

2017 Michigan Public Power Agency Final Impact Evaluation Report

Report for the 2017 Energy Waste Reduction Programs

Date: June 4, 2018





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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 Waste Reduction (EWR) programs (formerly referred to as the Energy Waste Reduction (EWR) Plans) as required by the State of Michigan's 2008 Public Act 295¹ (PA 295) Section 71. PA 342 of 2016.

The evaluation of MPPA EE Service Committee 2017 EWR programs was conducted in fourth quarter of 2017 and the first quarter of 2018. 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 EWR programs implemented by the utilities. Results for each individual utility can be found in the Appendices.

¹¹ <http://www.legislature.mi.gov/documents/2007-2008/publicact/pdf/2008-PA-0295.pdf>



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 (EWR) programs as required by the State of Michigan’s 2008 Public Act 295 (PA 295) Section 71 of PA 342 of 2016 (3)(i), which amended 2008 Public Act of 295. The legislation was aims to accomplish the following objective *“the overall goal of an energy waste reduction plan shall be to help the provider’s customers reduce energy waste and to reduce the future costs of provider service to customers. In particular, an electric provider’s energy waste reduction plan shall be designed to delay the need for constructing new electric generating facilities and thereby protect consumers from incurring the costs of such construction.”*

The ultimate goal of the evaluation was specified as the verification of incremental energy (kWh) savings for the MPPA EE Service Committee members’ EWR 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 EWR plans were approved by the Michigan Public Service Commission (MPSC or the Commission), or engineering estimates current at the time the EWR 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 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 2017 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

The following 18 municipal utilities with EWR 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

APPENDIX B. BAY CITY ELECTRIC LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2017 Bay City Light & Power Energy Waste Reduction 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 the 2017 results by program for Bay City Electric Light & Power.

Low Home Assessment Program deemed estimate is 151,562 kWh, due to the low volume of program participation 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 151,562 kWh. The variance associated with this estimate is zero.

Low Home Refrigerator Replacement Program the deemed estimate is 139,619 kWh, due to the similarity with the Appliance Recycling Program (APR) the APR verification rate was applied to the Low Income Refrigerator Replacement program. Based on the analysis of the program the verified gross savings estimate is 139,159 kWh. The variance associated with this estimate is ± 361 kWh ($\pm 0.3\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program the deemed savings estimate is 114,721 kWh. Based on the analysis of the program the verified gross savings estimate is 105,773 kWh. The variance associated with this estimate is $\pm 8,462$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 167,668 kWh. Based on the analysis of the program the verified gross savings estimate is 167,115 kWh. The variance associated with this estimate is ± 501 kWh ($\pm 0.3\%$).

Efficient Lighting Program (lighting kits) deemed savings estimate is 710,459 kWh. Based on the analysis of the program the verified gross savings estimate is 673,941 kWh. The variance associated with this estimate is $\pm 43,132$ kWh ($\pm 6.4\%$).

Residential Educational Services program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 1 for the gross savings.

Residential Pilot 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 4,117,836 kWh. Based on the analysis of the program the verified gross savings estimate is 4,055,245 kWh. The variance associated with this estimate is $\pm 133,823$ kWh ($\pm 3.3\%$).

Business Educational Services this program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 1 for the gross savings.

Pilot/Emerging Technology Services this program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 1 for the gross savings.

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income Home Assessment	136,946	151,562	151,562	100.0%
Low Income Refrigerator Replacement	136,946	139,619	139,159	99.7%
Residential Services				
HVAC & Appliance Products		114,721	105,773	92.2%
Appliance Recycling		167,668	167,115	99.7%
Efficient Lighting Kits	1,122,259	710,459	673,941	94.9%
Electric Water Heater		1,014	1,014	100.0%
Residential Education	49,276	49,862	49,862	100.0%
Residential Pilot	65,701	52,881	52,881	100.0%
2016 Carryover	-619,623			
Subtotal - Residential Solutions	891,505	1,387,786	1,341,306	96.7%
Business Services				
Commercial & Industrial	1,658,955	4,117,836	4,055,245	98.5%
Educational Services	49,276	24,997	24,997	100.0%
Pilot/Emerging Technology Programs	65,701	32,354	32,354	100.0%
2016 Carryover	-954,936			
Subtotal - Business Solutions	818,996	4,175,187	4,112,596	98.5%
Total Program Portfolio	1,710,501	5,562,973	5,453,903	98.0%

APPENDIX C. CHARLEVOIX ELECTRIC SYSTEM VERIFICATION REPORT

This section presents the verification results for the 2017 Charlevoix Electric System Energy Waste Reduction 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. Charlevoix Electric System., EWR Program Goals, Claimed and Verified Savings (kWh) presents the program goals and claimed and verified savings for the following programs:

Low Income program deemed savings estimate is 22,902 kWh. Based on the analysis of the program the verified gross savings estimate is 11,043 kWh. The variance associated with this estimate is kWh ± 574 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program the deemed savings estimate is 38,314 kWh. Based on the analysis of the program the verified gross savings estimate is 35,326 kWh. The variance associated with this estimate is $\pm 3,109$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 5,675 kWh. Based on the analysis of the program the verified gross savings estimate is 5,656 kWh. The variance associated with this estimate is ± 17 kWh ($\pm 0.3\%$).

Efficient Lighting Program (lighting kits) deemed savings estimate is 216,264 kWh. Based on the analysis of the program the verified gross savings estimate is 205,148 kWh. The variance associated with this estimate is $\pm 13,129$ kWh ($\pm 6.4\%$).

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.

Residential Pilot 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 524,856 kWh. Based on the analysis of the program the verified gross savings estimate is 516,878 kWh. The variance associated with this estimate is $\pm 17,057$ kWh ($\pm 3.3\%$).

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., EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	19,850	22,902	11,043	48.2%
Residential Services				
HVAC & Appliances		38,314	35,326	92.2%
Appliance Recycling	167,471	5,675	5,656	99.7%
Efficient Lighting Kits		216,264	205,148	94.9%
Educational Services	9,212	9,212	9,212	100.0%
2016 Carryover	29,340			
Subtotal - Residential Solutions	225,873	292,367	266,385	91.1%
Business Services				
Commercial & Industrial	408,420	524,856	516,878	98.5%
Educational Services	9,212	9,212	9,212	100.0%
2016 Carryover	169			
Subtotal - Business Solutions	417,801	534,068	526,090	98.5%
Total Program Portfolio	643,674	826,435	792,476	95.9%

APPENDIX D. CHELSEA ELECTRIC DEPT. VERIFICATION REPORT

This section presents the verification results for the 2017 Chelsea Electric Dept. Energy Waste Reduction 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 20,820 kWh. Based on the analysis of the program the verified gross savings estimate is 10,039 kWh. The variance associated with this estimate was ± 522 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 37,427 kWh. Based on the analysis of the program the verified gross savings estimate is 34,507 kWh. The variance associated with this estimate is $\pm 3,036$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 9,833 kWh. Based on the analysis of the program the verified gross savings estimate is 9,801 kWh. The variance associated with this estimate is ± 29 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 126,360 kWh. Based on the analysis of the program the verified gross savings estimate is 119,865 kWh. The variance associated with this estimate is $\pm 7,671$ kWh ($\pm 6.4\%$).

Residential Educational Services program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 3 for the gross savings.

Business Services:

Commercial and Industrial Program reported deemed savings estimate was 919,562 kWh. Based on the analysis of the program the verified gross savings estimate is 905,585 kWh. The variance associated with this estimate is 29,884 kWh ($\pm 3.3\%$).

Business Educational Services this program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 3 for the gross savings.

Pilot/Emerging Technology Services this program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 3 for the gross savings.

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	15,061	20,820	10,039	48.2%
Residential Services				
HVAC & Appliances	80,994	37,427	34,508	92.2%
Appliance Recycling		9,833	9,801	99.7%
Efficient Lighting Kits		126,360	119,865	94.9%
Educational Services	14,408	14,408	14,408	100.0%
Pilot Programs	24,014			
2016 Carryover	49,942			
Subtotal - Residential Solutions	184,419	208,848	188,621	90.3%
Business Services				
Commercial & Industrial	787,651	919,562	905,585	98.5%
Educational Services	14,408	14,408	14,408	100.0%
Pilot/Emerging Technology Programs	24,014	24,014	24,014	100.0%
2016 Carryover	-246,597			
Subtotal - Business Solutions	579,476	957,984	944,007	98.5%
Total Program Portfolio	763,895	1,166,832	1,132,628	97.1%

APPENDIX E. CITY OF CROSWELL VERIFICATION REPORT

This section presents the verification results for the 2017 City of Croswell Energy Waste Reduction 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 (HVAC & Appliances) Program deemed estimate was 1,907 kWh. Based on the analysis of the program the verified gross savings estimate is 1,758 kWh. The variance associated with this estimate is ± 155 kWh ($\pm 8.8\%$).

