Guidehouse

ComEd Food Bank LED Distribution Impact Evaluation Report

Energy Efficiency / Demand Response Plan: Program Year 2019 (CY2019) (1/1/2019-12/31/2019)

Presented to
ComEd

FINAL

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ComEd Food Bank LED Distribution Impact Evaluation Report

1. Introduction

This report presents the results of the impact evaluation of ComEd's CY2019 Food Bank LED Distribution Program. It includes a summary of the energy and demand impacts for the total program broken out by relevant measure and program structure details. The appendix provides the impact analysis methodology and details of the Total Resource Cost inputs. CY2019 covers January 1, 2019 through December 31, 2019.

The evaluation team reviewed the default per-unit savings assumptions used to calculate savings from CY2019 eligible measures.

2. Program Description

The Food Bank LED Distribution Program provides packages of ENERGY STAR certified LEDs and Advanced Power Strips (APS) to select Feeding America food banks. The food banks use their network of local food pantries within ComEd's service territory to distribute the bulbs to utility customers. The LEDs and APSs are distributed at no cost to the food banks, food pantries and their customers. CLEAResult Consulting Inc. ("CLEAResult") implements the program and coordinates program activities, including engaging with the food banks and their participating food pantries.

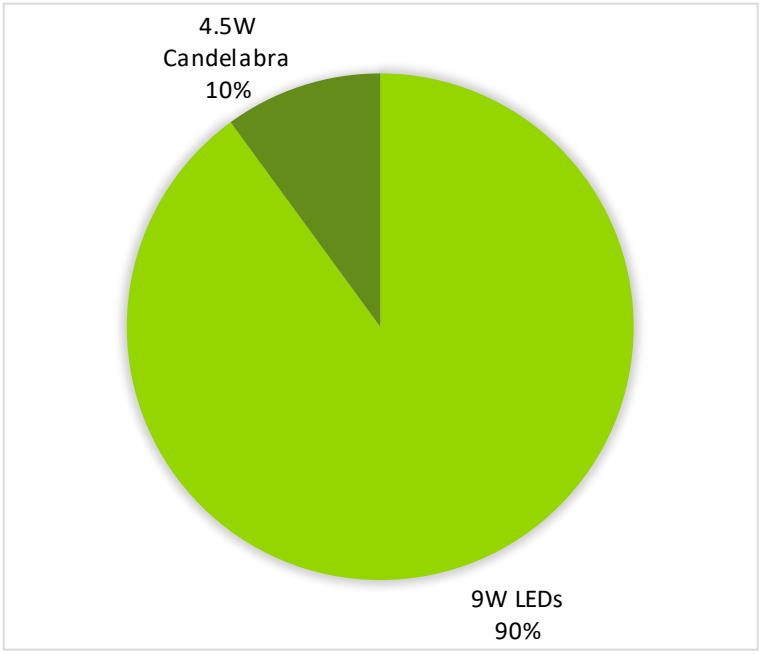
The program had 577 participating food pantries in CY2019 and distributed 1,879,860 measures as shown in the following table and graph.

Table 2-1. CY2019 Volumetric Findings Detail

Participation	Total CY2019 Count
Number of Participating Food Pantries	577
Number of 9W LEDs Distributed	1,690,960
Number of 4.5W Candelabra LED's Distributed	188,900
Total Number of Measures Distributed	1,879,860

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Number of Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Food Bank LED Distribution Program achieved in CY2019.

Table 3-1. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	61,524,375	NR	7,438
Program Gross Realization Rate	1.25	NA	1.21
Verified Gross Savings	76,763,976	69,593	9,026
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	76,763,976	69,593	9,026
Converted from Gas†			
Ex Ante Gross Savings	NA	NA	NA
Program Gross Realization Rate	NA	NA	NA
Verified Gross Savings	NA	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA	NA
Verified Net Savings	NA	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	61,524,375	NR	7,438
Program Gross Realization Rate	1.25	NA	1.21
Verified Gross Savings	76,763,976	69,593	9,026
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	76,763,976	69,593	9,026

NR = Not reported (refers a piece of data that was not reported, i.e., non-coincident demand savings)
NA = Not applicable (refers a piece of data cannot be produced or does not apply)
* The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.
† ComEd did not claim and the evaluation did not quantify gas savings for this program.
Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 shows the measure-specific and total verified gross savings for the Food Bank LED Distribution Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 76,763,976 kWh (Table 4-1). The “historic” rows in each table are the CPAS contribution back to CY2018. The “Program Total Electric CPAS” includes the sum of the CY2019 contribution and the historic contribution.

