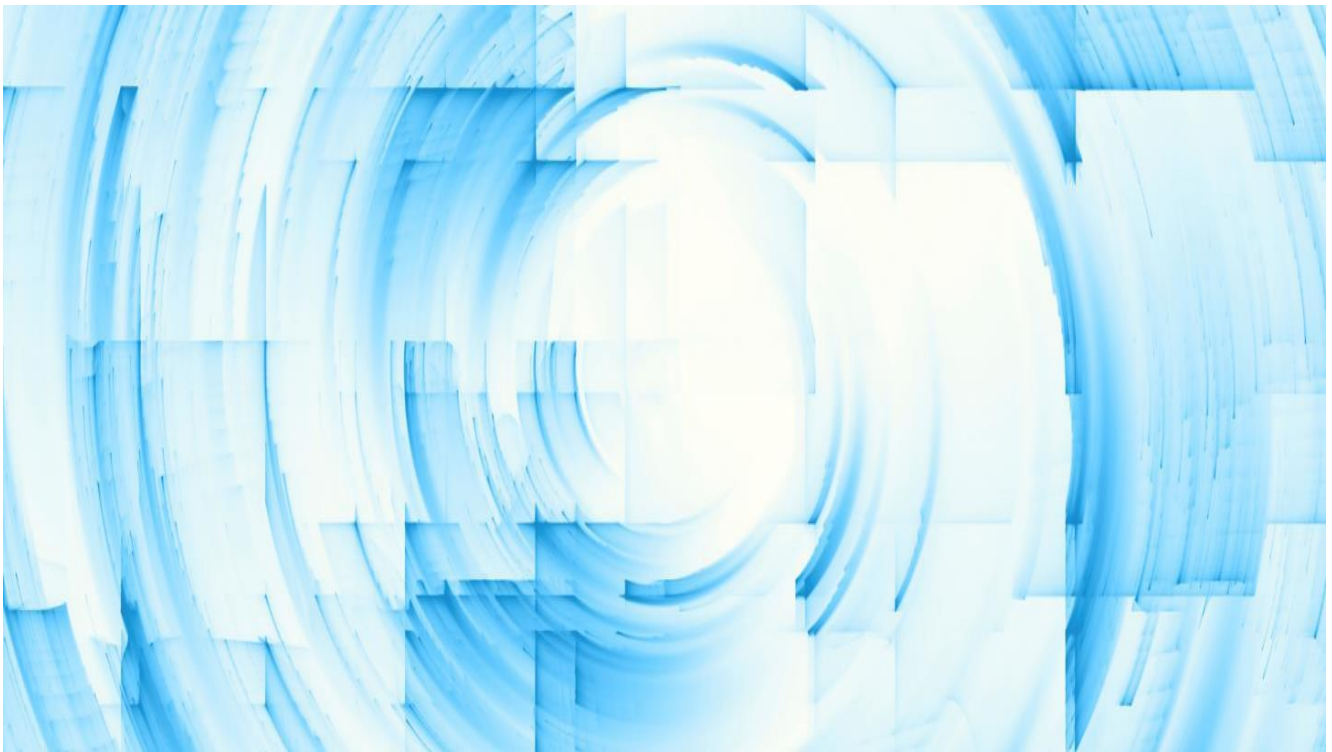


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# 2016 Michigan Public Power Agency Final Impact Evaluation Report

Report for the 2016 Energy Optimization Programs



**Date:** May 30, 2017



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## 1 EXECUTIVE SUMMARY

The Michigan Public Power Agency Energy Efficiency Service Committee (MPPA EE Service Committee) is a group of 18 Michigan municipal electric utilities that was formed to mutually verify the annual savings of similar Energy Optimization (EO) programs as required by the State of Michigan's 2008 Public Act 295 (PA 295) SEC. 71. (3)(i).

The evaluation of MPPA EE Service Committee 2016 EO programs was conducted in fourth quarter of 2016 and the first quarter of 2017. The evaluation estimated verification rates (i.e., the measures that were installed and operating as planned) using statistical sampling of participants across participating municipal utilities. These estimates were then applied to the participation parameters of specific member utilities.

This report presents the verification of energy savings for the EO programs implemented by the utilities. Table 1 recapitulates for all utilities, the verification findings, including the EO savings goals with the claimed (i.e., deemed savings), the verified gross savings and the verified net savings for all utilities. Results for each individual utility can be found in the Appendices.



## 2 INTRODUCTION

The MPPA EE Service Committee is a group of 18 Michigan municipal electric utilities (For a list of participating utilities, see Appendix A) that was formed to mutually verify the annual savings of similar (EO) programs as required by the State of Michigan’s 2008 Public Act 295 (PA 295) SEC. 71. (3)(i).

The ultimate goal of the evaluation was specified as the verification of incremental energy (kWh) savings for the MPPA EE Service Committee members’ EO programs. The MPPA EE Service Committee chose to accept the savings estimates from the Michigan Energy Measures Database (MEMD). The MEMD contain values that were current at the time the associated EO plans were approved by the Michigan Public Service Commission (MPSC or the Commission), or engineering estimates current at the time the EO plans were approved by the MPSC for measures not included in the MEMD as the source for gross energy savings. Accordingly, the objectives of the evaluation are to verify that measures are installed and operating as planned and to deliver a final annual report that provides the energy savings for each utility.

This report presents the verification results for the 18 MPPA member utilities. A recapitulation of the estimates of savings for programs implemented by the MPPA members utilizes are presented in APPENDIX B through APPENDIX S. APPENDIX T through APPENDIX W provide supporting documentation, analytical approaches, as well as generic descriptions of programs that MPPA EE Service Committee members may have implemented.



### **3 VERIFICATION OF SAVINGS ESTIMATES**

The 2016 verified savings estimates for the residential and commercial programs was prepared for each of the 18 individual utilities. Results are presented in APPENDIX B through APPENDIX S.



## **APPENDIX A. MPPA ENERGY EFFICIENCY SERVICE COMMITTEE UTILITIES**

### **UTILITIES**

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The following 18 municipal utilities with EO programs evaluated include:

- Bay City Electric Light & Power
- Charlevoix Electric System
- Chelsea Electric Department
- Croswell Light & Power Department
- City of Eaton Rapids
- Grand Haven Board of Light & Power
- Hart Hydro-Electric
- Holland Board of Public Works
- Lowell Light & Power
- Niles Utility Department
- Village of Paw Paw
- City of Petoskey
- Portland Light and Power Board
- City of St. Louis
- City of Sturgis
- Traverse City Light & Power
- Wyandotte Municipal Services
- Zeeland Board of Public Works



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## APPENDIX B. BAY CITY ELECTRIC LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2016 Bay City Light & Power Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 1 presents Bay City Light & Power's program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 351,506 kWh. Based on the analysis of the program the verified gross savings estimate is 330,469 kWh. The variance associated with this estimate was 4,573 kWh ( $\pm 1\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate is 105,728 kWh. Based on the analysis of the program the verified gross savings estimate is 92,698 kWh. The variance associated with this estimate was  $\pm 3,735$  kWh ( $\pm 4\%$ ).

**Appliance Recycling Program** deemed estimate is 91,555 kWh, due to the low volume among all utilities, the activity did not merit the cost of a verification. DNV GL performed a certification of the program, the gross savings certified at 91,555 kWh. The variance associated with this estimate is zero.

**Efficient Lighting Program** deemed savings estimate is 686,876 kWh. Based on the analysis of the program the verified gross savings estimate is 649,296 kWh. The variance associated with this estimate is  $\pm 13,663$  kWh ( $\pm 2\%$ ).

**Residential Educational Services and Pilot Programs** these programs have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 1 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 2,214,193 kWh. Based on the analysis of the program the verified gross savings estimate is 2,214,193 kWh. The variance associated with this estimate was zero.

**Business Educational Services and Pilot Programs** these programs have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 1 for the gross savings by program.

**Table 1. Bay City Electric Light & Power., EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Claimed</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	273,892	351,506	330,469	94%
<b>Residential Services</b>	<b>1,122,259</b>			
HVAC & Appliances		105,728	92,698	88%
Appliance Recycling		91,555	91,555	100%
Lighting Kits		686,876	649,296	95%
Educational Services	49,276	58,945	58,945	100%
Pilot Programs	65,701	45,145	45,145	100%
2015 Carryover	320,177			
<b>Subtotal - Residential Solutions</b>	<b>1,190,951</b>	<b>1,339,755</b>	<b>1,268,109</b>	
<b>Business Services</b>	<b>1,658,955</b>	<b>2,214,193</b>	<b>2,214,193</b>	<b>100%</b>
Commercial & Industrial	-	-	-	
Small Business Direct Install	-	-	-	
Educational Services	49,276	12,752	12,752	100%
Pilot/Emerging Technology	65,701	67,195	67,195	100%
2015 Carryover	570,566			
<b>Subtotal - Business Solutions</b>	<b>1,203,366</b>	<b>2,294,140</b>	<b>2,294,140</b>	
<b>Total Program Portfolio</b>	<b>2,394,317</b>	<b>3,633,895</b>	<b>3,562,249</b>	

## APPENDIX C. CHARLEVOIX ELECTRIC SYSTEM VERIFICATION REPORT

This section presents the verification results for the 2016 Charlevoix Electric System Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 2 presents the program goals and claimed and verified savings for the following programs:

**Low Income** program deemed savings estimate is 21,683 kWh. Based on the analysis of the program the verified gross savings estimate is 11,572 kWh. The variance associated with this estimate is kWh  $\pm 1,952$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** was 81,541 kWh. Based on the analysis of the program the verified gross savings estimate is 71,492 kWh. The variance associated with this estimate was  $\pm 2,880$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 69,925 kWh. Based on the analysis of the program the verified gross savings estimate is 47,930 kWh. The variance associated with this estimate is  $\pm 5,334$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 2 for the gross savings.

### Business Services:

**Commercial and Industrial Program** reported deemed savings estimate was 237,445 kWh. Based on the analysis of the program the verified gross savings estimate is 237,445 kWh. The variance associated with this estimate is zero.

**Business Educational Services** this program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 2 for the gross savings.