Business Services:

Commercial and Industrial Program reported deemed savings estimate was 306,752 kWh. Based on the analysis of the program the verified gross savings estimate is 302,090 kWh. The variance associated with this estimate is 9,969 kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	15,195	-	-	-
Residential Services				
HVAC & Appliances	22,125	1,907	1,758	92.2%
Educational Services	5,331	-	-	-
Pilot Programs	10,663	-	-	-
2016 Carryover	87,494			
Subtotal - Residential Solutions	140,808	1,907	1,758	92.2%
Business Services				
Commercial & Industrial	296,784	306,752	302,090	98.5%
Educational Services	5,331	-	-	-
2016 Carryover	-264,475			
Subtotal - Business Solutions	37,640	306,752	302,090	98.5%
Total Program Portfolio	178,448	308,659	303,848	98.4%



APPENDIX F. CITY OF EATON RAPIDS VERIFICATION REPORT

This section presents the verification results for the 2017 City of Eaton Rapids Energy Waste Reduction 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 29,148 kWh. Based on the analysis of the program the verified gross savings estimate is 14,055 kWh. The variance associated with this estimate is ± 731 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 10,918 kWh. Based on the analysis of the program the verified gross savings estimate is 10,066 kWh. The variance associated with this estimate is ± 886 kWh ($\pm 8.8\%$).

Efficient Lighting Program deemed savings estimate is 157,800 kWh. Based on the analysis of the program the verified gross savings estimate is 149,689 kWh. The variance associated with this estimate is ± 449 kWh ($\pm 0.3\%$).

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.

Residential Pilot Program has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 5 for the gross savings.

Business Services:

Commercial and Industrial Program deemed savings estimate was 405,723 kWh. Based on the analysis of the program the verified gross savings estimate is 399,556 kWh. The variance associated with this estimate is $\pm 13,185$ kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	23,826	29,148	14,055	48.2%
Residential Services				
HVAC & Appliances	107,088	10,918	10,066	92.2%
Efficient Lighting Kits		157,800	149,689	94.9%
Educational Services	8,182	8,182	8,182	100.0%
Pilot Programs	13,637	13,637	13,637	100.0%
2016 Carryover	-954			
Subtotal - Residential Solutions	151,779	219,685	195,629	89.0%
Business Services				
Commercial & Industrial	370,924	405,723	399,556	98.5%
Educational Services	8,182	-	-	-
Pilot/Emerging Technology Programs	13,637	-	-	-
2016 Carryover	-211,614			
Subtotal - Business Solutions	181,129	405,723	399,556	98.5%
Total Program Portfolio	332,908	625,407	595,185	95.2%

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

This section presents the verification results for the 2017 Grand Haven Board of Light & Power (BLP) Energy Waste Reduction 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 56,902 kWh. Based on the analysis of the program the verified gross savings estimate is 27,438 kWh. The variance associated with this estimate is $\pm 1,427$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 286,469 kWh. Based on the analysis of the program the verified gross savings estimate is 264,124 kWh. The variance associated with this estimate is $\pm 23,243$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 50,824 kWh. Based on the analysis of the program the verified gross savings estimate is 50,656 kWh. The variance associated with this estimate is ± 152 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 449,820 kWh. Based on the analysis of the program the verified gross savings estimate is 426,699 kWh. The variance associated with this estimate is $\pm 27,309$ kWh ($\pm 6.4\%$).

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

Residential Pilot Programs has 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 3,922,635 kWh. Based on the analysis of the program the verified gross savings estimate is 3,863,011 kWh. The variance associated with this estimate is $\pm 127,479$ kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	40,061	56,902	27,438	48.2%
Residential Services				
HVAC & Appliances		286,469	264,124	92.2%
Appliance Recycling	630,133	50,824	50,656	99.7%
Efficient Lighting Kits		449,820	426,699	94.9%
Educational Services	54,710	39,440	39,440	100.0%
Pilot Programs	68,387	-	-	-
2016 Carryover	-67,409			
Subtotal - Residential Solutions	725,882	883,454	808,358	91.5%
Business Services				
Commercial & Industrial	1,846,454	3,922,635	3,863,011	98.5%
Educational Services	27,355	-	-	-
Pilot/Emerging Technology Programs	68,387	-	-	-
2016 Carryover	-1,209,606			
Subtotal - Business Solutions	732,590	3,922,635	3,863,011	98.5%
Total Program Portfolio	1,458,472	4,806,089	4,671,369	97.2%

APPENDIX H. HART HYDRO ELECTRIC VERIFICATION REPORT

This section presents the verification results for the 2017 Hart Hydro Electric Energy Waste Reduction 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 7Table 3 presents program goals and claimed and verified savings for the following programs:

Low Income Program deemed savings estimate is 16,656 kWh. Based on the analysis of the program the verified gross savings estimate is 8,032 kWh. The variance associated with this estimate is ± 418 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (Appliances/ HVAC) Program deemed estimate was 5,158 kWh. Based on the analysis of the program the verified gross savings estimate is 4,755 kWh. The variance associated with this estimate is ± 418 kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 2,270 kWh. Based on the analysis of the program the verified gross savings estimate is 2,263 kWh. The variance associated with this estimate is ± 7 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 69,468 kWh. Based on the analysis of the program the verified gross savings estimate is 65,897 kWh. The variance associated with this estimate is $\pm 4,217$ kWh ($\pm 6.4\%$).

Residential Educational Services has 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 is 474,477 kWh. Based on the analysis of the program the verified gross savings estimate is 467,265 kWh. The variance associated with this estimate is 15,420 kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	11,314	16,656	8,032	48.2%
Residential Services				
HVAC & Appliances	38,481	5,158	4,755	92.2%
Appliance Recycling		2,270	2,263	99.7%
Efficient Lighting Kits		69,468	65,897	94.9%
Educational Services	6,495	6,495	6,495	100.0%
2016 Carryover	-25,979			
Subtotal - Residential Solutions	30,311	100,047	87,442	87.4%
Business Services				
Commercial & Industrial	370,215	474,477	467,265	98.5%
Educational Services	6,495	-	-	-
2016 Carryover	-20,961			
Subtotal - Business Solutions	355,749	474,477	467,265	98.5%
Total Program Portfolio	386,060	574,524	554,707	96.6%

APPENDIX I. HOLLAND BOARD OF PUBLIC WORKS VERIFICATION REPORT

This section presents the verification results for the 2017 Holland Board of Public Works Energy Waste Reduction 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 program goals and claimed and verified savings for the following programs:

Low Income Program deemed savings estimate is 626,898 kWh. Based on the analysis of the program the verified gross savings estimate is 302,290 kWh. The variance associated with this estimate is $\pm 15,719$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 394,946 kWh. Based on the analysis of the program the verified gross savings estimate is 364,140 kWh. The variance associated with this estimate is $\pm 32,044$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 308,139 kWh. Based on the analysis of the program the verified gross savings estimate is 307,122 kWh. The variance associated with this estimate is ± 921 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 629,969 kWh. Based on the analysis of the program the verified gross savings estimate is 597,588 kWh. The variance associated with this estimate is $\pm 38,246$ kWh ($\pm 6.4\%$).

Multi-family Program deemed estimate is 12,540 kWh, due to the low volume of program participation 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 12,540 kWh. The variance associated with this estimate is zero.

Residential Educational Services has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 8 for the gross savings by program.

Pilot Programs has 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 17,157,587 kWh. Based on the analysis of the program the verified gross savings estimate is 16,896,792 kWh. The variance associated with this estimate is 557,594 kWh ($\pm 3.3\%$).

Business Educational Services has stipulated savings. Accordingly, no verification was required. Therefore, the verified savings are 100%, see Table 8 for the gross savings by program.

Table 8. Holland Board of Public Works, EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	281,062	626,898	302,290	48.2%
Residential Services				
HVAC & Appliances		394,946	364,140	92.2%
Appliance Recycling	966,158	308,139	307,122	99.7%
Efficient Lighting Kits		629,969	597,588	94.9%
Multi-family		12,540	12,540	100.0%
Educational Services	162,681	159,386	159,386	100.0%
Pilot Programs	271,135	54,222	54,222	100.0%
2016 Carryover	-424,501			
Subtotal - Residential Solutions	1,256,535	2,186,099	1,797,288	82.2%
Business Services				
Commercial & Industrial	8,730,540	17,157,587	16,896,792	98.5%
Educational Services	162,681	36,929	36,929	100.0%
Pilot/Emerging Technology Programs	271,135	-	-	
2016 Carryover	-4,947,871			
Subtotal - Business Solutions	4,216,485	17,194,516	16,933,721	98.5%
Total Program Portfolio	5,473,020	19,380,615	18,731,009	96.6%

APPENDIX J. LOWELL LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2017 Lowell Light & Power Energy Waste Reduction 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 25,336 kWh. Based on the analysis of the program the verified gross savings estimate is 25,336 kWh. The variance associated with this estimate is zero.