Guidehouse did not evaluate gas savings for this program and as such electric CPAS is equivalent to total CPAS.

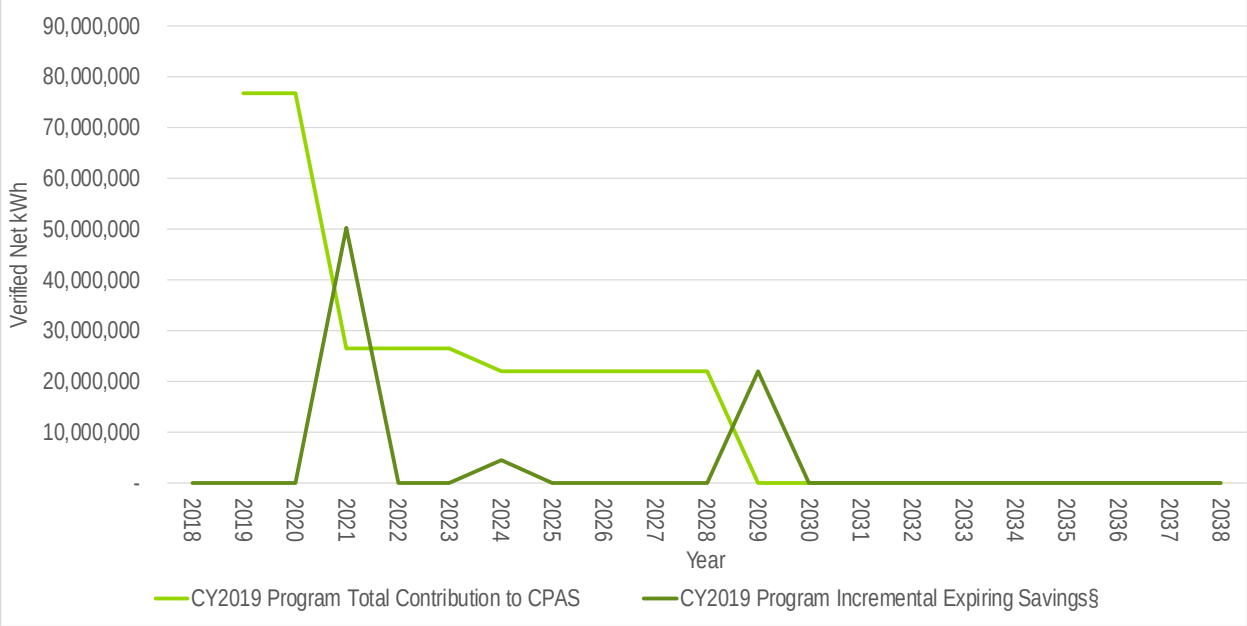
Table 4-1. Cumulative Persisting Annual Savings (CPAS)

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Lighting	9W LED	10.0	55,842,287	1.00	256,217,013		55,842,287	55,842,287	18,066,555	18,066,555	18,066,555	18,066,555	18,066,555	18,066,555
Lighting	4.5W Candelabra LED	10.0	5,630,329	1.00	33,861,243		5,630,329	5,630,329	5,630,329	5,630,329	5,630,329	1,141,919	1,141,919	1,141,919
Lighting	PY9 & CY2018 Carryover§§	7.5	15,291,360	1.00	52,752,410		15,291,360	15,291,360	2,778,360	2,778,360	2,778,360	2,767,831	2,767,547	2,766,411
CY2019 Program Total Electric Contribution to CPAS			76,763,976		342,830,665		76,763,976	76,763,976	26,475,244	26,475,244	26,475,244	21,976,305	21,976,021	21,974,885
Historic Program Total Electric Contribution to CPAS‡						39,753,102	39,753,102	39,753,102	12,007,480	12,007,480	12,007,480	12,006,881	11,218,166	11,218,166
Program Total Electric CPAS						39,753,102	116,517,078	116,517,078	38,482,724	38,482,724	38,482,724	33,983,186	33,194,187	33,193,051
CY2019 Program Incremental Expiring Electric Savings§								-	50,288,732	-	-	4,498,939	284	1,136
Historic Program Incremental Expiring Electric Savings‡§							-	-	27,745,622	-	-	599	788,715	-
Program Total Incremental Expiring Electric Savings§							-	-	78,034,354	-	-	4,499,538	788,999	1,136