**Table 2. Charlevoix Electric System., EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Claimed</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	19,850	21,683	11,572	53%
<b>Residential Services</b>	167,471			
HVAC & Appliances		81,541	71,492	88%
Lighting Kits		69,925	47,930	69%
Educational Services	9,212	9,212	9,212	
2015 Carryover	30,329			
<b>Subtotal - Residential Solutions</b>	<b>166,204</b>	<b>182,361</b>	<b>140,206</b>	
<b>Business Services</b>	408,420	237,445	237,445	100%
Commercial & Industrial				
Educational Services	9,212	9,212	9,212	100%
Pilot/Emerging Technology	-			
2015 Carryover	171,233			
<b>Subtotal - Business Solutions</b>	<b>246,399</b>	<b>246,657</b>	<b>246,657</b>	
<b>Total Program Portfolio</b>	<b>412,603</b>	<b>429,018</b>	<b>377,840</b>	

## APPENDIX D. CHELSEA ELECTRIC DEPT. VERIFICATION REPORT

This section presents the verification results for the 2016 Chelsea Electric Dept. Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 3 presents the program goals and claimed and verified savings for the following programs:

**Low Income** Program deemed savings estimate is 15,061 kWh. Based on the analysis of the program the verified gross savings estimate is 8,038 kWh. The variance associated with this estimate was 1,356 kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 35,393 kWh. Based on the analysis of the program the verified gross savings estimate is 31,031 kWh. The variance associated with this estimate is  $\pm 1,250$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 109,933 kWh. Based on the analysis of the program the verified gross savings estimate is 75,354 kWh. The variance associated with this estimate is  $\pm 8,385$  kWh ( $\pm 8\%$ ).

**Residential Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 3 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** reported deemed savings estimate was 974,878 kWh. Based on the analysis of the program the verified gross savings estimate is 974,878 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 3 for the gross savings by program.

**Table 3. Chelsea Electric Dept., EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	15,061	15,061	8,038	53%
<b>Residential Services</b>	80,994	-		
HVAC & Appliances		35,393	31,031	88%
Lighting Kits		109,933	75,354	69%
Educational Services	14,408	14,408	14,408	100%
Pilot Programs	24,014	400	400	100%
2015 Carryover	(8,392)			
<b>Subtotal - Residential Solutions</b>	<b>142,869</b>	<b>175,195</b>	<b>129,231</b>	
<b>Business Services</b>	787,651	974,878	974,878	100%
Commercial & Industrial		-		
Small Business Direct Install		-		
Educational Services	14,408	14,408	14,408	100%
Pilot/Emerging Technology	24,014	24,014	24,014	100%
2015 Carryover	60,357			
<b>Subtotal - Business Solutions</b>	<b>765,716</b>	<b>1,013,300</b>	<b>1,013,300</b>	
<b>Total Program Portfolio</b>	<b>908,585</b>	<b>1,188,495</b>	<b>1,142,531</b>	

## APPENDIX E. CITY OF CROSWELL VERIFICATION REPORT

This section presents the verification results for the 2016 City of Croswell Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year (“goal”), the estimated goals achieved (“claimed or deemed savings”) and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program (“gross verified and verification rate”). Table 4 presents the program goals and claimed and verified savings for the following programs:

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 1,651 kWh. Based on the analysis of the program the verified gross savings estimate is 1,448 kWh. The variance associated with this estimate is ±58 kWh (±4%).

### Business Services:

**Commercial and Industrial Program** reported deemed savings estimate was 539,803 kWh. Based on the analysis of the program the verified gross savings estimate is 539,803 kWh. The variance associated with this estimate is zero.

**Table 4. City of Croswell, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	15,195			
<b>Residential Services</b>	22,125			
HVAC & Appliances		1,651	1,448	88%
Educational Services	5,331			
Pilot Programs	10,663			
2015 Carryover				
<b>Subtotal - Residential Solutions</b>	<b>53,314</b>	<b>1,651</b>	<b>1,448</b>	
<b>Business Services</b>	296,784	539,803	539,803	100%
Commercial & Industrial				
Small Business Direct Install				
Educational Services	5,331			
Pilot/Emerging Technology	-			
2015 Carryover	27,192			
<b>Subtotal - Business Solutions</b>	<b>274,923</b>	<b>539,803</b>	<b>539,803</b>	
<b>Total Program Portfolio</b>	<b>328,237</b>	<b>541,454</b>	<b>541,251</b>	

## APPENDIX F. CITY OF EATON RAPIDS VERIFICATION REPORT

This section presents the verification results for the 2016 City of Eaton Rapids Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 5 presents the program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate was 23,826 kWh. Based on the analysis of the program the verified gross savings estimate is 12,716 kWh. The variance associated with this estimate is  $\pm 2,145$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 6,595 kWh. Based on the analysis of the program the verified gross savings estimate is 5,782 kWh. The variance associated with this estimate is  $\pm 233$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 68,234 kWh. Based on the analysis of the program the verified gross savings estimate is 46,771 kWh. The variance associated with this estimate is  $\pm 5,204$  kWh ( $\pm 8\%$ ).

**Residential Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 5 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 111,913 kWh. Based on the analysis of the program the verified gross savings estimate is 111,913 kWh. The variance associated with this estimate is zero.



**Table 5. City of Eaton Rapids, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	23,826	23,826	12,716	53%
<b>Residential Services</b>	107,088	-		
HVAC & Appliances		6,595	5,782	88%
Lighting Kits		68,234	46,771	69%
Educational Services	8,182	8,182	8,182	
Pilot Programs	13,637	180	180	
2015 Carryover	31,902			
<b>Subtotal - Residential Solutions</b>	<b>120,831</b>	<b>107,017</b>	<b>73,631</b>	
<b>Business Services</b>	370,924	-		
Commercial & Industrial		111,913	111,913	100%
Small Business Direct Install		-		
Educational Services	8,182	-		
Pilot/Emerging Technology	13,637	-		
2015 Carryover	231,319			
<b>Subtotal - Business Solutions</b>	<b>161,424</b>	<b>111,913</b>	<b>111,913</b>	
<b>Total Program Portfolio</b>	<b>282,255</b>	<b>218,930</b>	<b>185,544</b>	

## APPENDIX G. GRAND HAVEN BOARD OF LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2016 Grand Haven Board of Light & Power (BLP) Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 3 Table 6 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 22,891 kWh. Based on the analysis of the program the verified gross savings estimate is 12,217 kWh. The variance associated with this estimate is  $\pm 2,061$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 531,028 kWh. Based on the analysis of the program the verified gross savings estimate is 465,584 kWh. The variance associated with this estimate is  $\pm 18,760$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 592,320 kWh. Based on the analysis of the program the verified gross savings estimate is 406,009 kWh. The variance associated with this estimate is  $\pm 45,181$  kWh ( $\pm 8\%$ ).

**Residential Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 7 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 3,024,329 kWh. Based on the analysis of the program the verified gross savings estimate is 3,024,329 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 7 for the gross savings by program.

**Table 6. Grand Haven BLP, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	40,061	22,891	12,216.66	53%
<b>Residential Services</b>	630,133	-		
HVAC & Appliances		531,028	465,584.57	88%
Lighting Kits		592,320	406,009.12	69%
Educational Services	54,710	51,065	51,065	
Pilot Programs	68,387	-		
2015 Carryover				
<b>Subtotal - Residential Solutions</b>	<b>793,291</b>	<b>1,197,304</b>	<b>934,875</b>	
<b>Business Services</b>	1,846,454	-		
Commercial & Industrial		3,024,329	3,024,329	100%
Small Business Direct Install		-		
Educational Services	27,355	1,525	1,525	100%
Pilot/Emerging Technology	68,387	51,775	51,775	100%
2015 Carryover				
<b>Subtotal - Business Solutions</b>	<b>1,942,196</b>	<b>3,077,629</b>	<b>3,077,629</b>	
<b>Total Program Portfolio</b>	<b>2,735,487</b>	<b>4,274,933</b>	<b>4,012,504</b>	

## APPENDIX H. HART HYDRO ELECTRIC VERIFICATION REPORT

This section presents the verification results for the 2016 Hart Hydro Electric Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 7 Table 3 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 11,616 kWh. Based on the analysis of the program the verified gross savings estimate is 6,199 kWh. The variance associated with this estimate is  $\pm 1,045$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/ HVAC) Program** deemed estimate was 3,395 kWh. Based on the analysis of the program the verified gross savings estimate is 2,977 kWh. The variance associated with this estimate is  $\pm 120$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 10,662 kWh. Based on the analysis of the program the verified gross savings estimate is 7,308 kWh. The variance associated with this estimate is  $\pm 813$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 7 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 394,755 kWh. Based on the analysis of the program the verified gross savings estimate is 394,755 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot/Emerging Technologies Programs** these programs have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 7 for the gross savings by program.

**Table 7. Hart Hydro Electric, EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	11,314	11,616	6,199	53%
<b>Residential Services</b>	38,481	-		-
HVAC & Appliances		3,395	2,977	88%
Lighting Kits		10,662	7,308	69%
Educational Services	6,495	6,495	6,495	100%
2015 Carryover	60,469			
<b>Subtotal - Residential Solutions</b>	<b>(4,179)</b>	<b>32,168</b>	<b>22,979</b>	
<b>Business Services</b>	370,215	-	-	
Commercial & Industrial		394,755	394,755	100%
Small Business Direct Install		-	-	
Educational Services	6,495			
Pilot/Emerging Technology	-	-	-	
2015 Carryover	4,352			
<b>Subtotal - Business Solutions</b>	<b>372,358</b>	<b>394,755</b>	<b>394,755</b>	
<b>Total Program Portfolio</b>	<b>368,179</b>	<b>426,923</b>	<b>417,735</b>	

## APPENDIX I. HOLLAND BPW VERIFICATION REPORT

This section presents the verification results for the 2016 Holland BPW Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). **Error! Reference source not found.** Table 3 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 395,948 kWh. Based on the analysis of the program the verified gross savings estimate is 211,313 kWh. The variance associated with this estimate is  $\pm 35,652$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 312,691 kWh. Based on the analysis of the program the verified gross savings estimate is 274,155 kWh. The variance associated with this estimate is  $\pm 11,047$  kWh ( $\pm 7\%$ ).

**Appliance Recycling Program** deemed estimate is 315,120 kWh, due to the low of activity among all utilities, the program did not merit the cost of a verification. DNV GL performed a certification of the program, the gross savings certified at 315,120 kWh.

