Guidehouse

ComEd Nonprofit Organizations Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2020 (CY2020)
(1/1/2020-12/31/2020)

Prepared for:

ComEd

FINAL

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List of Tables, Figures, and Equations

1. Introduction

This report presents results from the CY2020 impact evaluation of ComEd's Nonprofit Organizations Program (a/k/a Nonprofit Retrofits Program). It summarizes the total energy and demand impacts for the program broken out by relevant measure and program structure details. The appendices provide the impact analysis methodology and details of the total resource cost (TRC) inputs. CY2020 covers January 1, 2020 through December 31, 2020.

2. Program Description

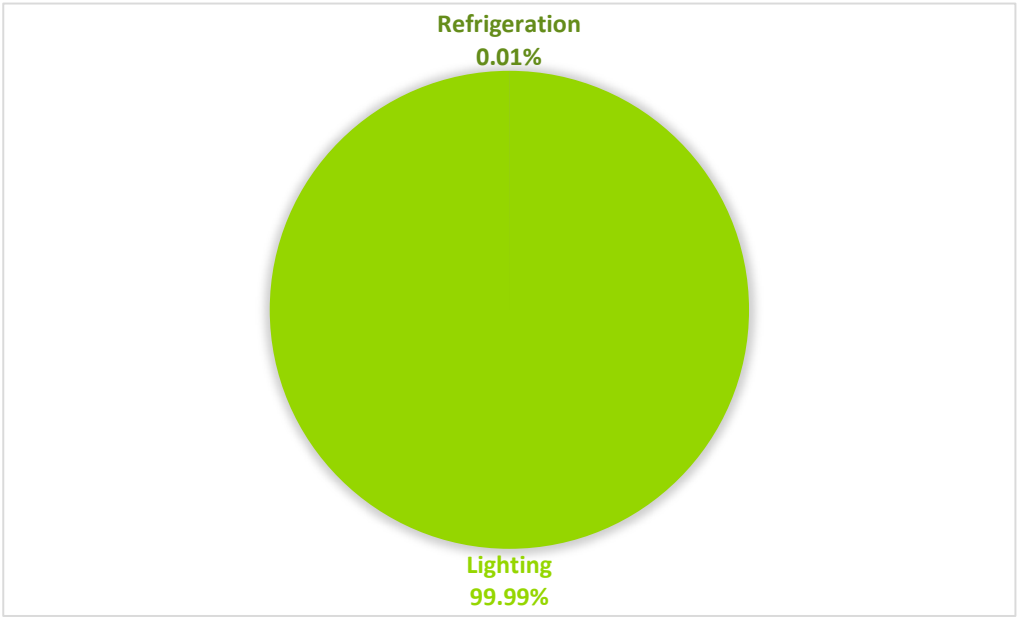
In CY2020, the program had 49 participants and the tracking data listed 14,655 measures distributed, as Table 2-1 and Figure 2-1 show. Table 2-1 shows participants, total measures, units per project, and reported installed projects. Figure 2-1 shows the majority of measures are lighting. The program's measure distribution consisted of lighting and lighting controls, and one refrigeration control measure.

Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total
Participants	49
Installed Projects	51
Measure Installations (Program Database)	14,665
Installed Lighting Measures	14,664
Installed Refrigeration Control Measures	1

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Share 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 Nonprofit Organizations Program achieved in CY2020. The program did not claim any gas savings as the installed measures (lighting and vending machine control) do not have associated gas savings.

Table 3-1. CY2020 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Summer Peak* Demand Savings (kW)
Electricity		
Ex Ante Gross Savings	3,411,435	681
Program Gross Realization Rate	0.98	0.96
Verified Gross Savings	3,357,628	653
Program Net-to-Gross Ratio (NTG)	0.97	0.97
Verified Net Savings	3,256,899	633
Converted from Gas†		
Ex Ante Gross Savings	0	NA
Program Gross Realization Rate	0.00	NA
Verified Gross Savings	0	NA
Program Net-to-Gross Ratio (NTG)	0.00	NA
Verified Net Savings	0	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	3,411,435	681
Program Gross Realization Rate	0.98	0.96
Verified Gross Savings	3,357,628	653
Program Net-to-Gross Ratio (NTG)	0.97	0.97
Verified Net Savings	3,256,899	633

