac{1.501}{0.480}$	=	<b>3.13</b>	<table border="1" style="float: right;"> <tr><td>QL=</td><td>3.13</td></tr> <tr><td>n=</td><td>16</td></tr> <tr><td>P=</td><td><b>0.06800</b></td></tr> </table>	QL=	3.13	n=	16	P=	<b>0.06800</b>
QL=	3.13											
n=	16											
P=	<b>0.06800</b>											
From table B-5 =		<b>0.000</b>			% PL FL below 98.0 %							
Calculations		<b>6.800</b>			% PL LL below 98.0 %							

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL	<u>0.000</u>	+	<u>0.000</u>	=	<b>0.000</b>
Light Load P = PU LL + PL LL	<u>0.000</u>	+	<u>6.800</u>	=	<b>6.800</b>
ALLOWABLE PERCENT DEFECTIVE: TABLE B-3	<b>4.87</b>				

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	99.949 + 1.404	UFL =	<b>101.353</b>
LFL = FL BAR X - (4 x FL Sigma)	99.949 - 1.404	LFL =	<b>98.545</b>
ULL = LL BAR X + (4 x LL Sigma)	99.501 + 1.92	ULL =	<b>101.421</b>
LLL = LL BAR X - (4 x LL Sigma)	99.501 - 1.92	LLL =	<b>97.581</b>

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 METERS IN THIS SAMPLE: **2014 Sample #5 GE model I50S meters**

LOT SIZE **3376** SAMPLE SIZE n= **27** AQL **2.5**

FL BAR X **100.142** FL SIGMA **0.272**  
LL BAR X **100.065** LL SIGMA **0.783**

ESTIMATE OF LOT ABOVE 102.0%

				Table B5 Calculations	
FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 100.142}{0.272}$	=	$\frac{1.858}{0.272}$	=	<b>6.83</b>
					QU= 6.83
					n= 27
					P= <b>0.00000</b>
LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 100.065}{0.783}$	=	$\frac{1.935}{0.783}$	=	<b>2.47</b>
					QU= 2.47
					n= 27
					P= <b>0.59500</b>
From Table B-5 =	<b>0.000</b>	% PU FL above 102.0%			
Calculations					
	<b>59.500</b>	% PU LL above 102.0 %			

ESTIMATE OF LOT BELOW 98.0%

				Table B5 Calculations	
FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{100.142 - 98}{0.272}$	=	$\frac{2.142}{0.272}$	=	<b>7.87</b>
					QL= 7.87
					n= 27
					P= <b>0.00000</b>
LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{100.065 - 98}{0.783}$	=	$\frac{2.065}{0.783}$	=	<b>2.64</b>
					QL= 2.64
					n= 27
					P= <b>0.35000</b>
From table B-5 =	<b>0.000</b>	% PL FL below 98.0 %			
Calculations					
	<b>35.000</b>	% PL LL below 98.0 %			

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL	<u>0.000</u>	+	<u>0.000</u>	=	<b>0.000</b>
Light Load P = PU LL + PL LL	<u>59.500</u>	+	<u>35.000</u>	=	<b>94.500</b>
ALLOWABLE PERCENT DEFECTIVE: TABLE B-3					<b>4.87</b>

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	100.142 + 1.088	UFL =	<u>101.230</u>
LFL = FL BAR X - (4 x FL Sigma)	100.142 - 1.088	LFL =	<u>99.054</u>
ULL = LL BAR X + (4 x LL Sigma)	100.065 + 3.132	ULL =	<u>103.197</u>
LLL = LL BAR X - (4 x LL Sigma)	100.065 - 3.132	LLL =	<u>96.933</u>

Lot is acceptable \_\_\_\_\_ Lot is unacceptable **X**  
 Tested & Reported by: Steve Ness Approved: \_\_\_\_\_