**Efficient Lighting Program** deemed savings estimate is 914,453 kWh. Based on the analysis of the program the verified gross savings estimate is 626,817 kWh. The variance associated with this estimate is  $\pm 69,752$  kWh ( $\pm 8\%$ ).

**Residential Educational Services, Pilot Programs and Energy Star New Homes** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see **Error! Reference source not found.** for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 11,403,560 kWh. Based on the analysis of the program the verified gross savings estimate is 11,403,560 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see **Error! Reference source not found.** for the gross savings by program.

**Table 8. Holland BPW, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	281,062	395,948	211,313	53%
Residential Services	966,158	-		
<i>HVAC &amp; Appliances</i>		312,691	274,155	88%
<i>Appliance Recycling</i>		315,120	315,120	100%
<i>Efficient Lighting</i>		914,453	626,817	88%
<i>Multifamily</i>		50,025	50,025	100%
<i>ENERGY STAR New Homes</i>		3,812	3,812	100%
Educational Services	162,681	187,024	187,024	100%
Pilot Programs	271,135	19,991	19,991	100%
<i>2015 Carryover</i>	417,280			
<b>Subtotal - Residential Solutions</b>	<b>1,263,756</b>	<b>2,199,064</b>	<b>1,688,257</b>	
Business Services	8,730,540	-	-	
<i>Commercial &amp; Industrial</i>		11,403,560	11,403,560	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	162,681	67,951	162,681	100%
Pilot/Emerging Technology	271,135	75,236	271,135	100%
<i>2015 Carryover</i>	2,274,851			
<b>Subtotal - Business Solutions</b>	<b>6,889,505</b>	<b>11,546,747</b>	<b>11,546,747</b>	
<b>Total Program Portfolio</b>	<b>8,153,261</b>	<b>13,745,811</b>	<b>13,235,004</b>	

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## APPENDIX J.      LOWELL LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2016 Lowell Light & Power Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 3 Table 9 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 29,377 kWh. Based on the analysis of the program the verified gross savings estimate is 29,377 kWh. The variance associated with this estimate is zero.

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 37,461 kWh. Based on the analysis of the program the verified gross savings estimate is 32,845 kWh. The variance associated with this estimate is  $\pm 1,323$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 92,221 kWh. Based on the analysis of the program the verified gross savings estimate is 63,213 kWh. The variance associated with this estimate is  $\pm 7,034$  kWh ( $\pm 8\%$ ).

**Residential Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 9 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 1,048,051 kWh. Based on the analysis of the program the verified gross savings estimate is 1,048,051 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 9 for the gross savings by program.



**Table 9. Lowell Light & Power, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	15,000	29,377	29,377	100%
Residential Services	128,837	-	-	
<i>HVAC &amp; Appliances</i>		37,461	32,845	88%
<i>Efficient Lighting</i>		92,221	63,213	69%
Educational Services	10,274	10,274	10,274	100%
Pilot Programs	17,124	14,155	14,155	100%
<i>2015 Carryover</i>	31,481			
<b>Subtotal - Residential Solutions</b>	<b>139,754</b>	<b>183,488</b>	<b>149,864</b>	
Business Services	486,309	-	-	
<i>Commercial &amp; Industrial</i>		1,048,051	1,048,051	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	10,274	7,158	7,158	100%
Pilot/Emerging Technology	17,124	17,124	17,124	100%
<b>Subtotal - Business Solutions</b>	<b>513,707</b>	<b>1,072,333</b>	<b>1,072,333</b>	
<b>Total Program Portfolio</b>	<b>653,461</b>	<b>1,255,821</b>	<b>1,222,197</b>	

## APPENDIX K. NILES UTILITY DEPT. VERIFICATION REPORT

This section presents the verification results for the 2016 Niles Utility Dept. Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 10 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 44,141 kWh. Based on the analysis of the program the verified gross savings estimate is 23,557 kWh. The variance associated with this estimate is  $\pm 3,974$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 75,903 kWh. Based on the analysis of the program the verified gross savings estimate is 66,549 kWh. The variance associated with this estimate is  $\pm 2,681$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 561,044 kWh. Based on the analysis of the program the verified gross savings estimate is 384,570 kWh. The variance associated with this estimate is  $\pm 42,795$  kWh ( $\pm 8\%$ ).

**Residential Educational Services, Pilot Programs and Energy Star New Homes** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 10 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 698,245 kWh. Based on the analysis of the program the verified gross savings estimate is 698,245 kWh. The variance associated with this estimate is zero.

**Business Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 10 for the gross savings by program.

**Table 10. Niles Utility Dept., EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	43,445	44,141	23,557	53%
Residential Services	394,268	-		
<i>HVAC&amp; Appliances</i>		75,903	66,549	88%
<i>Efficient Lighting</i>		561,044	384,571	69%
Educational Services	19,599	19,599	19,599	100%
<i>2015 Carryover</i>	(416,779)			
<b>Subtotal - Residential Solutions</b>	<b>874,091</b>	<b>700,687</b>	<b>494,276</b>	
Business Services	829,694	-	-	
<i>Commercial &amp; Industrial</i>		698,245	698,245	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	19,599	19,599	19,599	100%
<i>2015 Carryover</i>	472,800			
<b>Subtotal - Business Solutions</b>	<b>376,493</b>	<b>717,844</b>	<b>717,844</b>	
<b>Total Program Portfolio</b>	<b>1,250,584</b>	<b>1,418,531</b>	<b>1,212,120</b>	

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## APPENDIX L. VILLAGE OF PAW PAW VERIFICATION REPORT

This section presents the verification results for the 2016 Village of Paw Paw Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 11 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 39,494 kWh. Based on the analysis of the program the verified gross savings estimate is 21,077 kWh. The variance associated with this estimate is  $\pm 3,556$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 18,511 kWh. Based on the analysis of the program the verified gross savings estimate is 16,230 kWh. The variance associated with this estimate is  $\pm 654$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 68,234 kWh. Based on the analysis of the program the verified gross savings estimate is 46,771 kWh. The variance associated with this estimate is  $\pm 5,205$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 11 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 285,355 kWh. Based on the analysis of the program the verified gross savings estimate is 285,355 kWh. The variance associated with this estimate is zero.

**Business Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 11 for the gross savings by program.

**Table 11. Village of Paw Paw, EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	38,955	39,494	21,077	53%
<b>Residential Services</b>	83,545	-		
<i>HVAC &amp; Appliances</i>		18,511	16,230	88%
<i>Efficient Lighting</i>		68,234	46,771	69%
Educational Services	7,350	7,350	7,350	100%
<i>2015 Carryover</i>	11,352			
<b>Subtotal - Residential Solutions</b>	<b>118,498</b>	<b>133,589</b>	<b>91,429</b>	
Business Services	352,800	-	-	
<i>Commercial &amp; Industrial</i>		285,355	285,355	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	7,350	7,350	7,350	100%
Pilot/Emerging Technology		-	-	
<i>2015 Carryover</i>	456,678			
<b>Subtotal - Business Solutions</b>	<b>(96,528)</b>	<b>292,705</b>	<b>292,705</b>	
<b>Total Program Portfolio</b>	<b>21,970</b>	<b>426,294</b>	<b>384,134</b>	

## APPENDIX M. CITY OF PETOSKEY VERIFICATION REPORT

This section presents the verification results for the 2016 City of Petoskey Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 12 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 45,324 kWh. Based on the analysis of the program the verified gross savings estimate is 24,189 kWh. The variance associated with this estimate is  $\pm 4,081$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 62,630 kWh. Based on the analysis of the program the verified gross savings estimate is 54,912 kWh. The variance associated with this estimate is  $\pm 2,213$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 35,540 kWh. Based on the analysis of the program the verified gross savings estimate is 24,361 kWh. The variance associated with this estimate is  $\pm 2,711$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 12 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 1,122,205 kWh. Based on the analysis of the program the verified gross savings estimate is 1,122,205 kWh. The variance associated with this estimate was zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 12 for the gross savings by program.

**Table 12. City of Petoskey, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	45,324	45,324	24,189	53%
Residential Services	101,539	-		
<i>HVAC&amp; Appliances</i>		62,630	54,912	88%
<i>Efficient Lighting</i>		35,540	24,361	69%
Educational Services	16,946	16,946	16,946	100%
Pilot Programs	28,243	366	366	100%
<i>2015 Carryover</i>	27,466			
<b>Subtotal - Residential Solutions</b>	<b>164,586</b>	<b>160,806</b>	<b>120,773</b>	
Business Services	892,473	-		
<i>Commercial &amp; Industrial</i>		1,122,205	1,122,205	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	16,946	16,946	16,946	100%
Pilot/Emerging Technology	28,243	28,243	28,243	100%
<i>2015 Carryover</i>	171,887			
<b>Subtotal - Business Solutions</b>	<b>765,775</b>	<b>1,167,394</b>	<b>1,167,394</b>	
<b>Total Program Portfolio</b>	<b>930,361</b>	<b>1,328,200</b>	<b>1,288,167</b>	

## APPENDIX N. CITY OF PORTLAND LPB VERIFICATION REPORT

This section presents the verification results for the 2016 City of Portland Light and Power Board Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 13 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 9,292 kWh. Based on the analysis of the program the verified gross savings estimate is 4,959 kWh. The variance associated with this estimate is  $\pm 836$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 22,156 kWh. Based on the analysis of the program the verified gross savings estimate is 19,425 kWh. The variance associated with this estimate is  $\pm 783$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 187,649 kWh. Based on the analysis of the program the verified gross savings estimate is 128,625 kWh. The variance associated with this estimate is  $\pm 14,313$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 13 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 317,643 kWh. Based on the analysis of the program the verified gross savings estimate is 317,643 kWh. The variance associated with this estimate is zero.