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 25,455 kWh. Based on the analysis of the program the verified gross savings estimate is 23,470 kWh. The variance associated with this estimate is $\pm 2,065$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 10,838 kWh. Based on the analysis of the program the verified gross savings estimate is 10,802 kWh. The variance associated with this estimate is ± 32 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 70,693 kWh. Based on the analysis of the program the verified gross savings estimate is 67,059 kWh. The variance associated with this estimate is $\pm 4,292$ kWh ($\pm 6.4\%$).

Business Services:

Commercial and Industrial Program deemed savings estimate was 1,153,921 kWh. Based on the analysis of the program the verified gross savings estimate is 1,136,381 kWh. The variance associated with this estimate is 37,500 kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	7,123	25,336	25,336	100.0%
Residential Services				
HVAC & Appliances		25,455	23,470	92.2%
Appliance Recycling	136,714	10,838	10,802	99.7%
Efficient Lighting Kits		70,693	67,059	94.9%
Educational Services	10,274	-	-	-
Pilot Programs	17,124	-	-	-
2016 Carryover	-145,228			
Subtotal - Residential Solutions	26,007	132,322	126,667	95.7%
Business Services				
Commercial & Industrial	486,309	1,153,921	1,136,381	98.5%
Educational Services	10,274	-	-	-
Pilot/Emerging Technology Programs	17,124	-	-	-
2016 Carryover				
Subtotal - Business Solutions	513,707	1,153,921	1,136,381	98.5%
Total Program Portfolio	539,714	1,286,243	1,263,049	98.2%

APPENDIX K. NILES UTILITY DEPT. VERIFICATION REPORT

This section presents the verification results for the 2017 Niles Utility Dept. Energy Waste Reduction 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 54,132 kWh. Based on the analysis of the program the verified gross savings estimate is 26,102 kWh. The variance associated with this estimate is $\pm 1,357$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 54,992 kWh. Based on the analysis of the program the verified gross savings estimate is 50,702 kWh. The variance associated with this estimate is $\pm 4,462$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 1,135 kWh. Based on the analysis of the program the verified gross savings estimate is 1,131 kWh. The variance associated with this estimate is ± 3 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 357,440 kWh. Based on the analysis of the program the verified gross savings estimate is 339,068 kWh. The variance associated with this estimate is $\pm 21,700$ kWh ($\pm 6.4\%$).

Residential Educational Services has 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 1,053,620 kWh. Based on the analysis of the program the verified gross savings estimate is 1,037,605 kWh. The variance associated with this estimate is 34,241 kWh ($\pm 3.3\%$).

Business Educational Services has 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., EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	43,445	54,132	26,102	48.2%
Residential Services				
HVAC & Appliances		54,992	50,702	92.2%
Appliance Recycling	394,268	1,135	1,131	99.7%
Efficient Lighting Kits		357,440	339,068	94.9%
Educational Services	19,599	19,599	19,599	100.0%
2016 Carryover	385,837			
Subtotal - Residential Solutions	843,149	487,298	436,603	89.6%
Business Services				
Commercial & Industrial	829,694	1,053,620	1,053,621	98.5%
Educational Services	19,599	19,599	19,599	100.0%
2016 Carryover	-340,010			
Subtotal - Business Solutions	509,283	1,073,219	1,073,220	100.0%
Total Program Portfolio	1,352,432	1,560,517	1,509,822	96.8%

APPENDIX L. VILLAGE OF PAW PAW VERIFICATION REPORT

This section presents the verification results for the 2017 Village of Paw Paw Energy Waste Reduction 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 53,680 kWh. Based on the analysis of the program the verified gross savings estimate is 25,884 kWh. The variance associated with this estimate is $\pm 1,346$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 14,712 kWh. Based on the analysis of the program the verified gross savings estimate is 13,564 kWh. The variance associated with this estimate is $\pm 1,194$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 5,710 kWh. Based on the analysis of the program the verified gross savings estimate is 5,691 kWh. The variance associated with this estimate is ± 17 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 132,019 kWh. Based on the analysis of the program the verified gross savings estimate is 125,233 kWh. The variance associated with this estimate is $\pm 8,015$ kWh ($\pm 6.4\%$).

Residential Educational Services has 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 316,555 kWh. Based on the analysis of the program the verified gross savings estimate is 311,743 kWh. The variance associated with this estimate is 10,288 kWh ($\pm 3.3\%$).

Business Educational Services has 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, EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	38,955	53,680	25,884	48.2%
Residential Services				
HVAC & Appliances		14,712	13,564	92.2%
Appliance Recycling	83,545	5,710	5,691	99.7%
Efficient Lighting Kits		132,019	125,233	94.9%
Educational Services	7,350	7,350	7,350	100.0%
2016 Carryover	11,689			
Subtotal - Residential Solutions	141,539	213,471	177,723	83.3%
Business Services				
Commercial & Industrial	352,800	316,555	311,743	98.5%
Educational Services	7,350	7,350	7,350	100.0%
2016 Carryover	-346,973			
Subtotal - Business Solutions	13,177	323,905	319,093	98.5%
Total Program Portfolio	154,716	537,376	496,816	92.5%

APPENDIX M. CITY OF PETOSKEY VERIFICATION REPORT

This section presents the verification results for the 2017 City of Petoskey Energy Waste Reduction 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 54,132 kWh. Based on the analysis of the program the verified gross savings estimate is 26,102 kWh. The variance associated with this estimate is $\pm 1,357$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 25,539 kWh. Based on the analysis of the program the verified gross savings estimate is 23,547 kWh. The variance associated with this estimate is $\pm 2,072$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 4,540 kWh. Based on the analysis of the program the verified gross savings estimate is 4,525 kWh. The variance associated with this estimate is ± 14 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 148,368 kWh. Based on the analysis of the program the verified gross savings estimate is 140,742 kWh. The variance associated with this estimate is $\pm 9,007$ kWh ($\pm 6.4\%$).

Residential Educational Services has 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 2,837,441 kWh. Based on the analysis of the program the verified gross savings estimate is 2,794,311 kWh. The variance associated with this estimate is 92,212 kWh ($\pm 3.3\%$).

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

Business Pilot/Emerging Technology Programs has 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, EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	45,324	54,132	26,102	48.2%
Residential Services				
HVAC & Appliances		25,539	23,547	92.2%
Appliance Recycling	101,539	4,540	4,525	99.7%
Efficient Lighting Kits		148,368	140,742	94.9%
Educational Services	16,946	16,946	16,946	100.0%
Pilot Programs	28,243	-	-	-
2016 Carryover	43,812			
Subtotal - Residential Solutions	235,864	249,525	211,862	84.9%
Business Services				
Commercial & Industrial	892,473	2,837,441	2,794,311	98.5%
Educational Services	16,946	16,946	16,946	100.0%
Pilot/Emerging Technology Programs	28,243	28,243	28,243	100.0%
2016 Carryover	-401,619			
Subtotal - Business Solutions	536,043	2,882,630	2,839,500	98.5%
Total Program Portfolio	771,907	3,132,154	3,051,363	97.4%

APPENDIX N. CITY OF PORTLAND LIGHT OF POWER BOARD VERIFICATION REPORT

This section presents the verification results for the 2017 City of Portland Light and Power Board Energy Waste Reduction 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 12,492 kWh. Based on the analysis of the program the verified gross savings estimate is 6,024 kWh. The variance associated with this estimate is ± 313 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate was 41,374 kWh. Based on the analysis of the program the verified gross savings estimate is 38,147 kWh. The variance associated with this estimate is $\pm 3,357$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 20,604 kWh. Based on the analysis of the program the verified gross savings estimate is 20,536 kWh. The variance associated with this estimate is ± 62 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 126,360 kWh. Based on the analysis of the program the verified gross savings estimate is 119,865 kWh. The variance associated with this estimate is $\pm 7,671$ kWh ($\pm 6.4\%$).

Residential Educational Services has 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 410,994 kWh. Based on the analysis of the program the verified gross savings estimate is 404,747 kWh. The variance associated with this estimate is 13,357 kWh ($\pm 3.3\%$).

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

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	8,926	12,492	6,024	48.2%
Residential Services				
HVAC & Appliances		41,374	38,147	92.2%
Appliance Recycling	145,034	20,604	20,536	99.7%
Efficient Lighting Kits		126,360	119,865	94.9%
Educational Services	5,434	5,434	5,434	100.0%
2016 Carryover	32,918			
Subtotal - Residential Solutions	192,312	206,264	190,006	92.1%
Business Services				
Commercial & Industrial	197,432	410,994	404,747	98.5%
Educational Services	5,434	5,434	5,434	100.0%
2016 Carryover	-153,671			
Subtotal - Business Solutions	49,195	416,428	410,181	98.5%
Total Program Portfolio	241,507	622,692	600,186	96.4%

APPENDIX O. CITY OF ST. LOUIS VERIFICATION REPORT

This section presents the verification results for the 2017 City of St. Louis Energy Waste Reduction 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 20,820 kWh. Based on the analysis of the program the verified gross savings estimate is 10,039 kWh. The variance associated with this estimate is ± 522 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 12,006 kWh. Based on the analysis of the program the verified gross savings estimate is 11,069 kWh. The variance associated with this estimate is ± 974 kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 5,484 kWh. Based on the analysis of the program the verified gross savings estimate is 5,466 kWh. The variance associated with this estimate is ± 16 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 134,534 kWh. Based on the analysis of the program the verified gross savings estimate is 127,619 kWh. The variance associated with this estimate is $\pm 8,168$ kWh ($\pm 6.4\%$).