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	9W LED	18,066,555	18,066,555										
Lighting	4.5W Candelabra LED	1,141,919	1,141,919										
Lighting	PY9 & CY2018 Carryover§§	2,766,411	2,766,411										
CY2019 Program Total Electric Contribution to CPAS		21,974,885	21,974,885	-									
Historic Program Total Electric Contribution to CPAS‡		11,218,166	-	-									
Program Total Electric CPAS		33,193,051	21,974,885	-									
CY2019 Program Incremental Expiring Electric Savings§		-	-	21,974,885									
Historic Program Incremental Expiring Electric Savings‡		-	11,218,166	-									
Program Total Incremental Expiring Electric Savings§		-	11,218,166	21,974,885									

Note: The green highlighted cell shows program total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2019 contribution to CPAS.
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
† Lifetime savings are the sum of CPAS savings through the EUL.
‡ Historical savings go back to CY2018
§ Incremental expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n
§§ The EUL for carryover savings is a weighted average of the lighting measures that were combined together.
Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings

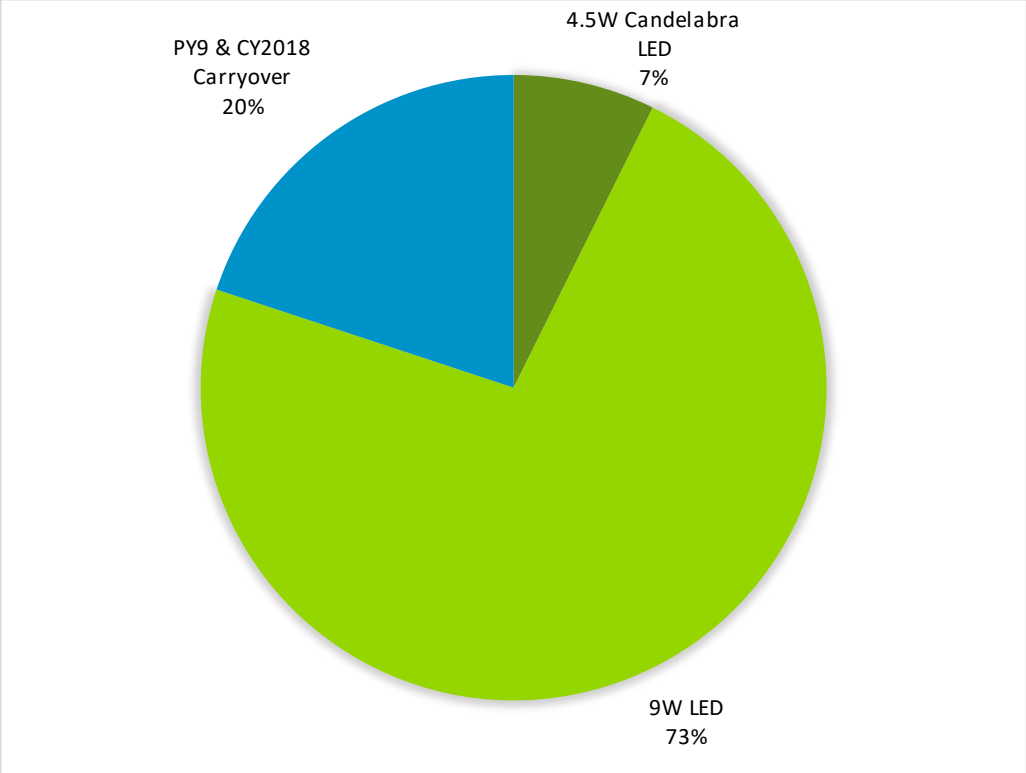


* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n
Source: Evaluation team analysis

5. Program Savings by Measure

The program includes two measures as shown in the following tables. The 9W LED lamps contributed the most savings (see Figure 5-1). There is also carryover from deferred installations of lamps distributed in PY9 and CY2018. Total ex ante savings from the program did not include carryover savings.

Figure 5-1. Verified Net Savings by Measure – Electric



Source: ComEd tracking data and evaluation team analysis

Table 5-1. CY2019 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	EUL (years)
Lighting	9W LED	55,842,263	1.00	55,842,287	1.00	55,842,287	10.0
Lighting	4.5W Candelabra LED	5,682,112	0.99	5,630,329	1.00	5,630,329	10.0
Lighting	PY9 & CY2018 Carryover	NR	NA	15,291,360	1.00	15,291,360	7.5
	Total	61,524,375	1.25	76,763,976	1.00	76,763,976	9.5