**Business Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 13 for the gross savings by program.



**Table 13. City of Portland Light and Power Board, EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	8,926	9,292	4,959	53%
Residential Services	145,034	-		
<i>HVAC&amp; Appliances</i>		22,156	19,425	88%
<i>Efficient Lighting</i>		187,649	128,625	69%
Educational Services	5,434	5,434	5,434	100%
Pilot Programs	-	-		
<i>2015 Carryover</i>	(29,388)			
<b>Subtotal - Residential Solutions</b>	<b>188,782</b>	<b>224,531</b>	<b>158,444</b>	
Business Services	197,432	-		
<i>Commercial &amp; Industrial</i>		317,643	317,643	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	5,434	5,434	5,434	100%
<i>2015 Carryover</i>	252,576			
<b>Subtotal - Business Solutions</b>	<b>(49,710)</b>	<b>323,077</b>	<b>323,077</b>	
<b>Total Program Portfolio</b>	<b>139,072</b>	<b>547,608</b>	<b>481,521</b>	

## APPENDIX O. CITY OF ST. LOUIS VERIFICATION REPORT

This section presents the verification results for the 2016 City of St. Louis Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 14 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 17,037 kWh. Based on the analysis of the program the verified gross savings estimate is 9,092 kWh. The variance associated with this estimate is  $\pm 1,534$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 1,300 kWh. Based on the analysis of the program the verified gross savings estimate is 1,140 kWh. The variance associated with this estimate is  $\pm 46$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 122,765 kWh. Based on the analysis of the program the verified gross savings estimate is 84,150 kWh. The variance associated with this estimate is  $\pm 9,364$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 14 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 231,748 kWh. Based on the analysis of the program the verified gross savings estimate is 231,748 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 14 for the gross savings by program.

**Table 14. City of St. Louis, EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	16,430	17,037	9,092.45	53%
Residential Services	81,122	-		
<i>HVAC&amp; Appliances</i>		1,300	995.92	77%
<i>Appliance Recycling</i>		-	-	
<i>Efficient Lighting</i>		122,765	84,149.83	69%
<i>Multifamily</i>		-	-	
<i>ENERGY STAR New Homes</i>			-	
Educational Services	5,628	5,628	5,628	100%
Pilot Programs	5,628			
<i>2015 Carryover</i>	(40,073)			
<b>Subtotal - Residential Solutions</b>	<b>148,881</b>	<b>146,730</b>	<b>99,866</b>	
Business Services	253,258	-		
<i>Commercial &amp; Industrial</i>		231,748	231,748	100%
<i>Small Business Direct Install</i>		-	-	
Educational Services	5,628	5,628	5,628	100%
Pilot/Emerging Technology	7,504	-	-	
<i>2015 Carryover</i>	252,576			
<b>Subtotal - Business Solutions</b>	<b>13,814</b>	<b>237,376</b>	<b>5,628</b>	
<b>Total Program Portfolio</b>	<b>162,695</b>	<b>384,106</b>	<b>105,494</b>	

## APPENDIX P. CITY OF STURGIS VERIFICATION REPORT

This section presents the verification results for the 2016 City of Sturgis Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 15 presents the reported the savings estimate for the following programs:

**Low Income Program** deemed savings estimate is 47,238 kWh. Based on the analysis of the program the verified gross savings estimate is 25,210 kWh. The variance associated with this estimate is  $\pm 4,253$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 108,901 kWh. Based on the analysis of the program the verified gross savings estimate is 95,480 kWh. The variance associated with this estimate is  $\pm 3,847$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 355,400 kWh. Based on the analysis of the program the verified gross savings estimate is 234,611 kWh. The variance associated with this estimate is  $\pm 27,109$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 15 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 2,614,338 kWh. Based on the analysis of the program the verified gross savings estimate is 2,614,338 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 15 for the gross savings by program.

**Table 15. City of Sturgis EO Program Goals, Claimed and Verified Savings (kWh)**

<b>Program Portfolio</b>	<b>Goal</b>	<b>Achieved</b>	<b>Gross Verified</b>	<b>Verification Rate</b>
Low Income	47,202	47,238	25,210	53%
Residential Services	237,557	-		
<i>HVAC &amp; Appliances</i>		108,901	95,480	88%
<i>Efficient Lighting</i>		355,400	243,611	69%
Educational Services	34,171	34,171	34,171	100%
Pilot Programs	-	-		
<i>2015 Carryover</i>	54,351			
<b>Subtotal - Residential Solutions</b>	<b>264,579</b>	<b>545,710</b>	<b>398,472</b>	
Business Services	1,811,063	-		
<i>Commercial &amp; Industrial</i>		2,614,338	2,614,338	100%
<i>Small Business Direct Install</i>		-		
Educational Services	34,171	34,171	34,171	100%
Pilot/Emerging Technology	113,903	-	-	
<i>2015 Carryover</i>	277,723			
<b>Subtotal - Business Solutions</b>	<b>1,681,414</b>	<b>2,648,509</b>	<b>2,648,509</b>	
<b>Total Program Portfolio</b>	<b>1,945,993</b>	<b>3,194,219</b>	<b>3,046,981</b>	

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## APPENDIX Q. TRAVERSE CITY LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2016 Traverse City Light & Power Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 16 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 22,827 kWh. Based on the analysis of the program the verified gross savings estimate is 12,183 kWh. The variance associated with this estimate is  $\pm 2,055$  kWh ( $\pm 9\%$ ).

### Residential Services:

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 145,253 kWh. Based on the analysis of the program the verified gross savings estimate is 127,352 kWh. The variance associated with this estimate is  $\pm 5,312$  kWh ( $\pm 4\%$ ).

**Efficient Lighting Program** deemed savings estimate is 106,620 kWh. Based on the analysis of the program the verified gross savings estimate is 73,083 kWh. The variance associated with this estimate is  $\pm 8,133$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 16 for the gross savings by program.

### Business Services:

**Commercial and Industrial Program** deemed savings estimate was 4,739,913 kWh. Based on the analysis of the program the verified gross savings estimate is 4,739,913 kWh. The variance associated with this estimate is zero.

**Business Educational Services and Pilot Programs** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 16 for the gross savings by program.

**Table 16. Traverse City Light & Power, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	22,827	22,827	12,183	53%
Residential Services	415,135	-		
<i>HVAC &amp; Appliances</i>		145,253	127,352	88%
<i>Efficient Lighting</i>		106,620	73,083	69%
Educational Services	49,768	49,768	49,768	100%
Pilot Programs	82,947	405	405	100%
<i>2015 Carryover</i>	(150,073)			
<b>Subtotal - Residential Solutions</b>	<b>720,750</b>	<b>324,873</b>	<b>262,791</b>	
Business Services	2,614,499	-		
<i>Commercial &amp; Industrial</i>		4,739,913	4,739,913	100%
Educational Services	49,768	49,768	49,768	100%
Pilot/Emerging Technology	82,947	100	100	100%
<i>2015 Carryover</i>	86,571			
<b>Subtotal - Business Solutions</b>	<b>2,660,643</b>	<b>4,789,781</b>	<b>4,789,781</b>	
<b>Total Program Portfolio</b>	<b>3,381,393</b>	<b>5,114,654</b>	<b>5,052,572</b>	

## APPENDIX R. WYANDOTTE MUNICIPAL SERVICES, VERIFICATION REPORT

This section presents the verification results for the 2016 Wyandotte Municipal Services Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 17 Table 16 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 996 kWh. Based on the analysis of the program the verified gross savings estimate is 531 kWh. The variance associated with this estimate is  $\pm 90$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 58,556 kWh. Based on the analysis of the program the verified gross savings estimate is 51,340 kWh. The variance associated with this estimate is  $\pm 2,069$  kWh ( $\pm 4\%$ ).

**Appliance Recycling Program** deemed estimate is 57,237 kWh. Due to the low volume among all utilities, the activity did not merit the cost of a verification. DNV GL performed a certification of the program, the gross savings certified at 57,237 kWh. The variance associated with this estimate is zero.

**Efficient Lighting Program** deemed savings estimate is 53,479 kWh. Based on the analysis of the program the verified gross savings estimate is 36,657 kWh. The variance associated with this estimate is  $\pm 4,079$  kWh ( $\pm 8\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 17 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 865,512 kWh. Based on the analysis of the program the verified gross savings estimate is 865,512 kWh. The variance associated with this estimate is zero.



**Table 17. Wyandotte Municipal Services, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	79,516	996	531	53%
Residential Services	617,268	-		
<i>HVAC &amp; Appliances</i>		58,556	51,340	88%
<i>Appliance Recycling</i>		57,237	57,237	100%
<i>Efficient Lighting</i>		53,479	36,657	69%
Educational Services	74,741	5,956.28	5,956	100%
Pilot Programs	59,739	-	-	
<i>2015 Carryover</i>				
<b>Subtotal - Residential Solutions</b>	<b>831,264</b>	<b>176,224</b>	<b>151,722</b>	
Business Services	955,233	-		
<i>Commercial &amp; Industrial</i>		865,512	865,512	100%
<i>Small Business Direct Install</i>		18,562	18,562	100%
Educational Services	15,065	-	-	
Pilot/Emerging Technology	90,388	-	-	
<i>2015 Carryover</i>	285,165			
<b>Subtotal - Business Solutions</b>	<b>775,521</b>	<b>884,073</b>	<b>884,073</b>	
<b>Total Program Portfolio</b>	<b>1,606,785</b>	<b>1,060,297</b>	<b>1,035,795</b>	

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## APPENDIX S. ZEELAND BPW, VERIFICATION REPORT

This section presents the verification results for the Zeeland Board of Public Works Energy Optimization program portfolio. The results identify the goals the utility program sought to achieve at the beginning of the program year ("goal"), the estimated goals achieved ("claimed or deemed savings") and the gross verification rate which is the percentage of measures that are installed and operating as planned for each program ("gross verified and verification rate"). Table 18 presents program goals and claimed and verified savings for the following programs:

**Low Income Program** deemed savings estimate is 51,110 kWh. Based on the analysis of the program the verified gross savings estimate is 27,277 kWh. The variance associated with this estimate is  $\pm 4,602$  kWh ( $\pm 9\%$ ).

### **Residential Services:**

**High-Efficiency Products (Appliances/HVAC) Program** deemed estimate was 325,108 kWh. Based on the analysis of the program the verified gross savings estimate is 285,041 kWh. The variance associated with this estimate is  $\pm 11,485$  kWh ( $\pm 4\%$ ).

**Residential Educational Services** have stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 18 for the gross savings by program.

### **Business Services:**

**Commercial and Industrial Program** deemed savings estimate was 2,173,369 kWh. Based on the analysis of the program the verified gross savings estimate is 2,173,369 kWh. The variance associated with this estimate is zero.