NA = not applicable (refers to a piece of data that cannot be produced or does not apply)
*The coincident summer peak period is defined as 1:00 p.m.-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.
Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1**Error! Reference source not found.** shows the measure-specific and total verified gross savings for the Nonprofit Organizations Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2020. Figure 4-1 shows the savings across the useful life of the measures. The electric CPAS across all measures installed in 2020 is 3,256,899 kWh (Table 4-1). The historic rows in the table are the CPAS contribution back to CY2018. The Program Total Electric CPAS row is the sum of the CY2020 contribution and the historic contribution. The program did not claim and the evaluation team did not estimate gas savings for this program; as such, electric CPAS is equivalent to total CPAS.

Figure 4-1**Error! Reference source not found.** accounts for midlife adjustments to all lighting measures including those with T12 baselines, according to the procedures in the Illinois Statewide Technical Reference Manual version 8.0 (TRM v8.0). Section 6.2 provides a discussion on the midlife adjustment approach.

Due to the large number of Lighting measures in the Nonprofit Organizations Program, the CPAS values represented in the tables of this section are shown by research category. The effective useful life (EUL) values reflect weighted averages by energy savings, within each research category. Savings broken down by individual measures can be seen in Appendix B.

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

End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Lighting	LED Fixtures - Other	13.2	2,648,340	0.97	33,921,906			2,568,889	2,568,889	2,568,889	2,568,889	2,568,889	2,568,889	2,391,750
Lighting	LED Lamps	8.5	399,846	0.97	2,291,468			387,851	387,851	387,851	387,851	161,991	161,991	123,403
Lighting	LED Fixtures - Baseline T12	14.1	262,970	0.97	2,647,871			255,081	255,081	249,364	240,293	217,281	168,881	162,201
Lighting	Commercial Occupancy Sensors	8.0	28,313	0.97	219,708			27,464	27,464	27,464	27,464	27,464	27,464	27,464
Lighting	LED Exit Signs	5.0	16,547	0.97	80,252			16,050	16,050	16,050	16,050	16,050	-	-
Refrigeration	Vending Machine Control - Refrigerated	5.0	1,613	0.97	7,823			1,565	1,565	1,565	1,565	1,565	-	-
CY2020 Program Total Electric Contribution to CPAS			3,357,628		39,169,028			3,256,899	3,256,899	3,251,182	3,242,111	2,993,240	2,927,225	2,704,817
Historic Program Total Electric Contribution to CPAS‡							3,156,390	3,156,390	3,156,390	3,156,390	3,156,390	3,009,343	3,009,343	3,009,343
Program Total Electric CPAS						-	3,156,390	6,413,289	6,413,289	6,407,572	6,398,501	6,002,583	5,936,568	5,714,160
CY2020 Program Incremental Expiring Electric Savings§									-	5,717	9,071	248,871	66,015	222,407
Historic Program Incremental Expiring Electric Savings‡§								-	-	-	-	147,047	-	-
Program Total Incremental Expiring Electric Savings§								-	-	5,717	9,071	395,918	66,015	222,407

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED Fixtures - Other	2,273,657	2,273,657	2,256,795	2,231,503	2,016,469	1,693,919	1,693,919	1,676,901	-	-	-	-
Lighting	LED Lamps	97,678	97,678	97,324	-	-	-	-	-	-	-	-	-
Lighting	LED Fixtures - Baseline T12	157,747	157,747	145,919	128,178	127,870	127,410	127,410	127,410	-	-	-	-
Lighting	Commercial Occupancy Sensors	27,464	-	-	-	-	-	-	-	-	-	-	-
Lighting	LED Exit Signs	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	Vending Machine Control - Refrigerated	-	-	-	-	-	-	-	-	-	-	-	-
CY2020 Program Total Electric Contribution to CPAS		2,556,546	2,529,082	2,500,038	2,359,680	2,144,340	1,821,329	1,821,329	1,804,311	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		3,009,343	332,060	332,060									
Program Total Electric CPAS		5,565,889	2,861,142	2,832,098	2,359,680	2,144,340	1,821,329	1,821,329	1,804,311	-	-	-	-
CY2020 Program Incremental Expiring Electric Savings§		148,272	27,464	29,044	140,358	215,341	323,011	-	17,018	1,804,311	-	-	-
Historic Program Incremental Expiring Electric Savings‡		-	2,677,283	-	332,060	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§		148,272	2,704,747	29,044	472,418	215,341	323,011	-	17,018	1,804,311	-	-	-

Note: The green highlighted cell shows program total first-year electric savings. The gray cells are blank, indicating values irrelevant to the CY2020 contribution to CPAS.