NA = Not applicable
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd.
Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2019 Non-Coincident Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Lighting	9 W LED	NR	NA	50,052.42	1.00	50,052.42
Lighting	4.5W Candelabra LED	NR	NA	5,723.67	1.00	5,723.67
Lighting	PY9 & CY2018 Carryover	NR	NA	13,817.39	1.00	13,817.39
	Total	NR	NA	69,593.48	1.00	69,593.48

NA = Not applicable
NR = Not reported* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

Table 5-3. CY2019 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Lighting	9 W LED	6,763.84	1.00	6,763.84	1.00	6,763.84
Lighting	4.5 W Candelabra LED	674.37	0.98	661.15	1.00	661.15
Lighting	PY9 & CY2018 Carryover	NR	NA	1,600.86	1.00	1,600.86
	Total	7,438.21	1.21	9,025.85	NA	9,025.85

NA = Not applicable
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation follows the methodology provided in the Illinois TRM (TRM). The lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life for each measure.

Table 6-1 and Table 6-2 show the inputs used to calculate the verified energy and demand savings for the 9W LED and 4.5W candelabra LED measures, respectively, along with details about the source of each input.

Table 6-1. 9W LED Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	1,690,960	# measures	Evaluated	ComEd Tracking Data
Watts EE	9	W	Deemed	Specifications
Watts Base	43	W	Deemed	TRM v7.0 - Section 5.5.8
ISR	80.30%	-	Evaluated	Guidehouse CY2018 Survey
Leakage	0.7%	-	Deemed	TRM v7.0 - Section 5.5.8
Hours	1,159	Hours/year	Deemed	TRM v7.0 - Section 5.5.8
WHe	1.051	-	Deemed	TRM v7.0 - Section 5.5.8
WHFd	1.093	-	Deemed	TRM v7.0 - Section 5.5.8
CF	0.135	-	Deemed	TRM v7.0 - Section 5.5.8
HF	42%	-	Deemed	TRM v7.0 - Section 5.5.8
nHeat - gas	0.7	-	Deemed	TRM v7.0 - Section 5.5.8

* TRM is the State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

Table 6-2. 4.5W Candelabra LED Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	188,900	# measures	Evaluated	ComEd Tracking Data
Watts EE	4.5	W	Deemed	Specifications
Watts Base	40	W	Deemed	TRM v7.0 - Section 5.5.6
ISR	80.30%	-	Evaluated	Guidehouse CY2018 Survey
Leakage	2.0%	-	Deemed	TRM v7.0 - Section 5.5.6
Hours	1,020	Hours/year	Deemed	TRM v7.0 - Section 5.5.6
WHe	1.046	-	Deemed	TRM v7.0 - Section 5.5.6
WHFd	1.083	-	Deemed	TRM v7.0 - Section 5.5.6
CF	0.117	-	Deemed	TRM v7.0 - Section 5.5.6
HF	42%	-	Deemed	TRM v7.0 - Section 5.5.6
nHeat - gas	0.7	-	Deemed	TRM v7.0 - Section 5.5.6

* TRM is the State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

6.2 CY2020 Carryover Savings Estimates

Calculation of the Calendar Year 2020 (CY2020) carryover estimate relies upon the TRM v8.0 and the CY2018 and CY2019 reports. At this time, all of these data sources are available and thus it is possible to estimate the gross and net carryover energy savings that the evaluation team recommends for CY2020. The energy and demand savings from these CY2018 and CY2019 deferred installs are calculated based on the following parameters:

- Delta Watts – calculated for the year of installation (source: TRM v7.0, CY2019 program data).
- HOU and Peak CF –TRM deemed value from the year of installation (source: TRM v7.0).

- Energy and Demand Interactive Effects –TRM deemed value from the year of installation (source: TRM v7.0.)
- Installation Rate –TRM deemed value from the year of purchase (source: TRM v6.0, TRM v7.0).
- NTG – Evaluation research from the year of purchase (source: CY2018 and CY2019 Reports).

Table 6-3 shows that in CY2020, 222,165 bulbs, purchased during either CY2018 or CY2019, are expected to be installed within ComEd service territory. The table provides both the gross and net energy and demand savings from these bulbs. The total net energy savings is estimated to be 15,622,866 kWh and 1,897 summer peak kW, which will be counted in CY2020 as LED Distribution Program carryover savings.