**Table 18. Zeeland BPW, EO Program Goals, Claimed and Verified Savings (kWh)**

Program Portfolio	Goal	Achieved	Gross Verified	Verification Rate
Low Income	50,798	51,110	27,277	53%
Residential Services	186,427			
<i>HVAC &amp; Appliances</i>		325,108	285,042	88%
Educational Services	47,445	43,094	43,094	100%
Pilot Programs	63,260			
<i>2015 Carryover</i>	42,208			
<b>Subtotal - Residential Solutions</b>	<b>305,722</b>	<b>419,312</b>	<b>355,413</b>	
Business Services	2,767,617	-		
<i>Commercial &amp; Industrial</i>		2,173,369	2,173,369	100%
<i>Small Business Direct Install</i>		-		
Educational Services	47,445	-		
<i>2015 Carryover</i>	933,459			
<b>Subtotal - Business Solutions</b>	<b>1,881,603</b>	<b>2,173,369</b>	<b>2,173,369</b>	
<b>Total Program Portfolio</b>	<b>2,187,325</b>	<b>2,592,681</b>	<b>2,528,782</b>	

## APPENDIX T. PROGRAM DESCRIPTIONS

The utilities and MPPA EE Service Committee municipal utility members offered a variety of residential, commercial and industrial EO programs. This appendix briefly and generically describes the programs that may have been offered by the individual utilities. The individual utilities determined which of the specific programs were offered to their customers, as well the appropriate implementation approach.

### RESIDENTIAL PROGRAMS

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**Efficient Lighting Program:** This program promotes the installation of ENERGY STAR LED-based lighting. The most common lamps dispersed through the program were LED 60w equivalent bulbs followed by LED night lights. The program also offers the following: LEDs: A lamp, candelabra, globe, flood, night lights and interior and exterior lamps, and fixtures (custom). The light bulbs are primarily distributed in the form of kits however distributions methods vary according to each utility's preference. The distribution methods may include: direct-install, drive-through give-away, rebates in-store promotion; special sales: internet orders; coupons; over the counter at the utility offices; or at events (i.e. home shows). The Efficient Lighting Program was marketed in various ways such as through the utility website and through return cards that were mailed out to customers. The Efficient Lighting Program also provides opportunities for recycling CFLs.

**Refrigerator/Freezer Turn-In Program:** This program was not offered by the majority of utilities in 2016 due to the lack of a service provider. In previous years Jaco offered this service. Among the few utilities that were able to operate the program, it is designed to encourage customers to dispose of "second" refrigerators and encourages the accelerated retirement of older, inefficient "primary" refrigerators and freezers. The program offers turnkey pick up and recycling services.

**High-Efficiency Appliances/ High-Efficiency HVAC (High Efficiency Products):** This program provides incentives to customers to encourage them to replace their older, inefficient dehumidifiers and room air-conditioners with high-efficiency ENERGY STAR qualified units. This program also promotes heating and cooling technologies that can reduce electric energy use. The program focuses on the promotion of high-efficiency central air-conditioning and premium efficiency furnaces that have high-efficiency motors (electrically commutated motors – ECMs). ECM motors save electric energy during the heating and cooling seasons.

**Low Income Services Program:** This program provides funding to customers living on limited incomes subsidizing the installation of cost effective energy efficient electric measures. The delivery of the program is coordinated with local weatherization or Low Income Assistance agencies.

**Multifamily Direct Install Program:** The Multifamily program installs complimentary energy saving measures to reduce the amount of energy that is consumed not only in each unit but the property as a



whole. The measures include CFL light bulbs, aerators, and shower heads. The program is marketed to property managers, communities and property development companies by sending literature, holding events, completing energy assessments and social media marketing.

**Education Services:** This program provides informative and actionable educational materials to residential customers that educate customers on the benefits of energy efficiency and conservation. Such materials include brochures, fact sheets, workshops, web sites and online energy audits.

**Pilot/Emerging Technology Program:** Residential pilot programs pursue new initiatives such as residential-sized HVAC equipment optimization, advanced residential water heating technology or promotion of LED lighting technology in residential applications.

## APPENDIX U. SAMPLE DESIGN

### MPPA Energy Services Committee 2016 Energy Optimization Program Verification Sample Design Report

**Methodology:** A sample was designed for each MPPA program, except the Multifamily program. Model based statistical sampling (MBSS) was used to guide the sample design. This technique uses a statistical model and its parameters to represent prior information about the population to be sampled. The model describes the nature of the variation in the relationship between a key target variable  $y$  of the study (called the dependent variable), in this case the verified amount of program energy savings and an explanatory variable  $x$ , in this case the tracking system estimate of savings. The model is used to help choose the sample size ("n") and to help formulate a sample design with near-optimal stratification for stratified ratio estimation. The model describes the trend and the variation around the trend, i.e., the conditional mean and standard deviation of  $y$  given  $x$ .

#### Equation 1. Primary and secondary equations

$$y_k = \beta x_k + \varepsilon_k$$
$$\sigma_k = sd(\varepsilon_k) = \sigma_0 x_k^\gamma$$

Equation 1 illustrates the primary and secondary equations of the model that are used in the sample design. Here  $x_k > 0$  is the tracking system estimate of energy savings, and is known for each participant,  $k$ , in the population. The residuals are considered to be independent random variables with zero expected value and standard deviations following the secondary equation. There are three parameters in the model:  $\beta$  (beta),  $\sigma_0$  (sigma-naught), and  $\gamma$  (gamma). The coefficient beta is a fixed constant applied to the known tracking estimate  $x_k$  to predict the verified savings  $y_k$ .  $\sigma_k$  is the residual standard deviation of each unit  $k$ . Both the expected value  $\sigma_k$  and residual standard deviation  $\sigma_k$  generally vary from one unit to another depending on  $x_k$ , following the primary and secondary equations of the model. In statistical terms, the ratio model is a heteroscedastic regression model with zero intercept. Gamma describes how the standard deviation varies in relationship to the tracking system estimate of savings.

Where:

$D$  is the desired relative precision,

and  $z$  corresponds to the desired confidence level.

#### Equation 2. Initial sample size calculator

$$n_0 \approx \left( \frac{z \cdot er}{D} \right)^2$$
$$n = \frac{n_0}{1 + n_0/N}$$

Using MBSS techniques in sample design minimizes the uncertainty of the results by controlling the variation of the sample. Accordingly, for the verification the initial sample size was determined using Equation 2. Sample size is based on an assumed "error ratio".

The true beta terms and true error ratios are not known. However, the sample can be designed using estimates of these parameters based on last years' evaluation results that determined "gross" verified savings. Last year's results were examined, and subjectively adjusted to be conservative when establishing this year's sample sizes.

**Sample Design:** Table 19 presents a recap of the sample design parameters, and expected confidence intervals.

**Table 19. Sample design parameters, sample sizes and expected confidence intervals**

Parameter	Beta	Error Ratio	Assumed Population	Sample Size 90/10 Confidence Level	Study Sample Size and Confidence Interval	
	$\beta$	ER	N	n	n	Gross CI
<b>Program</b>						
<b>Residential</b>						
Lighting	0.95	0.20	2,412	15	43	5.8%
High Efficiency Appliances	0.95	0.24	2,252	16	24	11.6%
Low Income	0.95	0.20	645	11	33	2.5%
<b>C&amp;I</b>						
Prescriptive/Custom	0.95	0.10	245	3	22	3.4%

Table 20 shows that to achieve a  $\pm 10\%$  confidence interval at the 90% confidence level the sample sizes range from 3 to 16. The sample sizes for the Lighting and Low Income were increased for the additional sample points for Bay City. Due to the uncertainty of the assumptions, the sample size for the C&L Prescriptive/Custom program was increased to assure adequate coverage. The Multifamily program had a minimal activity this year, and did not merit a sample design.

The increase in sample sizes for all programs manifests itself in lower expected confidence intervals for each sample. Table 20 shows the expected confidence intervals range from  $\pm 3.4\%$  to  $\pm 11.6\%$

The next step in the sample design was to choose the number of strata. Typically, in evaluations such as these three strata are chosen (small, medium and large). Stratum boundaries are determined so there is approximately equal amount of variance in each stratum. To do this the tracking estimates of savings are sorted. The participant savings are raised to the assumed ( $\gamma$ ) gamma. This is a proxy for  $\sigma_i = \sigma \gamma$ . The relative cumulative sum of the ( $\gamma$ ) is then calculated. The strata cut points identified as the multiples of the cumulative sum divided by the number of strata. For the sample design for all programs, the value of gamma was assumed to be 0.8 An additional stratum was added for the Bay City sample points in the Lighting and Low Income Samples.

**Table 20. Final 2016 sample design**

Strata	N	n	kWh Savings	
			Max	Total
<b>Residential</b>				
<b><i>Efficient Lighting</i></b>				
<b>1</b>	1149	7	711	266,273
<b>2</b>	177	7	1,264	213,768
<b>3</b>	50	7	17,664	151,804
<b>Bay</b>	1036	22	9,101	437,607
<b>Total</b>	<b>2412</b>	<b>43</b>		<b>1,069,452</b>
<b><i>High Efficiency Appliances</i></b>				
<b>1</b>	1617	8	855	618,037
<b>2</b>	555	8	2,280	843,742
<b>3</b>	80	8	206,700	1,260,234
<b>Total</b>	<b>2252</b>	<b>24</b>		<b>2,722,013</b>
<b><i>Low Income Qualified</i></b>				
<b>1</b>	358	10	774	276,976
<b>2</b>	47	11	5,842	46,428
<b>Bay</b>	240	12	2396	128,962
<b>Total</b>	<b>645</b>	<b>33</b>		<b>452,366</b>
<b>Commercial and Industrial</b>				
<b><i>Custom/Prescriptive</i></b>				
<b>1</b>	191	7	59,280	3,263,156
<b>2</b>	42	7	268,715	4,317,610
<b>3</b>	11	7	666,769	5,356,030
<b>4</b>	1	1	1,128,554	1,128,554
<b>Total</b>	<b>245</b>	<b>22</b>		<b>14,065,350</b>



## APPENDIX V. ANALYSIS METHODOLOGY

Model Based Statistical Sampling and analysis was the basis of the analysis. For each of the programs, an appropriate evaluation approach was developed. This section describes the methodologies used for each program's analysis approach.