Residential Educational Services has stipulated savings. Accordingly, no verification is 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 is 368,928 kWh. Based on the analysis of the program the verified gross savings estimate is 363,320 kWh. The variance associated with this estimate is 12,024 kWh ($\pm 3.3\%$).

Business Educational Services has stipulated savings. Accordingly, no verification is required. Therefore, the verified savings are 100%, see Table 14 for the gross savings by program.

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	16,430	20,820	10,039	48.2%
Residential Services				
HVAC & Appliances		12,006	11,069	92.2%
Appliance Recycling	81,122	5,484	5,466	99.7%
Efficient Lighting Kits		134,534	127,619	94.9%
Educational Services	5,628	5,628	5,628	100.0%
Pilot Programs	5,628	-	-	-
2016 Carryover	49,015			
Subtotal - Residential Solutions	157,823	178,472	159,822	89.6%
Business Services				
Commercial & Industrial	253,258	368,928	363,320	98.5%
Educational Services	5,628	5,628	5,628	100.0%
Pilot/Emerging Technology Programs	7,504	-	-	-
2016 Carryover	-223,562			
Subtotal - Business Solutions	42,828	374,556	368,948	98.5%
Total Program Portfolio	200,651	553,028	528,770	95.6%

APPENDIX P. CITY OF STURGIS VERIFICATION REPORT

This section presents the verification results for the 2017 City of Sturgis Energy Waste Reduction 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 64,542 kWh. Based on the analysis of the program the verified gross savings estimate is 31,122 kWh. The variance associated with this estimate is $\pm 1,618$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 142,177 kWh. Based on the analysis of the program the verified gross savings estimate is 131,087 kWh. The variance associated with this estimate is $\pm 11,536$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 26,094 kWh. Based on the analysis of the program the verified gross savings estimate 26,008 kWh. The variance associated with this estimate is 78 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 522,826 kWh. Based on the analysis of the program the verified gross savings estimate is 495,952 kWh. The variance associated with this estimate is $\pm 31,741$ kWh ($\pm 6.4\%$).

Residential Educational Services has stipulated savings. Accordingly, no verification is 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 is 2,671,853 kWh. Based on the analysis of the program the verified gross savings estimate is 2,631,241 kWh. The variance associated with this estimate is 86,831 kWh ($\pm 3.3\%$).

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

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	47,202	64,542	31,122	48.2%
Residential Services				
HVAC & Appliances		142,177	131,087	92.2%
Appliance Recycling	237,557	26,094	26,008	99.7%
Efficient Lighting Kits		522,826	495,952	94.9%
Educational Services	34,171	34,171	34,171	100.0%
2016 Carryover	-126,655			
Subtotal - Residential Solutions	192,275	789,810	718,341	91.0%
Business Services				
Commercial & Industrial	1,811,063	2,671,853	2,631,241	98.5%
Educational Services	34,171	34,171	34,171	100.0%
Pilot/Emerging Technology Programs	113,903	-	-	-
2016 Carryover	-965,272			
Subtotal - Business Solutions	993,865	2,706,024	2,665,412	98.5%
Total Program Portfolio	1,186,140	3,495,834	3,383,753	96.8%

APPENDIX Q. TRAVERSE CITY LIGHT & POWER VERIFICATION REPORT

This section presents the verification results for the 2017 Traverse City Light & Power Energy Waste Reduction 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 22,902 kWh. Based on the analysis of the program the verified gross savings estimate is 11,043 kWh. The variance associated with this estimate is ± 574 kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 100,280 kWh. Based on the analysis of the program the verified gross savings estimate is 92,459 kWh. The variance associated with this estimate is $\pm 8,136$ kWh ($\pm 8.8\%$).

Appliance Recycling Program the deemed savings estimate is 70,125 kWh. Based on the analysis of the program the verified gross savings estimate 69,894 kWh. The variance associated with this estimate is 210 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 130,317 kWh. Based on the analysis of the program the verified gross savings 123,619 estimate is kWh. The variance associated with this estimate is $\pm 7,912$ kWh ($\pm 6.4\%$).

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

Residential Pilot Program has stipulated savings. Accordingly, no verification is 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 is 2,400,266 kWh. Based on the analysis of the program the verified gross savings estimate is 2,363,782 kWh. The variance associated with this estimate is 78,005 kWh ($\pm 3.3\%$).

Business Educational Services has stipulated savings. Accordingly, no verification is required. Therefore, the verified savings are 100%, see Table 16 for the gross savings by program.

Business Pilot/Emerging Technology Programs has stipulated savings. Accordingly, no verification is required. Therefore, the verified savings are 100%, see Table 16 for the gross savings by program.

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	22,827	22,902	11,043	48.2%
Residential Services				
HVAC & Appliances		100,280	92,459	92.2%
Appliance Recycling	415,135	70,125	69,894	99.7%
Efficient Lighting Kits		130,317	123,619	94.9%
Educational Services	49,768	49,768	49,768	100.0%
Pilot Programs	82,947	82,947	82,947	100.0%
2016 Carryover	369,563			
Subtotal - Residential Solutions	940,240	456,340	429,729	94.2%
Business Services				
Commercial & Industrial	2,614,499	2,400,266	2,363,782	98.5%
Educational Services	49,768	49,768	49,768	100.0%
Pilot Programs	82,947	82,947	82,947	100.0%
2016 Carryover	-2,130,556			
Subtotal - Business Solutions	616,658	2,532,981	2,496,497	98.6%
Total Program Portfolio	1,556,898	2,989,321	2,926,227	97.9%

APPENDIX R. WYANDOTTE MUNICIPAL SERVICES VERIFICATION REPORT

This section presents the verification results for the 2017 Wyandotte Municipal Services Energy Waste Reduction 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 17Table 16 presents program goals and claimed and verified savings for the following programs:

Low Income Program deemed savings estimate is 69,418 kWh. Based on the analysis of the program the verified gross savings estimate is 33,473 kWh. The variance associated with this estimate is $\pm 1,741$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 11,998 kWh. Based on the analysis of the program the verified gross savings estimate is 11,036 kWh. The variance associated with this estimate is ± 971 kWh ($\pm 8.8\%$).

Appliance Recycling Program deemed estimate is 37,455 kWh. Based on the analysis of the program the verified gross savings estimate 37,331 kWh. The variance associated with this estimate is 124 kWh ($\pm 0.3\%$).

Efficient Lighting Program deemed savings estimate is 69,418 kWh. Based on the analysis of the program the verified gross savings estimate is 65,850 kWh. The variance associated with this estimate is $\pm 4,214$ kWh ($\pm 6.4\%$).

Business Services:

Commercial and Industrial Program deemed savings estimate is 1,094,829 kWh. Based on the analysis of the program the verified gross savings estimate is 1,078,188 kWh. The variance associated with this estimate is 35,580 kWh ($\pm 3.3\%$).

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

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	79,516	69,418	33,473	48.2%
Residential Services				
HVAC & Appliances	617,268	11,998	11,036	92.0%
Appliance Recycling		37,455	37,331	99.7%
Efficient Lighting Kits		69,418	65,850	94.9%
Educational Services	74,741	-	-	-
Pilot Programs	59,793	-	-	-
2016 Carryover				
Subtotal - Residential Solutions	831,318	188,288	147,690	78.4%
Business Services				
Commercial & Industrial	955,233	1,094,829	1,078,188	98.5%
Educational Services	15,065	-	-	-
Pilot/Emerging Technology Programs	90,388	-	-	-
2016 Carryover				
Subtotal - Business Solutions	1,060,686	1,094,829	1,078,188	98.5%
Total Program Portfolio	1,892,004	1,283,117	1,225,878	95.5%

APPENDIX S. ZEELAND BOARD OF PUBLIC WORKS VERIFICATION REPORT

This section presents the verification results for the Zeeland Board of Public Works Energy Waste Reduction 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 57,879 kWh. Based on the analysis of the program the verified gross savings estimate is 27,909 kWh. The variance associated with this estimate is $\pm 1,451$ kWh ($\pm 5.2\%$).

Residential Services:

High-Efficiency Products (HVAC & Appliances) Program deemed estimate is 247,371 kWh. Based on the analysis of the program the verified gross savings estimate is 228,076 kWh. The variance associated with this estimate is $\pm 20,071$ kWh ($\pm 8.8\%$).