Table 6-3. CY2020 Verified Savings Carryover Estimate

CY2020 Verified Savings Carryover Estimate	CY2018 Bulbs	CY2019 Bulbs	Carryover in CY2020
Carryover Bulbs Installed During CY2019	204,031	18,134	222,165
Average Delta Watts	34.0	34.2	34.0
Average Annual Hours of Use	1,159	1,145	1,157.9
Energy Interactive Effects	1.051	1.050	1.051
Demand Interactive Effects	1.093	1.092	1.093
Summer Peak Load Coicidence Factor	0.135	0.133	0.135
Carryover Gross Energy Savings (kWh)	8,267,530	7,355,336	15,622,866
Carryover Gross Demand Savings (kW)	7,471	6,674	14,144
Carryover Gross Summer Peak Demand Savings (kW)	1,008.54	888.64	1,897.18
Net-to-Gross Ratio	1.00	1.00	1.00
Carryover Net Energy Savings (kWh)	8,267,530	7,355,336	15,622,866
Carryover Net Demand Savings (kW)	7,471	6,674	14,144
Carryover Net Summer Peak Demand Savings (kW)	1,008.54	888.64	1,897.18
Effective Useful Life	10.0	10.0	6.0

6.3 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2019 evaluation.

The evaluation team observed minor discrepancies in the verified and ex ante per unit energy and demand savings for LEDs, most likely caused by rounding at different points in the calculation. Guidehouse recommends that calculated values be rounded only at the final value, not in any interim calculation steps. The evaluation team calculated ex post values using this rounding methodology to ensure the most accurate calculations. Please see Recommendation 2 for a detailed description of the recommended rounding methodology. The program level realization rate is 125% due to carryover savings not being included in ex ante calculations.

Finding 1. The ex ante calculations do not include the carryover savings from previous evaluation years.

Recommendation 1. Guidehouse recommends including the carryover savings from previous evaluations years in the ex ante energy, non-coincident demand, and peak demand savings.

Finding 2. The ex ante values claimed in eTrack for the 4.5W candelabra LED are slightly different than the implementer provided calculations. The verified savings are consistent with the implementer provided calculations. This is likely due to differences in rounding methods applied during analysis.

Recommendation 2. Guidehouse recommends verifying that the values used in eTrack are consistent with the implementer provided and Guidehouse reviewed values for CY2020. The implementer should round final calculated values for electric kWh savings to three decimal places and five decimal places for kW savings with no rounding of interim calculation steps. Guidehouse recommends that calculated values be rounded only at the final value, not in any interim calculation steps.

7. Appendix 1. Total Resource Cost Detail

Table 7-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

Table 7-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Verified Gross Electric Energy Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Gas Savings (Therms)	Gross Heating Penalty (kWh)	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Verified Net Electric Energy Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Gas Savings (Therms)	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Lighting	9 W LED	Lamp	1,690,960	10.0	No	55,842,287	6,764	-	-	-1,095,404	1.00	1.00	1.00	55,842,287	6,764	0	0	-1,095,404
Lighting	4.5W Candelarbra LED	Lamp	188,900	10.0	No	5,630,329	661	-	-	-112,452	1.00	1.00	1.00	5,630,329	661	0	0	-112,452
Lighting	13W CFL Carryover	Lamp	128,464	2.0	No	4,701,566	344	-	-	-83,617	1.00	1.00	1.00	4,701,566	344	0	0	-83,617
Lighting	9W CFL Carryover	Lamp	405	2.0	No	9,887	1	-	-	-176	1.00	1.00	1.00	9,887	1	0	0	-176
Lighting	18W CFL Carryover	Lamp	67	2.0	No	2,851	0	-	-	-51	1.00	1.00	1.00	2,851	0	0	0	-51
Lighting	23W CFL Carryvoer	Lamp	34	2.0	No	2,006	0	-	-	-36	1.00	1.00	1.00	2,006	0	0	0	-36
Lighting	14 W Flood Carryover	Lamp	27	6.8	No	1,474	0	-	-	-26	1.00	1.00	1.00	1,474	0	0	0	-26
Lighting	9W Candelabra Carryover	Lamp	4	6.8	No	130	0	-	-	-2	1.00	1.00	1.00	130	0	0	0	-2
Lighting	9W Globe Carryover	Lamp	315	6.8	No	10,344	1	-	-	-184	1.00	1.00	1.00	10,344	1	0	0	-184
Lighting	9W LED Carryover	Lamp	254,916	10.0	No	10,563,101	1,255	-	-	-187,864	1.00	1.00	1.00	10,563,101	1,255	0	0	-187,864
	Total		2,264,092	9.5		76,763,976	9,026	-	-	-1,479,811				76,763,976	9,026	0	0	-1,479,811

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.
† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.
Source: ComEd tracking data and evaluation team analysis