### Model Based Statistical Sampling and Analysis

This technique used a statistical model and its parameters to represent prior information about the population to be sampled. The model describes the nature of the variation in the relationship between a key target variable  $y$  of the study (called the dependent variable), in this case the actual amount of program energy savings and an explanatory variable  $x$ , in our case the tracking system estimate of savings. The model is used to help choose the sample size  $n$  and to help formulate a sample design with near-optimal stratification for stratified ratio estimation. The model describes the trend and the variation around the trend, i.e., the conditional mean and standard deviation of  $y$  given  $x$ .

The model is used as a guide to the sample design, but the results of the study itself are not strongly dependent on the accuracy of the model. Once the sample design is selected, the subsequent analysis of the data is usually based only on the sample design and not on the model used to develop the sample design. In particular, conventional stratified-sampling techniques can be used to analyze the sample data collected from an MBSS sample design. The resulting estimates will be almost unbiased in repeated sampling and the confidence intervals will also be valid, provided that the sample design is followed.

This technique used a statistical model and its parameters to represent prior information about the population to be sampled. The model describes the nature of the variation in the relationship between a key target variable  $y$  of the study (called the dependent variable), in this case the actual amount of program energy savings and an explanatory variable  $x$ , in our case the tracking system estimate of savings. The model is used to help choose the sample size  $n$  and to help formulate a sample design with near-optimal stratification for stratified ratio estimation. The model describes the trend and the variation around the trend, i.e., the conditional mean and standard deviation of  $y$  given  $x$ .

### Equation 1. Primary and secondary equations

$$y_i = \beta x_i + \varepsilon_i$$
$$\sigma_i = sd(\varepsilon_i) = \sigma_0 x_i^\gamma$$

Using MBSS techniques in sample design minimizes the uncertainty of the results by controlling the variation of the sample. Accordingly, for the verifications the initial sample size was determined using Equation 2. Sample size is based on an assumed "error ratio".

The true error ratios were not known. However, based on past experience, a high level of compliance should be expected.

The next step in the sample design is to choose the number of strata. Typically, in evaluations such as these three strata are chosen (small medium and large). Next, stratum boundaries are determined so there is approximately equal amount of variance in each stratum. To do this the tracking estimates of savings are sorted. The participant savings are raised to the assumed ( $\gamma$ ) gamma. This is a proxy for  $\sigma_i = \sigma \gamma$ . The relative cumulative sum of the  $\gamma y$  is then calculated. The strata cut points identified as the multiples of the cumulative sum divided by the number of strata.

**Equation 2. Initial sample size calculation**

$$n_0 \approx \left( \frac{z \cdot er}{D} \right)^2$$

$$n_0 \approx \left( \frac{z \cdot er}{D} \right)^2 \frac{n_0}{1 + n_0/N}$$

Where:

D is the desired relative precision, and z corresponds to the desired confidence level.

**Equation 3. Combined ratio estimation**

Ratio Estimate	Mean	Total
$\hat{B}_0 = \frac{\sum_{i=1}^{n_0} w_i y_i}{\sum_{i=1}^{n_0} w_i x_i}$	$\bar{y}_0 = \hat{B}_0 \mu_{x0}$	$\hat{Y}_0 = \hat{B}_0 X_0$
	where	$w_i = N_h/n_h$

**Equation 4. Calculating the statistical precision**

1. Calculate the residuals  $e_i = y_i - \hat{B}_0 x_i$
2. Calculate  $se(\hat{B}_0) = \left( \frac{1}{\hat{X}_0} \right) \sqrt{\sum_{i=1}^{n_0} w_i (w_i - 1) e_i^2}$   
 with  $\hat{X}_0 = \sum_{i=1}^{n_0} w_i x_i$
3. Then  $se(\bar{y}_0) = se(\hat{B}_0) \mu_{x0}$  and  $se(\hat{Y}_0) = se(\hat{B}_0) X_0$

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## APPENDIX W. VERIFICATION METHODOLOGY AND SURVEY INSTRUMENTS

This section describes the verification approach for the following programs:

- Residential Efficient Lighting Program
- High-Efficiency Appliances/ High-Efficiency HVAC Program (High Efficiency Products)
- Low Income Qualified Program

Customer verification data were collected for the Residential Efficient Lighting, High Efficiency Products and Income Qualified through the use of a CATI-telephone based surveys. A random sample was selected from all known and available participating efficient lighting and high efficiency product customers. The responses from the sampled customers determined the compliance rate (i.e., the percentage of measures that are installed and operating as planned) for each program.

The participants were asked:

- To verify if they participated in the program
- How many measures they received
- If they are using all the measures, and if not, how many are not in use

From the returned surveys, proportions of the measures that were installed and operating as intended were estimated to produce a verification rate at the measure level.

As described in Appendix D, **Error! Reference source not found.** was used to determine the verified savings, and **Error! Reference source not found.** was used to estimate the statistical precision of the estimate.

### Commercial and Industrial Prescriptive and Custom Programs

For the verification, an energy engineer conducted a quality control inspection of commercial and industrial participants of the C&I Prescriptive Program and C&I Custom Program. The engineer physically inspected all measures and commented on both the quality and the appropriateness for the participant. The inspector noted any problems with measure installation and recorded any customer comments expressing either satisfaction or dissatisfaction with the program, measures, and contractor services. The engineer inspected all of the measures or activities recorded in the participant's program file. A copy of the on-site inspection form can be found in Appendix W.

The information gathered on site was used to verify the savings of the measures that were installed and operating as intended. The verified estimate of savings and the tracking system estimate of savings were used to develop a stratified ratio estimate of program savings.

## EFFICIENT LIGHTING SURVEY

### MPPA – Efficient Lighting Program CATI Survey 13 February 2017

#### Survey house instructions

1. Text in **bold** should be read.
2. Text in brackets [ ] are instructions for interviewer, minor programming such as skips, or answer choices and should NOT be read.
3. Text in carrots < > are variables that should be filled in on a case-by-case basis.
4. Text in gray boxes is major programming instruction.
5. Unless specifically noted, do NOT read answer choices. [Don't know] and [Refused] should NEVER be read.

THIS TABLE MAY BE UPDATED ONCE THE SAMPLE DESIGN IS FINALIZED

#### Database variables

Variable	Definition
<b>Name_1</b>	<b>Customer last name. Some implementer records include both first and last name in Name_1.</b>
<b>Name_2</b>	<b>Customer first name</b>
<b>Site_Address</b>	<b>Address where equipment was installed</b>
<b>City</b>	<b>City where equipment was installed</b>
<b>Utility</b>	<b>Customer Utility</b>
<b>LED_QTY</b>	<b>This is the sum of all LEDs (A-lamp and PAR) distributed to customers that need to be verified. If QTY is greater than 0, the LED battery should be delivered.</b>
<b>LED Night_QTY</b>	<b>This is the sum of all LED nightlights distributed to customers that need to be verified. If QTY is greater than 0, the LED nightlight battery should be delivered.</b>
<b>LED Holiday_QTY</b>	<b>This is the sum of all LED holiday lights distributed to customers that need to be verified. If QTY is greater than 0, the LED holiday lights battery should be delivered.</b>
<b>CFL_QTY</b>	<b>This is the sum of all CFLs distributed to customers that need to be verified. If QTY is greater than 0, the</b>

**CFL battery should be delivered.**

**Program Name** "Efficient Lighting Program" is the program name.

**INTRODUCTION**

**Intro1. May I speak with < Name\_2, Name\_1>? Hello, my name is \_\_\_\_\_, and I'm calling on behalf of the Efficient Lighting Program run by your utility, <UTILITY>. I'm calling to talk to you about some energy efficient light bulbs that were purchased, given to you or directly installed at your home last year.**

[IF NEEDED] I'm not selling anything; I'd just like to ask your opinions. Your responses will be kept confidential and your individual responses will not be revealed to anyone.

[IF ASKED] You can verify the legitimacy of this research by calling Patrick Devon (517) 323-8919 Ext. 114

**Intro2. Are you familiar with the lighting rebated, distributed, or installed by the program? [PROMPT IF NEEDED: You may have received things like LED light bulbs, LED night lights, etc.]**

1	[Yes]	Intro6
2	[No]	
97	[Don't know]	Intro3
98	[Refused]	

**Intro3. Who could I speak to that would be familiar with that process?**

	[RECORD FIRST and LAST NAME]	Intro4
97	[Don't know]	
98	[Refused]	

**Intro4. Could I speak with <Intro3> now?**

1	[Yes]	Intro1
2	[No]	Intro5
97	[Don't know]	
98	[Refused]	

**Intro5. When is a good time I could call back to reach <Intro3>?**

	[RECORD DAY and TIME]	Call back later
97	[Don't know]	
98	[Refused]	

[If <intro3> ≠ <name>, else skip to L1]

**Intro6. What is your name?**

	[RECORD FIRST and LAST NAME]	V1
97	[Don't know]	
98	[Refused]	

## Verification –LED bulbs

[IF LED\_QTY > 0, ask L1-L4, else END LED Block]

L1. To verify, did you receive one or more LED light bulbs from <UTILITY> this year?

1	Yes	L2
2	No	L1a
97	[Don't know]	L1a
98	[Refused]	

L1a. Just to confirm, you did NOT receive any LED bulbs from <UTILITY> this year?

1	We received LEDs	L1a.
2	We did NOT receive any LEDS	END LED Block
97	[Don't know]	
98	[Refused]	

L2. Our records show that you received <LED\_QTY> LED light bulbs. Is this correct?

1	[Yes]	L3
2	[No ]	L2a
97	[Don't know]	
98	[Refused]	

L2a. How many LED light bulbs did you receive?

1	[Enter quantity]	L3
2	[None]	END LED block
3	[Did receive the quantity stated previously]	L3
97	[Don't know]	L3
98	[Refused]	

L3. Are you using these LED light bulbs at <address>?

1	[Yes]	L4
2	[No]	
97	[Don't know]	

L4. How many of the LED bulbs provided by the program have been removed, burnt out, given away, or are not being used?