Appliance Recycling Program deemed estimate is 25,150 kWh. Based on the analysis of the program the verified gross savings estimate 25,067 kWh. The variance associated with this estimate is 75 kWh ($\pm 0.3\%$).

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

Residential Pilot Program has stipulated savings. Accordingly, no verification is 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 is 2,627,298 kWh. Based on the analysis of the program the verified gross savings estimate is 2,587,363 kWh. The variance associated with this estimate is 85,383 kWh ($\pm 3.3\%$).

Table 18. Zeeland Board of Public Works, EWR Program Goals, Claimed and Verified Savings (kWh)

Program Name	Goal	Claimed	Verified Gross	Verification Rate
Low Income	50,798	57,879	27,909	48.2%
Residential Services				
HVAC & Appliances	186,427	247,371	228,076	92.2%
Appliance Recycling		25,150	25,067	99.7%
Educational Services	47,445	-	-	-
Pilot Programs	63,260	-	-	-
2016 Carryover	53,548			
Subtotal - Residential Solutions	401,478	330,400	281,052	85.1%
Business Services				
Commercial & Industrial	2,767,617	2,627,298	2,587,363	98.5%
Educational Services	47,445	-	-	-
Pilot/Emerging Technology Programs	-	-	-	-
2016 Carryover	-291,766			
Subtotal - Business Solutions	2,523,296	2,627,298	2,587,363	98.5%
Total Program Portfolio	2,924,774	2,957,698	2,868,415	97.0%



APPENDIX T. PROGRAM DESCRIPTIONS

The utilities and MPPA EE Service Committee municipal utility members offered a variety of residential, commercial and industrial EWR 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

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, globe, flood (PAR-30) interior and exterior bulbs. 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, mailed, 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 is marketed in various ways such as through the utility website and through return cards that were mailed out to customers.

Appliance Recycling Program: This program is offered in 2017 by some of the utilities after a brief one-year lapse in 2016 when there was no service recycling provider. Among the few utilities that are 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 also offers turnkey pick up and recycling services for room air conditioners and dehumidifiers.

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 furnace motors that have high-efficiency motors (electrically commutated motors – ECMs). ECM motors save electric energy during the heating and cooling seasons.

Income Qualified 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. It includes primarily a mix of LED lamps and some utilities offer measures like smart power strips, water-saving aerators and pipe wrap insulation.



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 LED 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 2017 Energy Waste Reduction 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: β (beta), σ_0 (sigma-naught), and γ (gamma). The coefficient beta is a fixed constant applied to the known tracking estimate x_k to predict the verified savings y_k . σ_k is the residual standard deviation of each unit k . Both the expected value σ_k and residual standard deviation σ_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

Program	Beta	Error Ratio	Assumed Population	Sample Size 90/10 Confidence Level	Study Sample Size and Confidence Interval	
	β	ER	N	n	n	Gross CI
Program						
Residential						
Appliance Pick Up	0.95	0.20	292	10	30	5.4%
High Efficiency Products	0.95	0.20	1,082	11	30	5.9%
Lighting	0.63	0.20	3,288	11	24	6.6%
Low Income	0.80	0.20	1,441	11	25	6.5%
C&I						
Prescriptive/Custom	0.89	0.15	303	6	15	6.5%

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 (γ) gamma. This is a proxy for $\sigma_i = \sigma \gamma$. The

relative cumulative sum of the (xy) 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 2017 sample design

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

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

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

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 (γ) gamma. This is a proxy for $\sigma_i = \sigma \gamma$. The relative cumulative sum of the γ 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

$$\hat{B}_0 = \frac{\sum_{i=1}^{n_0} w_i y_i}{\sum_{i=1}^{n_0} w_i x_i} \quad \bar{y}_0 = \hat{B}_0 \mu_{x0} \quad \hat{Y}_0 = \hat{B}_0 X_0$$

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 $se(\hat{Y}_0) = se(\hat{B}_0) X_0$



APPENDIX W. VERIFICATION METHODOLOGY AND SURVEY INSTRUMENTS

This section describes the verification approach for the following programs:

- Appliance Recycling
- 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, Equation 3 was used to determine the verified savings, and Equation 4 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 and 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 BB.



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.



APPENDIX X. APPLIANCE RECYCLING TELEPHONE SURVEY

MPPA Residential Appliance Recycling Program Survey

CATI Survey 30 November 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 database variables that should be filled in on a case-by-case basis.
4. Text in double-carrots << >> are larger blocks of text that will change on a case-by-case basis depending on database variables.
5. Text in gray boxes is major programming instruction.
6. Unless specifically noted, do NOT read answer choices. [Don't know] and [Refused] should NEVER be read.

Programming Notes

1. Code multiple response questions as a series of variables that have a 0 or 1 value. One variable for each answer option. For example, R5_1 = 1 if the respondent answers "internet" to R5. R5_1 = 0 if the respondent does not answer "internet. Make separate 0/1 variables for the [Don't know] and [Refused] options as well.

Database variables

Variable Definition

(Unless otherwise noted, the database can contain more than one of each variable per respondent)

Customer_Name Contact name(s).

Utility Name Utility name(s): Bay City Electric Light & Power, Charlevoix Electric System, Chelsea Electric Department, Grand Haven Board of Light & Power Hart Hydro-Electric, Holland Board of Public Works, Lowell Light & Power, Niles Utility Department, City of Petoskey, Portland Light & Power Board, City of St. Louis, City of Sturgis, Village of Paw Paw, Zeeland Board of Public Works

Program Names Appliance Recycling (Pick up Program) Appliance Recycling (drop off only offered in the City of Sturgis)

AddressAddress where equipment was recycled from

Phone Number

Phone number

MeasName1, MeasName2

MeasName3

Text summarizing equipment type that was (Refrigerator, Freezer, Air Conditioning Unit, Dehumidifier)

MeasNameCount1,... X Text summarizing quantity of that equipment that was recycled

Recycling service provider Michigan Energy Options or Padnos or Arca

Stratum The strata each participant is assigned to either one or two,

INTRODUCTION

Intro1. May I speak with <Customer_Name>? Hello, my name is _____, and I'm calling on behalf of the Appliance Recycling Program offered through <utility>I'm calling to speak with you about some appliances your household recently recycled.

[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 that your household recycled some appliances through <utility>'s Appliance Recycling program services. Are you familiar with having appliances recycled in 2017?

Prompt if needed: They may have been picked by a company or dropped off at a recycling event back on <date of pick up>

1	[Yes]	VG0	97	[Don't know]
2	[No]	Intro3	98	[Refused]

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

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

Intro4. Could I speak with <Intro3> now?

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

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

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

Intro6. What is your name?

	[RECORD FIRST and LAST NAME]	VG0		
98	[Refused]		97	[Don't know]

VERIFY GROSS INSTALLATION

VG0. I have some questions about the equipment you recycled.

[IF MeasNameX=NULL GOTO A1]

VG1. Our records show your household had <Total_Measure_Cnt > < Measure_Name1>, Measure_Name2, Measure_Name3> recycled. Is that correct number of recycled appliances?

1	[Yes]	GOTO VG2c	97	[Don't know]	GOTO Intro3 or T&T
2	[No]	VG2a	98	[Refused]	

VG2a. How many <MeasNameX> were recycled?

[RECORD VERBATIM] If ≠ <MeasNameCountX > the go to GOTO VG2b.

97 [Don't know] VG2c. 98 [Refused]

VG2b. Why were a different number of <MeasNameX> recycled?

[RECORD VERBATIM] VG2c

97 [Don't know] 98 [Refused]

VG2c. Before being recycled, was the <MeasNameX> being stored or used at < Address>?

1 [Address is incorrect – Record correct address] VG2d

2 [Address is correct] R0

97 [Don't know] 98 [Refused]

VG2d. Why were they recycled from a different address?

[RECORD VERBATIM]

R0

97 [Don't know] 98 [Refused]

OPERATIONAL

[Repeat for each <MeasNameX>]

RO. Was/were the <MeasNameCountX or VG2a# > <MeasNameX> you recycled in working condition?

1 [Yes –All] R1 97 [Don't know] R1

2 [No – none/or only some] R0a. 98 [Refused]

R0a. How many <MeasNameX> were in working condition?

[RECORD VERBATIM] R1

97 [Don't know] 98 [Refused]

R1. If the program had not offered the recycling service when it did, would you have still gotten rid of the <MeasNameCountX > <MeasNameX>, or would you have kept it/them?

[PROMPT FOR RESPONSE – READ OPTIONS IF NEEDED]		3	[Kept it or both]	REPEAT VG0-R2
				for each MeasNameX ELSE GO
1	[Gotten rid of it or both]	R2	97	[Don't know]
2	[Kept one and got rid of one]		98	[Refused]

R2. How would you have gotten rid of it/them? [PROMPT FOR RESPONSE – READ OPTIONS IF NEEDED, ACCEPT MULTIPLES IF <MeasNameCountX >=1]

1	[Threw away / Took to Landfill]	REPEAT VG0-R2 for each MeasNameX ELSE GO TO RO	8	[Kept it - plugged in]
			9	[Kept it - not plugged in]
2	[Took to recycling center]		10	[Disassembled it myself]
3	[Donated to charity]		11	[Abandon it]
4	[Taken by installer of new one]		77	[Other (specify)]
5	[Sold to used appliance dealer]		97	[Don't know]
6	[Sold to private individual]		98	[Refused]
7	[Given it to friend/relative/private individual]			

ATTRIBUTION

A1. What is the main reason you chose this recycling service to dispose of your appliance(s)? [ALLOW ONLY ONE RESPONSE]

1	[To get the program rebate]	S1	7	[Old and outdated equipment]
2	[To save energy]		8	[No longer needed]
3	[Service was free]		9	[It came recommended]
4	[Proper disposal (recycled)]		77	[Other - SPECIFY]
5	[Convenience]		97	[Don't Know] S1
6	[Unwanted equipment]		98	[Refused]

Satisfaction

S1. How satisfied or dissatisfied were you with the recycling program?

1	1 – Very Dissatisfied	3	3
2	2	4	4
5	5- Very Satisfied	98	[Refused]
97	[Don't know]		

S5a. Why do you say that? [ALLOW MULTIPLE RESPONSES]

1	[Pick up times were inconvenient] FE1	6	[Shorter follow up survey]
		7	[Scheduling pickup was inconvenient]
2	[Equipment should not have to be working properly to quality for free service]	77	[Other - SPECIFY] ()
3	[Increase the incentive]	78	None
4	[Drop the incentive/incentive not needed]	97	[Don't Know]
		98	[Refused]
5	[Incentive check should be more timely]		

Closing statement

Those are all the questions I have for you today, unless you have something you would like to tell us regarding your experience with this program we are finished. Thank you for your time.

1	Record:D1	97	[Don't know]
2	No Comments		

D1. RECORD GENDER [DO NOT ASK.]

1	Male END_1	97	[Don't know]
2	Female		

APPENDIX Y. EFFICIENT LIGHTING TELEPHONE SURVEY

MPPA – Efficient Lighting Program CATI Survey

Final 09 Jan 2013

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

Name Customer name

Address Address where equipment was installed

City City where equipment was installed

Municipal_Name Customer Utility

Program_Name Utility program name

MeasType1, MeasType2.

...10..x Original measure description (do not use) e.g., "17-101, LED 60w Equivalent"

MeasDesc1,

MeasDesc2..

...10 Cleaned measure description (do use).e.g., "LED 60w Equivalent"

Meas_qty1 Quantity of measures distributed by measure description.

Distributor Name Source that gave-away or installed the light bulbs.

** not all utilities provided this information.**

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.

LED Night_QTY 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.

CFL_QTY 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.

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 LED light bulbs that were purchased through a mail-in rebate, given to you at an event or directly installed at your home this year. [PROMPT IF NEEDED: You may have received things like LED light bulbs, LED night lights, etc. at <distributor name>]

[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 LED light bulbs, distributed, or installed by the program? [PROMPT IF NEEDED: You may have received things like LED light bulbs, LED night lights, etc. from <Distributor name>]

1 [Yes] Intro6 97 [Don't know]

2 [No] 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	97	[Don't know]
2	[No]	Intro5	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]

LED_ASK - Sample LED bulb

- 1 = 'LED 5 watt candelabra base'
- 2 = 'LED 40 watt Equivalent'
- 3 = 'LED 60 watt Equivalent'
- 4 = 'LED 75 watt Equivalent'
- 5 = 'LED 100 watt Equivalent'
- 6 = 'LED Exterior Fixture - 1 Lamp'
- 7 = 'LED Exterior Fixture - 2 Lamp'
- 8 = 'LED Globe'
- 9 = 'LED Indoor Downlights'
- 10 = 'LED Indoor Flood/PAR'
- 11 = 'LED Lamp less than 7 watts'
- 12 = 'LED Lamp 7 watts or greater'
- 13 = 'LED Outdoor Flood/PAR' ;

START LED BLOCK:

IF LED_QTY>0 then ask L1

IF LED = 0 then skip to next section (LED Night Lights)

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 | 97 | [Don't know] | L1a |
| 2 | No | L1a | 98 | [Refused] | |

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

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

Block

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

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

L2a. How many LED light bulbs did you receive?

- | | | | | | |
|---|----------------------------------------------|---------------|----|--------------|----|
| # | [Enter quantity] | L3 | 97 | [Don't know] | L3 |
| 0 | [None] | END LED block | 98 | [Refused] | |
| 3 | [Did receive the quantity stated previously] | L3 | | | |

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

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

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

#	[Enter quantity]	L5	9997	[Don't know]
9999	[All of them]		9998	[Refused]
0	[None of them]			

L5. How many of the LEDs provided by the program replaced another type of light bulb such as an incandescent, CFL or LED bulb? [IF NEEDED, "AS OPPOSED TO BEING INSTALLED IN A NEW LIGHT FIXTURE OR SOCKET"]

			0	[None of them, all installed in new sockets] End LED block
#	[Enter quantity]	L6.	9997	[Don't know]
9999	[All of them]		9998	[Refused]

L6. What type of light bulb(s) were you using before you installed the program provided LED(s)? [Prompt if needed: Was it the least efficient incandescent (or halogen) bulbs, the lesser efficient CFL bulbs or did you remove an LED?] Circle all that apply

1	[Incandescent or halogen]	L7.	50	[Other]
2	[CFL]		97	[Don't know] End LED block
3	[LED]		98	[Refused]
4	[Mix of INC and CFL]			

L7. What was the approximate wattage of bulb(s) that you removed? (Prompt if needed: 100W, 75W, 60W or 40w or less?) Circle all that apply.

1	[100w or more]	End LED Block	4	[20w or below]
2	[75w]		50	[Other]
3	[60w]		97	[Don't know]
4	[40w]		98	[Refused]

Verification – LED NIGHT LIGHTS

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

[IF <LED> = Y, ask L1-L4, else END Lighting Block]

NL1. Our records show that you received <LED Night_QTY> LED nightlight(s). Is this correct?

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

NL1a. How many LED night lights did you receive?

- | | | | | | |
|---|----------------------------------------------|---------------------------|------|--------------|-----|
| # | [Enter quantity] | NL2 | 9997 | [Don't know] | NL2 |
| 0 | [None] | End LED Night Light Block | 9998 | [Refused] | |
| 3 | [Did receive the quantity stated previously] | NL2 | | | |

NL2. Are you using these LED nightlights at your address?

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

NL3. Have the <LED Night_QTY> nightlight(s), provided by the program, been removed, given away or is not in use? Circle all that apply.

- | | | | | | |
|---|-------------------------------------|-----|----|--------------|--------------|
| 1 | [Yes removed, given away, not used] | | 97 | [Don't know] | End NL block |
| | End NL block | | 98 | [Refused] | |
| 2 | [No still installed] | NL4 | | | |

NL4. How many of the LED nightlights replaced another type of nightlight bulb? [If needed, or did you install them in new sockets?]

- | | | | | |
|------|----------------------------------------------|-----|------|--------------|
| # | [Enter quantity] | NL5 | 9997 | [Don't know] |
| 9999 | [All of them] | | 9998 | [Refused] |
| 0 | [None of them, all installed in new sockets] | | | |
| | End NL block | | | |

NL5. What type of nightlights were you using before you installed the LED nightlights? [Prompt if needed: Was it the least efficient incandescent (or halogen) bulbs, the lesser efficient CFL bulbs or did you remove an LED?] Circle all that apply.

- | | | | |
|--------------|---------------------------|----|----------------------|
| 1 | [Incandescent or halogen] | 4 | [Mix of INC and CFL] |
| End NL block | | 50 | [Other] |
| 2 | [CFL] | 97 | [Don't know] |
| 3 | [LED] | 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 | 97 | [Don't know] | C1a |
| 2 | No | C1a | 98 | [Refused] | |

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

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

Block

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

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

C2a. How many CFLs did you receive?

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

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 97 [Don't know]
- 2 [All of them] 98 [Refused]
- 3 [None of them]

C5. How many of the LEDs installed replaced another type of light bulb such as an incandescent, CFL or LED bulb?


- 1 [Enter quantity] C6. block
 - 2 [All of them] 97 [Don't know]
 - 3 [None of them, all installed in new sockets] 98 [Refused]
- End CFL

C6. What type of light bulbs were you using before you installed the LEDs? [Prompt if needed: Was it the least efficient incandescent (or halogen) bulbs, the lesser efficient CFL bulbs or did you remove an LED?] Circle all that apply

- 1 [Incandescent or halogen] C7. 50 [Other]
- 2 [CFL] 97 [Don't know] End CFL block
- 3 [LED] 98 [Refused]
- 4 [Mix of INC and CFL]

C7. What was the wattage of bulbs that you removed? (Prompt if needed: 100W, 75W, 60W or 40w or less?) Circle all that apply.