1	[Enter quantity]	End LED Block
2	[All of them]	
3	[None of them]	
97	[Don't know]	
98	[Refused]	

Verification – LED NIGHT LIGHTS

[IF LED Night\_QTY> 0, ask NL1-NL3, else END LED Night Lights Block]

**NL1. Our records show that you received <LED Night\_QTY> LED night light(s). Is this correct?**

1	[Yes]	NL2
2	[No]	NL1a
97	[Don't know]	
98	[Refused]	

**NL1a. How many LED night lights did you receive?**

1	[Enter quantity]	NL2
2	[None]	End LED Night Light Block
3	[Did receive the quantity stated previously]	NL2

97	[Don't know]	NL2
98	[Refused]	

**NL2. Are you using these LED nightlights at <address>?**

1	Yes	NL3
2	No	
97	[Don't know]	
98	[Refused]	

**NL3. Have the <LED Night\_QTY> night light(s), provided by the program, been removed, given away or is it not being used?**

1	[Yes removed, given away, not used]	End LED NL Block
2	[No still installed]	
97	[Don't know]	
98	[Refused]	

Verification – LED HOLIDAY LIGHTS

[IF LED Holiday\_QTY > 0, ask HL1-HL2, else END LED Holiday Lights Block]

**HL1. Our records show that you received <LED Holiday\_QTY> strands of LED holiday lights. Is this correct?**

1	[Yes]	HL2
2	[No]	HL1a
97	[Don't know]	
98	[Refused]	

**HL1a. How many strands of LED holiday lights did you receive?**



1	[Enter quantity]	HL2
2	[None]	End LED Holiday Block
3	[Did receive the quantity stated previously]	HL2
97	[Don't know]	HL2
98	[Refused]	

**HL2. During the holidays, did you use these LED holiday lights at <address>?**

1	Yes	End LED Holiday Block
2	No	
97	[Don't know]	
98	[Refused]	

[IF CFL\_QTY > 0, ask C1-C4, else END CFL Block]

**C1. To verify, did you receive one or more CFL bulbs from <UTILITY> this year?**

1	Yes	C2
2	No	C1a
97	[Don't know]	C1a
98	[Refused]	

**C1a. Just to confirm, you did not receive any CFL bulbs from <UTILITY> this year?**

1	We received CFLs	C2
2	We did NOT receive any CFLS	END CFL Block
97	[Don't know]	

98	[Refused]	
----	-----------	--

**C2. Our records show that you received <CFL\_QTY> CFL bulbs. Is this correct?**

1	[Yes]	C3
2	[No ]	C2a
97	[Don't know]	
98	[Refused]	

**C2a. How many CFLs did you receive?**

1	[Enter quantity]	C3
2	[None]	END CFL block
3	[Did receive the quantity stated previously]	L3
97	[Don't know]	L3
98	[Refused]	

**C3. Are you using these CFL light bulbs at <address>?**

1	[Yes]	C4
2	[No]	
97	[Don't know]	

**C4. How many of the CFL bulbs provided by the program have been removed, burnt out, given away, or are not being used?**

1	[Enter quantity]	End CFL Block
2	[All of them]	
3	[None of them]	
97	[Don't know]	



98	[Refused]	
----	-----------	--

**END SURVEY**

## HIGH EFFICIENCY PRODUCTS SURVEY

MPPA - Residential High Efficiency Products CATI Survey  
13 February 2017

Aug 29, 2016

Survey house instructions

Text in bold should be read.

Text in brackets [ ] are instructions for interviewer, minor programming such as skips, or answer choices and should NOT be read.

Text in carrots < > are database variables that should be filled in on a case-by-case basis.

Text in gray boxes is major programming instruction.

Unless specifically noted, do NOT read answer choices. [Don't know] and [Refused] should NEVER be read.

### Database variables

Variable	Definition
	<b>(Unless otherwise noted, the database can contain more than one of each variable per respondent)</b>
<b>Name_1</b>	<b>Customer last name. Some implementer records include both first and last name in Name_1.</b>
<b>Name_2</b>	<b>Customer first name</b>
<b>Site_Address</b>	<b>Address where equipment was installed</b>
<b>City</b>	<b>City where equipment was installed</b>
<b>Utility</b>	<b>Customer Utility</b>
<b>MEAS_QTY1, MEAS_QTY2, etc.</b>	<b>Equipment type (non-lighting) and quantity of measure. These measures should be verified when QTY &gt; 0. The individual measure names are included in the column header. Measures include efficient air-conditioners, AC tune-up, ceiling fans, clothes washers and dryers, computers, dehumidifiers, dishwashers, freezers, furnaces, heat pump water heaters, low-flow aerators and showerheads, monitors, pipe wrap, pool pumps, power strips, programmable thermostats, refrigerators and TVs.</b>
<b>Lighting</b>	<b>Y/N indicates whether the recipient received lighting measures (primarily LEDs, although a few CFLs).</b>

**LED\_QTY**

**This is the sum of all LEDs (A-lamp and PAR) distributed to customers that need to be verified. If QTY is greater than 0, the LED battery should be delivered.**

**Program Name**

**“High Efficiency Products”**

## **Introduction**

Intro1. May I speak with < Name\_2, Name\_1>? Hello, my name is \_\_\_\_\_, and I'm calling on behalf of the High Efficiency Products Program run by your utility, <UTILITY>. The program provides rebates for efficient appliances and heating and cooling equipment. I'm calling to talk to you about your experience with the rebate program. Is now a good time to speak to you?

**[IF NEEDED:] I'm not selling anything; I'd just like to ask your opinions. Your responses will be kept confidential and your individual responses will not be revealed to anyone.**

**[IF ASKED] You can verify the legitimacy of this research by calling Patrick Devon (517) 323-8919 Ext. 114**

1	[AGREES TO PARTICIPATE]	Intro2
2	[DOES NOT AGREE TO PARTICIPATE]	END_1

### **Intro2. Our records show that you received rebates for a/an**

<Equipment> you recently purchased. Are you familiar with the decision to purchase this equipment?

1	[Yes]	V1
2	[No]	Intro3
97	[Don't know]	
98	[Refused]	

Intro3. Who could I speak to that would be familiar with that process?

	[RECORD FIRST and LAST NAME]	Intro4
--	------------------------------	--------

97	[Don't know]	
98	[Refused]	

Intro4. Could I speak with <Intro3> now?

1	[Yes]	Intro1
2	[No]	Intro5
97	[Don't know]	
98	[Refused]	

Intro5. When is a good time I could call back to reach <Intro3>?

	[RECORD DAY and TIME]	Call back later
97	[Don't know]	
98	[Refused]	

**[If <intro3> ≠ <cont1>, else skip to V1]**

Intro6. What is your name?

	[RECORD FIRST and LAST NAME]	V1
97	[Don't know]	
98	[Refused]	

## Verification

**START EQUIPMENT BLOCK: Repeat V1 to V3 for each measure that was installed (MEAS\_TYPE1, MEAS\_TYPE2...MEAS\_TYPEX). Programmer note, max repeats = 4.**

V1. Just to verify, did purchase and the following equipment: <MEAS\_TYPE1, MEAS\_TYPE2, MEAS\_TYPE3, etc.> this year?

[If Meas\_TYPE X = Air Conditioner Tune-up ONLY then read: <UTILITY> records show you had a/an AC tune-up that was rebated by <UTILITY>. Just to verify, did you have your air conditioner tuned up?]

1	Yes	V2
2	No	V1a
97	[Don't know]	Intro3
98	[Refused]	

V1a. Just to confirm, you did not receive a rebate for < MEAS\_TYPE1 to MEAS\_TYPEx> from <UTILITY> this year?

1	We received equipment	V2
2	We did NOT receive any equipment	END Equipment Block
97	[Don't know]	Intro3
98	[Refused]	

V2. Our records show that the equipment was installed at <site address, city>, is this correct?

1	Yes	V3
2	No	
97	[Don't know]	
98	[Refused]	

V3. Is/are this/these <MEAS\_TYPE1 to MEAS\_TYPEx> still operational?

1	Yes	END Equipment Block
2	No	
97	[Don't know]	
98	[Refused]	

Next I would like to ask you about the various types of light bulbs you received through the program.

[IF LED\_QTY > 0, ask L1-L4, else END LED Block]

L1. To verify, did you receive one or more LED light bulbs from <UTILITY> this year?

1	Yes	L2
2	No	L1a
97	[Don't know]	L1a
98	[Refused]	

L1a. Just to confirm, you did not receive any LED bulbs from <UTILITY> this year?

1	We received LEDs	L1a.
2	We did NOT receive any LEDS	END LED Block
97	[Don't know]	
98	[Refused]	

L2. Our records show that you received <LED\_QTY> LED light bulbs. Is this correct?

1	[Yes]	L3
2	[No ]	L2a
97	[Don't know]	
98	[Refused]	

L2a. How many LED light bulbs did you receive?

1	[Enter quantity]	L3
2	[None]	END LED block
3	[Did receive the quantity stated previously]	L3
97	[Don't know]	L3
98	[Refused]	



L3. Are you using these LED light bulbs at <address>?

1	[Yes]	L4
2	[No]	
97	[Don't know]	

L4. How many of the LED bulbs provided by the program have been removed, burnt out, given away, or are not being used?

1	[Enter quantity]	End LED Block
2	[All of them]	
3	[None of them]	
97	[Don't know]	
98	[Refused]	

THANK & TERMINATE

Those are all of the questions I have for you today. Thank you for your time.

## LOW INCOME QUALIFIED SURVEY

### MPPA - Income Qualified Program CATI Survey 13 February 2017

#### Survey house instructions

1. Text in **bold** should be read.
2. Text in brackets [ ] are instructions for interviewer, minor programming such as skips, or answer choices and should NOT be read.
3. Text in carrots < > are variables that should be filled in on a case-by-case basis.
4. Text in gray boxes is major programming instruction.
5. Unless specifically noted, do NOT read answer choices. [Don't know] and [Refused] should NEVER be read.