- 1 [100w or more] End CFL Block 3 [60w]
- 2 [75w] 4 [40w]



4 [20w or below]

97 [Don't know]

50 [Other]

98 [Refused]

THANK & TERMINATE

END_1. Those are all the questions I have for you today. Thank you for your time.

APPENDIX Z. HIGH EFFICIENCY PRODUCTS TELEPHONE SURVEY

MPPA - Residential High Efficiency Products CATI Survey

30 November 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 database 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.

Database variables

Variable Definition

(Unless otherwise noted, the database can contain more than one of each variable per respondent)

Name_1 Customer last name. Some implementer records include both first and last name in Name_1.

Name_2 Customer first name

Site_Address Address where equipment was installed

City City where equipment was installed

Utility Customer Utility

MEAS_QTY1, MEAS_QTY2, etc. Equipment type (non-lighting) and quantity of measure. These measures should be verified when QTY > 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.

Lighting Y/N indicates whether the recipient received lighting measures (primarily LEDs, although a few CFLs).

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 97 [Don't know]
- 2 [No] Intro3 98 [Refused]

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

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

Intro4. Could I speak with <Intro3> now?

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

97 [Don't know]

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 you purchase or receive and the following equipment: <MEAS_TYPE1, MEAS_TYPE2, MEAS_TYPE3,..7 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 97 [Don't know] Intro3

2 No V1a 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 97 [Don't know] Intro3

2 We did NOT receive any equipment 98 [Refused]
END Equipment Block

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

1 Yes V3 97 [Don't know]

2 No 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]

START LED BLOCK

IF Lighting = Y and LED_QTY>0 then ask L1 Else IF LED="0", end survey.

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

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 97 [Don't know] L1a

2 No L1a 98 [Refused]

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

1 We received LEDs L1a. 97 [Don't know]

2 We did NOT receive any LEDs END LED 98 [Refused]

Block

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

1 [Yes] L3 97 [Don't know]

2 [No] L2a 98 [Refused]

L2a. How many LED light bulbs did you receive?

1 [Enter quantity] L3 97 [Don't know] L3

2 [None] END LED block 98 [Refused]

3 [Did receive the quantity stated previously]
L3

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

1 [Yes] L4 97 [Don't know]

2 [No]

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 | 97 | [Don't know] |
| 2 | [All of them] | | 98 | [Refused] |
| 3 | [None of them] | | | |

L5. How many of the LEDs installed replaced another type of light bulb such as an incandescent, CFL or LED bulb?

- | | | | | |
|---|----------------------------------------------|-----|----|--------------|
| 1 | [Enter quantity] | L6. | 97 | [Don't know] |
| 2 | [All of them] | | 98 | [Refused] |
| 3 | [None of them, all installed in new sockets] | | | |
- End LED block

L6. What type of light bulb(s) were you using before you installed the LED(s)? [Prompt if needed: Was it the least efficient incandescent (or halogen) bulbs, the lesser efficient CFL bulbs or did you remove an LED?] Circle all that apply

- | | | | | |
|---|---------------------------|-----|----|----------------------------|
| 1 | [Incandescent or halogen] | L7. | 50 | [Other] |
| 2 | [CFL] | | 97 | [Don't know] End LED block |
| 3 | [LED] | | 98 | [Refused] |
| 4 | [Mix of INC and CFL] | | | |

L7. What was the wattage of bulb(s) that you removed? (Prompt if needed: 100W, 75W, 60W or 40w or less?) Circle all that apply.

- | | | | | |
|---|----------------|---------------|----|----------------|
| 1 | [100w or more] | End LED Block | 4 | [20w or below] |
| 2 | [75w] | | 50 | [Other] |
| 3 | [60w] | | 97 | [Don't know] |
| 4 | [40w] | | 98 | [Refused] |

Verification –Recycled Small Appliances

[IF MeasType1: "Dehumidifier Recycling or Room AC Recycling or Freezer Recycling" then ask otherwise skip this section (none exist in MeasType2 though 7)

VG0. I have some questions about the equipment you had recycled.

VG1. Our records show your household had <Total_Measure_Cnt > < Measure_Name1>, Measure_Name2, Measure_Name3> recycled. Is that correct number of recycled appliances?

- 1 [Yes] GOTO VG2c 97 [Don't know] GOTO Intro3 or T&T
- 2 [No] VG2a 98 [Refused]

VG2a. How many <MeasNameX> were recycled?

- [RECORD VERBATIM] If ≠ 97 [Don't know] VG2c.
- <MeasNameCountX > the go to GOTO VG2b. 98 [Refused]

VG2b. Why were a different number of <MeasNameX> recycled?

- [RECORD VERBATIM] VG2c 98 [Refused]
- 97 [Don't know]

VG2c. Before being recycled, was the <MeasNameX> being stored or used at < Address>?

- 1 [Address is incorrect – Record correct address] VG2d 97 [Don't know]
- 2 [Address is correct] R0 98 [Refused]

VG2d. Why were they recycled from a different address?

- [RECORD VERBATIM] 97 [Don't know]
- R0 98 [Refused]

[Repeat for each <MeasNameX>]

RO. Was/were the <MeasNameCountX or VG2a# > <MeasNameX> you recycled in working condition?

- 1 [Yes –All] R1 97 [Don't know] R1
- 2 [No – none/or only some] R0a.
- 98 [Refused]

R0a. How many <MeasNameX> were in working condition?

[RECORD VERBATIM] R1 98 [Refused]

97 [Don't know]

R1. If the program had not offered the recycling service when it did, would you have still gotten rid of the <MeasNameCountX > <MeasNameX>, or would you have kept it/them?

[PROMPT FOR RESPONSE – READ OPTIONS IF NEEDED]

1 [Gotten rid of it or both] R2 97 [Don't know]

2 [Kept one and got rid of one] 98 [Refused]

3 [Kept it or both] REPEAT VG0-R2
for each MeasNameX ELSE GO

R2. How would you have gotten rid of it/them? [PROMPT FOR RESPONSE – READ OPTIONS IF NEEDED, ACCEPT MULTIPLES IF <MeasNameCountX >=1]

1 [Thrown away / Taken to Landfill] 7 [Given it to friend/relative/private individual]
REPEAT VG0-R2 for each MeasNameX

ELSE GO TO RO

2 [Taken to recycling center] 8 [Kept it - plugged in]
9 [Kept it - not plugged in]

3 [Donated to charity] 10 [Disassembled it myself]

4 [Have removed by installer of new one] 11 [Abandon it]

5 [Sold to used appliance dealer] 77 [Other (specify)]

6 [Sold to private individual] 97 [Don't know]

98 [Refused]

END_1. Those are all the questions I have for you today.

THANK & TERMINATE

Thank you for your time.

APPENDIX AA. INCOME QUALIFIED TELEPHONE SURVEY

MPPA - Income Qualified Program CATI Survey

Feb 1, 2018

Final 09 Jan 2013

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

(Unless otherwise noted, the database can contain more than one of each variable per respondent)

ID DNVGL Unique Identifier

Utility Customer Utility Name; often same name as the City where they live or presented as an acronym.

Name_1 Customer first name. Some implementer records include both first and last name in Name_1.

Name_2 Customer last name

Site_Address Address where equipment was installed


City City where equipment was installed

Phone If Null – Okay to skip this record.

MeasCount Sum of measure types given away per household

Other Y/N indicates whether the recipient received non-lighting measure(s). These may include, Advanced/Smart Power Strip, aerators, pipe wrap. This field will drive the decision to ask the non-lighting battery of questions.

MEAS_QTY1, MEAS_QTY2, etc. Equipment type (non-lighting) and quantity of measure. These measures should be verified when "other" flag = Y and QTY > 0. The individual measure names are included in the column header.



LED_1; LED_2 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.

NL 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.

LED Holiday_QTY 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.

Program Name "Income Qualified Program" is the program name. This is primarily a Giveaway (kit/box) that is given or mailed to customers. Some utilities do direct installation performed by the utility's contactor Michigan Energy Options.

NL ENERGY STAR LED Night Light

L1-L3 only

LED Bulb (60 W); (40); (75W); Globe LEDs

LED Holiday Light Strings

V1-V3

Advanced/Smart Power Strip

Bathroom Faucet -Aerator

Shower Head-Aerator

Kitchen-Aerator

Pipe Wrap Insulation

INTRODUCTION

Intro1. May I speak with < Name_1, Name_2>? Hello, my name is _____, and I'm calling on behalf of your electric utility company <Utility>. I would like to ask to you about some energy saving LED light bulbs that were either given to you, mailed to you or previously installed in your home last year.