THIS TABLE MAY BE UPDATED ONCE THE SAMPLE DESIGN IS FINALIZED

#### Database variables

Variable	Definition
	<b>(Unless otherwise noted, the database can contain more than one of each variable per respondent)</b>
<b>Name_1</b>	<b>Customer last name. Some implementer records include both first and last name in Name_1.</b>
<b>Name_2</b>	<b>Customer first name</b>
<b>Site_Address</b>	<b>Address where equipment was installed</b>
<b>City</b>	<b>City where equipment was installed</b>
<b>Utility</b>	<b>Customer Utility</b>
<b>MEAS_QTY1, MEAS_QTY2, etc.</b>	<b>Equipment type (non-lighting) and quantity of measure. These measures should be verified when "other" flag = Y and QTY &gt; 0. The individual measure names are included in the column header.</b>
<b>Other</b>	<b>Y/N indicates whether the recipient received non-lighting measure(s). These may include, Advanced/Smart Power Strip, aerators, refrigerators, pipe wrap. This field will drive the decision to ask the non-lighting battery of questions.</b>
<b>LED_QTY</b>	<b>This is the sum of all LEDs (A-lamp and PAR) distributed to customers that need to be verified. If QTY is greater than 0, the LED battery should be</b>

	<b>delivered.</b>
<b>LED Night_QTY</b>	<b>This is the sum of all LED nightlights distributed to customers that need to be verified. If QTY is greater than 0, the LED nightlight battery should be delivered.</b>
<b>LED Holiday_QTY</b>	<b>This is the sum of all LED holiday lights distributed to customers that need to be verified. If QTY is greater than 0, the LED holiday lights battery should be delivered.</b>
<b>CFL_QTY</b>	<b>This is the sum of all CFLs distributed to customers that need to be verified. If QTY is greater than 0, the CFL battery should be delivered.</b>
<b>Program Name</b>	<p><b>“Income Qualified Program” is the program name. This is an Educational and Direct Installation Program performed by the utility’s contactor Michigan Energy Options.</b></p> <p><b>Income qualified (only) customers can receive both light bulbs and some can receive appliances – see “other”.</b></p> <p><b>The program is available to income qualified and market rate customers for LEDs.</b></p> <p><b>Market rate customers can receive no more than 5 LEDs Income qualified have no limit of LEDS at the direct install.</b></p>

## **INTRODUCTION**

Intro1. May I speak with < Name\_2, Name\_1>? Hello, my name is \_\_\_\_\_, and I'm calling on behalf of the <Utility>. I'm calling to talk to you about some energy efficient lighting and/or equipment that was either given to you or previously installed in your home.

**[IF NEEDED] I'm not selling anything; I'd just like to ask your opinions. Your responses will be kept confidential and your individual responses will not be revealed to anyone.**

**[IF ASKED] You can verify the legitimacy of this research by calling Patrick Devon (517) 323-8919 Ext. 114**

1	[AGREES TO PARTICIPATE]	Intro2
2	[DOES NOT AGREE TO PARTICIPATE]	TERMINATE

**Intro2. Our records show the Income Qualified program installed or gave away energy saving lighting and equipment for your home. Are you familiar with having received the free lightbulbs or equipment?**

**[PROMPT IF NEEDED: You may have received LED light bulbs, a low-flow faucet aerator, or perhaps a new refrigerator?**

1	[Yes]	Intro6
2	[No]	Intro3
97	[Don't know]	
98	[Refused]	

Intro3. Who could I speak to that would be familiar with the program's free energy saving equipment?

1	[RECORD FIRST and LAST NAME]	Intro4
97	[Don't know]	
98	[Refused]	

Intro4. Could I speak with <Intro3> now?

1	[Yes]	Intro1
2	[No]	Intro5
97	[Don't know]	
98	[Refused]	

Intro5. When is a good time I could call back to reach <Intro3>?

1	[RECORD DAY and TIME]	Call back later
97	[Don't know]	
98	[Refused]	

**[If <intro3> ≠ <name>, else skip to V1]**

Intro6. What is your name?

	[RECORD FIRST and LAST NAME]	V1
97	[Don't know]	
98	[Refused]	

START "OTHER" EQUIPMENT BLOCK:

IF Other="Y" then Repeat V1 to V4 for each measure that was installed (M1, M2, ... Mx)

IF Other="N" then skip to LED Block (L1)

Verification -Other equipment (non-lighting)

**V1. Just to verify, did representatives on behalf of <UTILITY> install or give you the following equipment: < MEAS\_TYPE1, MEAS\_TYPE2, MEAS\_TYPE3, etc.> this year?**

1	Yes	V2
2	No	V1a
97	[Don't know]	Intro3
98	[Refused]	

**V1a. Just to confirm, you did not receive a/an < MEAS\_TYPE1 to MEAS\_TYPEx> on behalf of <UTILITY> this year?**

1	We received equipment	V2
2	We did NOT receive any equipment	END Equipment Block
97	[Don't know]	Intro3
98	[Refused]	

**V2. Our records show that the free equipment was installed at <site address, city>, is this correct?**

1	Yes	V3
2	No	
97	[Don't know]	
98	[Refused]	

**V3. Is/are this/these <MEAS\_TYPE1 to MEAS\_TYPEx> still operational?**

1	Yes	END Equipment Block
2	No	
97	[Don't know]	
98	[Refused]	

END Other (non-lighting) measures Block

Repeat other block for all non-lighting measures installed (M1, M2, ... Mx)

START LED BLOCK

IF LED\_QTY>0 then ask L1

Else IF LED="0", skip to next section (LED Night Lights)

**Next I would like to ask you about the various types of light bulbs you received through the program.**

[IF LED\_QTY > 0, ask L1-L4, else END LED Block] **L1. To verify, did you receive one or more LED light bulbs from <UTILITY> this year?**

1	Yes	L2
2	No	L1a
97	[Don't know]	L1a
98	[Refused]	

**L1a. Just to confirm, you did not receive any LED bulbs from <UTILITY> this year?**

1	We received LEDs	L1a.
2	We did NOT receive any LEDS	END LED Block
97	[Don't know]	
98	[Refused]	

**L2. Our records show that you received <LED\_QTY> LED light bulbs. Is this correct?**

1	[Yes]	L3
2	[No ]	L2a
97	[Don't know]	
98	[Refused]	

**L2a. How many LED light bulbs did you receive?**

1	[Enter quantity]	L3
2	[None]	END LED block
3	[Did receive the quantity stated]	L3

	previously]	
97	[Don't know]	L3
98	[Refused]	

**L3. Are you using these LED light bulbs at <address>?**

1	[Yes]	L4
2	[No]	
97	[Don't know]	

**L4. How many of the LED bulbs provided by the program have been removed, burnt out, given away, or are not being used?**

1	[Enter quantity]	End LED Block
2	[All of them]	
3	[None of them]	
97	[Don't know]	
98	[Refused]	

Verification – LED NIGHT LIGHTS

IF LED Night\_QTY = 0, ask NL1-NL3, else END LED Night Lights Block

NL1. Our records show that you received <LED Night\_QTY> LED night light(s). Is this correct?

1	[Yes]	NL2
2	[No]	NL1a
97	[Don't know]	
98	[Refused]	

NL1a. How many LED night lights did you receive?

1	[Enter quantity]	NL2
2	[None]	End LED Night Light Block



3	[Did receive the quantity stated previously]	NL2
97	[Don't know]	NL2
98	[Refused]	

NL2. Are you using these LED nightlights at <address>?

1	Yes	NL3
2	No	
97	[Don't know]	
98	[Refused]	

NL3. Have the <LED Night\_QTY> night light(s), provided by the program, been removed, given away or is it not being used?

1	[Yes removed, given away, not used]	End LED NL Block
2	[No still installed]	
97	[Don't know]	
98	[Refused]	

### Verification – LED HOLIDAY LIGHTS

**[IF LED Holiday\_QTY > 0, ask HL1-HL2, else END LED Holiday Lights Block]**

HL1. Our records show that you received <LED Holiday\_QTY> strands of LED holiday lights. Is this correct?

1	[Yes]	HL2
2	[No]	HL1a
97	[Don't know]	
98	[Refused]	

HL1a. How many strands of LED holiday lights did you receive?

1	[Enter quantity]	HL2
---	------------------	-----

2	[None]	End LED Holiday Block
3	[Did receive the quantity stated previously]	HL2
97	[Don't know]	HL2
98	[Refused]	

HL2. During the holidays, did you use these LED holiday lights at <address>?

1	Yes	End LED Holiday Block
2	No	
97	[Don't know]	
98	[Refused]	

### Verification – CFL bulbs

**[IF CFL\_QTY > 0, ask C1-C4, else END CFL Block]**

C1. To verify, did you receive one or more CFL bulbs from <UTILITY> this year?

1	Yes	C2
2	No	C1a
97	[Don't know]	C1a
98	[Refused]	

C1a. Just to confirm, you did not receive any CFL bulbs from <UTILITY> this year?

1	We received CFLs	C2
2	We did NOT receive any CFLS	END CFL Block
97	[Don't know]	
98	[Refused]	

C2. Our records show that you received <CFL\_QTY> CFL bulbs. Is this correct?

1	[Yes]	C3
2	[No ]	C2a
97	[Don't know]	
98	[Refused]	

C2a. How many CFLs did you receive?

1	[Enter quantity]	C3
2	[None]	END CFL block
3	[Did receive the quantity stated previously]	L3
97	[Don't know]	L3
98	[Refused]	

C3. Are you using these CFL light bulbs at <address>?

1	[Yes]	C4
2	[No]	
97	[Don't know]	

C4. How many of the CFL bulbs provided by the program have been removed, burnt out, given away, or are not being used?

1	[Enter quantity]	End CFL Block
2	[All of them]	
3	[None of them]	
97	[Don't know]	
98	[Refused]	



## C&I ONSITE VERIFICATION FORM

Utility Name:	<b>Bay City - MPPA Energy Smart - C&amp;I 2016</b>
Project Name:	
Account_Name	
Site_Address	
Primary_Project_Contact__Full_Na	
Primary_Project_Contact__Phone	
Primary_Project_Contact__Email	

Scheduled Date/time	Scheduled Site Contact	Scheduling Notes
		Out of the office today.

DNV GL Signature: \_\_\_\_\_ Date \_\_\_\_\_ | Time \_\_\_\_\_

DNVqty	Measure Type: Prescriptive/Lighting	Measure or Model Detail
<b>157</b>	<b>Garage/24 Hour HID to LED - MPPA 2016</b>	<b>Factory Floor 200w LED lamp</b>
Qty Verified:		
Qty Operational:		
Measure Verified	YES      NO	
(comment any notes if any discrepancy from tracking)		
Notes:		

DNVqty	Measure Type: /Custom	Measure or Model Detail
	<b>Bonus / Rebate</b>	<b>N/A</b>
Qty Verified:		
Qty Operational:		
Measure Verified	YES      NO	
(comment any notes if any discrepancy from tracking)		
Notes:		

DNVqty	Measure Type: /	Measure or Model Detail
Qty Verified		
Qty Operational		
Measure Verified	YES      NO	
(comment any notes if any discrepancy from tracking)		
Notes:		



## **DNV GL**

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter and greener.