[IF NEEDED] You may have received a box of energy saving light bulbs either by mail or they could have been given to you in person or installed directly in your home. These were distributed sometime in 2017.

[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. <Utility> records show the program gave away or directly installed energy saving LED light bulbs and may have provided other energy savings improvements to your home. Are you familiar with having received the free light bulbs or other equipment?

[PROMPT IF NEEDED: You may have received LED light bulbs, night lights, low-flow faucet aerators or smart power strips.

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

Intro3. Who could I speak to that would be familiar with the program's offering?

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

Intro4. Could I speak with <Intro3> now?

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

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

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

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

Intro6. What is your name?

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

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> give you or directly install the following equipment <measX>? in 2017?

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

V1a. Just to confirm, you did not receive a/an <measX> on behalf of <UTILITY> in 2017?

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

V2. Our records show that you received <measX qty>. Is this correct?

1 Yes V3V4 97 [Don't know]
 2 No V3 98 [Refused]

V3. How many <measX> did you receive?

#	[Enter quantity]	L3VL4	-97	[Don't know]	L3VL4
0	[None]	END LED block	-98	[Refused]	
-96	[Did receive the quantity stated previously]	L3VL4			

V4. Are you using <measX> at this address?

1	[Yes]	V5	97	[Don't know]
2	[No]			

V5. How many of the <measX> provided by the program have been removed, given away, or are not being used?

Check all that apply.

#	[Enter quantity NOT USED]	V6	-97	[Don't know]	END Equipment Block
0	[All of them ARE NOT USED]	V6	-98	[Refused]	

V65. What did you do with the <measX> that are not being used? [IF NEEDED: Check all that apply.]

1	Failed/ no longer work	END Equipment Block	4	Thrown away
			[50]	Other
2	Gave them away		[97]	[Don't know]
3	Stored in house		[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 LED light bulbs you received through the program.

Verification -LED bulbs

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

[IF MULTIPLE TYPE OF LEDS THEN REPEAT L2-L7

L1. To verify, did you receive one or more LED light bulbs from <UTILITY> in 2017?

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

L1a. Just to confirm, you did not receive any LED bulbs from <UTILITY> in 2017?

- | | | | | | |
|---|-----------------------------|---------|----|--------------|--|
| 1 | We received LEDs | L2. | 97 | [Don't know] | |
| 2 | We did NOT receive any LEDS | END LED | 98 | [Refused] | |

Block

L2. Our records show that you received <LED_QTY/TYPE> light bulbs. Is this correct?

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

L2a. How many LED light bulbs did you receive?

- | | | | | | |
|-----|----------------------------------------------|---------------|-----|--------------|----|
| # | [Enter quantity] | L3 | -97 | [Don't know] | L3 |
| 0 | [None] | END LED block | -98 | [Refused] | |
| -96 | [Did receive the quantity stated previously] | L3 | | | |

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

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

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

[IF NEEDED: Those that are removed, burnt out, given away, or are not being used?] Check all that apply.

- | | | | | | |
|---|----------------------------|----|-----|--------------|---------------|
| 0 | [All of them ARE NOT USED] | L5 | | | |
| # | [Enter quantity NOT USED] | L5 | -97 | [Don't know] | END LED block |

-98 [Refused]

L5. What did you do with the LEDs provided by the program that are not being used?

[IF NEEDED: Those that are removed, burnt out, given away, or are not being used?] Check all that apply.

1	[Removed]	L6	50	[Other]
2	[Burned out]		97	[Don't know]
3	[Gave away]		98	[Refused]
4	[Storage]			

L6. How many of the LEDs installed replaced another type of light bulb such as an incandescent, CFL or LED bulb?

#	[Enter quantity]	L7	97	[Don't know]
-90	[All of them]		98	[Refused]
0	[None of them, all installed in new sockets]			
	End LED block			

L7 What type of light bulb(s) were you using before you installed the LED(s)? [Prompt if needed: Was it an incandescent (or halogen) bulb(s), CFL bulb(s) or did you remove an LED (LEDs) ?] Circle all that apply

1	[Incandescent or halogen]	End LED block	4	[Mix of INC and CFL]
			50	[Other]
2	[CFL]		97	[Don't know]
3	[LED]		98	[Refused]

Verification – LED NIGHT LIGHTS

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

[IF <LED> = Y, ask L1-L4, else END Lighting Block]

NL1. Our records show that you received <LED QTY/ NIGHTLIGHTS>. Is this correct?

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

NL1a. How many LED night lights did you receive?

#	[Enter quantity]	NL2	-97	[Don't know]	NL2
0	[None]	End LED Night Light Block	-98	[Refused]	
-960	[Did receive the quantity stated previously]				
	NL2				

NL2. Are you using these LED nightlights at this address?

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

NL3. How many of the <LED Night_QTY> night light(s), provided by the program, have been removed, given away or are not being used?

#	[Enter quantity NOT USED]	NL45		
-960	[All of them ARE NOT USED][None of them]	End Block		
-97	[Don't know]			

NL45. What did you do with the night light(s) provided by the program that are not being used?

[IF NEEDED: Those that are removed, burnt out, given away, or are not being used?] Check all that apply.

1	[Removed]	End LED Block	50	[Other]
2	[Burned out]		97	[Don't know]
3	[Gave away]		98	[Refused]
4	[Storage]			

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 < QTY /LED Holiday_QTY> strands. Is this correct?

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

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

#	[Enter quantity]	HL2	97	[Don't know]	HL2
0	[None]	End LED Holiday Block	98	[Refused]	
90	[Did receive the quantity stated previously]	HL2			

HL2. During the holidays, did you use these at your <address>?

1	Yes	HL3	97	[Don't know]	HL3
2	No	HL3	98	[Refused]	

HL3. During the holidays, were the holiday light(s), provided by the program, removed, given away or not used?

1	[Yes all removed, given away, not used]	HL4HL45	-97	[Don't know]	HL4END
			-98	[Refused]	
2	[No, all were installed]	HL4end			
3	[Some removed some installed]	HL45			

HL45. What did you do with the holiday light(s) provided by the program that were not used?

1	[Removed]	End LED Block	50	[Other]	
2	[Burned out]		97	[Don't know]	
3	[Gave away]		98	[Refused]	
4	[Storage]				

END SURVEY

THANK & TERMINATE

END_1. Those are all of the questions I have for you today. Thank you for your time.

APPENDIX BB. COMMERCIAL ONSITE SURVEY

Utility Name:	«Program_Name__Program_Name»
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
		«Site_Notes»

DNV GL Signature: _____ Date _____ | Time _____

DNVqty	Measure Type: «RetroType1»/«RetroRetroType1»	Measure or Model Detail
«DNVQty1»	«RetroName1»	«DNVDesc1»
Qty Verified:		
Qty Operational:		
Measure Verified	YES NO	
(comment any notes if any discrepancy from tracking)		
Notes:		

DNVqty	Measure Type: «RetroType2»/«RetroRetroType2»	Measure or Model Detail
«DNVQty2»	«RetroName2»	«DNVDesc2»
Qty Verified:		
Qty Operational:		
Measure Verified	YES NO	
(comment any notes if any discrepancy from tracking)		
Notes:		

DNVqty	Measure Type: «RetroType3»/«RetroRetroType3»	Measure or Model Detail
«DNVQty3»	«RetroName3»	«DNVDesc3»
Qty Verified		
Qty Operational		
Measure Verified	YES NO	
(comment any notes if any discrepancy from tracking)		
Notes:		

APPENDIX CC. LOW INCOME VERIFICATION RATE

DNV GL completed the Low Income Program verification during the 1st quarter of 2018 with all surveys completed by February 14, 2018. The overall weighted verification rate is 48%. The unweighted survey results are presented in *Table 21. Low Income Average Verified and Installed by Measure Type*. The table illustrates the type of measures, number of measures and the average verification rate by measure as well as the average installation rate by measure. The results show the majority of customers acknowledge receiving the measures but only approximately half (depending on the measure type 45-57%) installed the measures. The survey asked respondents what they did with the measures provided by the program that are not being used the vast majority stated the measures were “in storage” which implies the measures will be installed eventually.

All respondents received at least three measures, some received four. Measure types included LEDs: 60W equivalent A-style bulbs, globe light bulbs, night lights, and in some cases holiday lights or smart power strips.

The starting sample was 27 customers, one customer was excluded due to an incomplete survey. Due the lower verification rate, DNV GL tested the results by added six additional sample points to identify if the trend of low installation rates persisted. The added sample showed no significantly difference from the primary sample.

Table 21. Low Income Average Verified and Installed by Measure Type

Unweighted averages			
	n, measures	Average Verification Rate	Average Installation Rate
60W equivalent LEDs	96	97%	57%
Globe LEDs	106	82%	54%
Night Light LEDs	36	90%	45%
Holiday Lighting	28	82%	50%
Smart Power Strips	2	100%	100%



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.