*A deemed value. Source found on the Illinois Stakeholder Advisory Group (SAG) website: https://www.ilsag.info/ntg_2020.

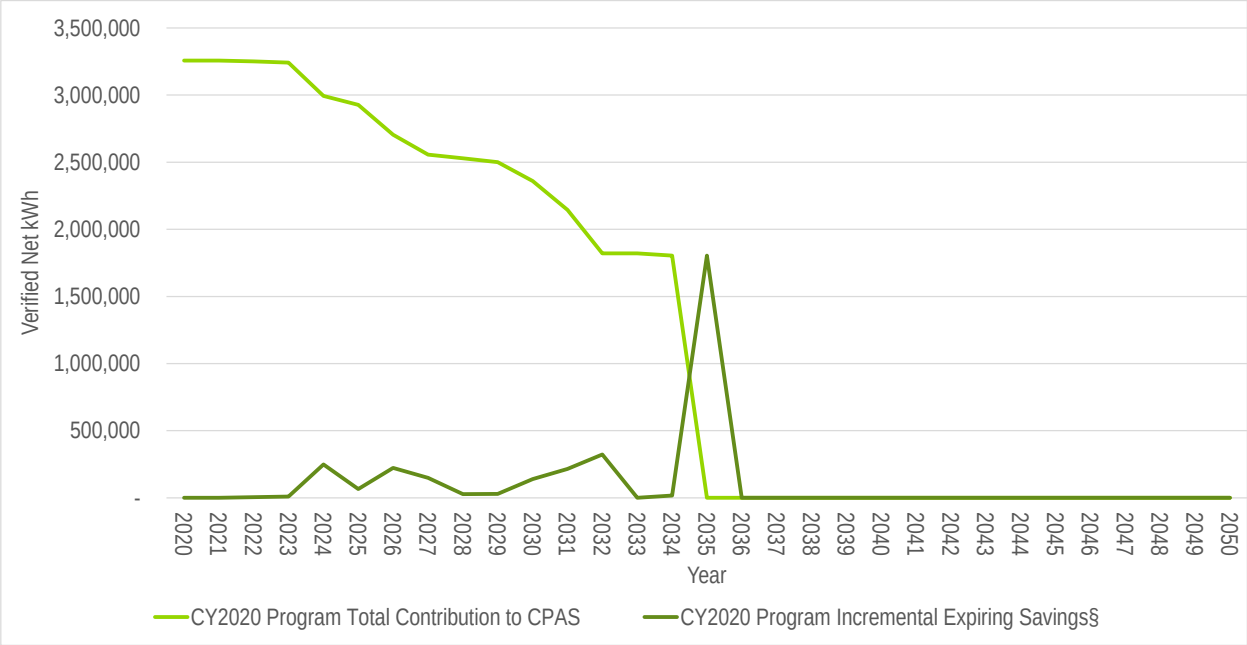
†Lifetime savings are the sum of CPAS savings through the effective useful life (EUL).

‡Historic savings go back to CY2018.

§Incremental expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n.

Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



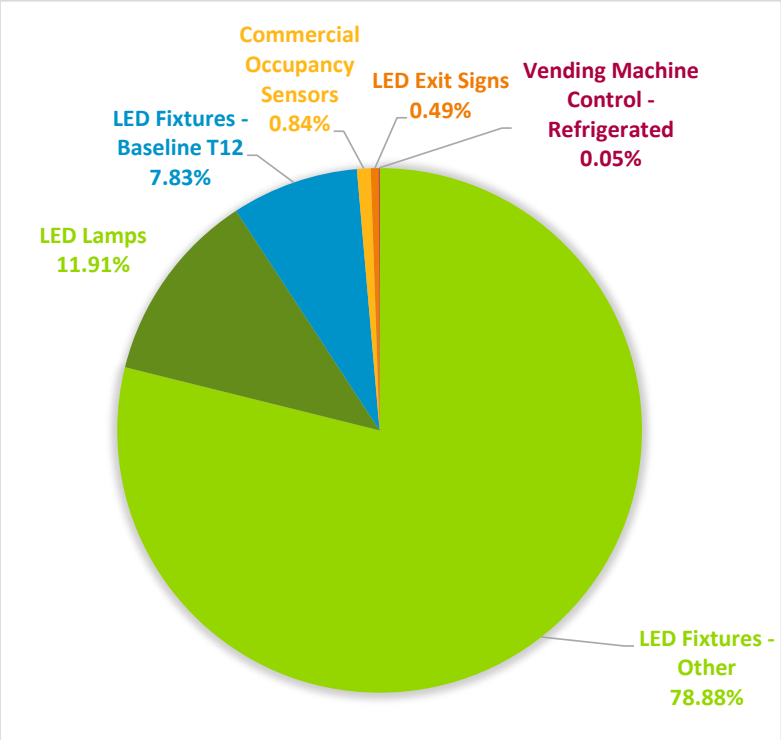
§Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n + Expiring Savings Y_{n-1}.

Source: Evaluation team analysis

5. Program Savings by Measure

The program includes 6 measures as shown in the following tables. The lighting measures contributed the greatest savings at 99.99% (see Figure 5-1). These measures include LED lamps, LED fixtures broken out by baseline (T12 and other), LED exit signs, lighting occupancy sensors, and vending machine control. Energy and peak demand savings are summarized in Table 5-1, and Table 5-2 respectively. The implementer did not claim any gas and water savings for this program.

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



Source: Evaluation team analysis

Table 5-1. CY2020 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	LED Fixtures - Other	2,746,073	0.96	2,648,340	0.97	2,568,889	13.2
Lighting	LED Lamps	333,566	1.20	399,846	0.97	387,851	8.5
Lighting	LED Fixtures - Baseline T12	279,354	0.94	262,970	0.97	255,081	14.1
Lighting	Commercial Occupancy Sensors	32,213	0.88	28,313	0.97	27,464	8.0
Lighting	LED Exit Signs	18,615	0.89	16,547	0.97	16,050	5.0
Refrigeration	Vending Machine Control - Refrigerated	1,613	1.00	1,613	0.97	1,565	5.0
	Total	3,411,435	0.98	3,357,628	0.97	3,256,899	NA

NA = not applicable (refers to a piece of data that cannot be produced or does not apply)
*A deemed value. Source found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2020 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	LED Fixtures - Other	512.34	0.96	493.78	0.97	478.96
Lighting	LED Lamps	78.90	0.95	74.97	0.97	72.72
Lighting	LED Fixtures - Baseline T12	65.92	0.93	61.26	0.97	59.42
Lighting	Commercial Occupancy Sensors	21.04	0.97	20.32	0.97	19.71
Lighting	LED Exit Signs	2.34	1.17	2.74	0.97	2.66
Refrigeration	Vending Machine Control - Refrigerated	0.00	1.00	0.00	0.97	0.00
	Total	680.55	0.96	653.06	0.97	633.47

NA = not applicable (refers to a piece of data that cannot be produced or does not apply)
*A deemed value. Source found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team estimated verified energy and demand savings for LED bulbs and fixtures using Equation 6-1, as specified in the TRM v8.0:

Equation 6-1. LED Bulbs and Fixtures TRM Algorithms

The variables in the following algorithms are defined in Table 6-1.

$$\Delta kWh = ((Wattsbase-WattsEE)/1,000) * Hours *WHFe*ISR$$
$$\Delta kWhheatpenalty = (((WattsBase-WattsEE)/1,000) * ISR * Hours * -IFkWh$$
$$\Delta kW =((Wattsbase-WattsEE)/1,000) * ISR * WHFd * CF$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the Effective Useful Life (EUL) for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters not specified in the TRM v8.0 or tracking data. Some of these measures were part of the midyear review, where the team audited their quantities against project files. Table 6-1 shows LED bulb and fixture savings parameters.

Table 6-1. LED Bulbs and Fixtures Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source*
Quantity	Varies	No. of measures	Evaluated	Tracking Data, Project Files
Net to Gross Ratio (NTG)	0.97	%	Deemed	Illinois SAG Consensus
$Watts_{base}$	Varies	W	Evaluated	Tracking Data
$Watts_{EE}$	Varies	W	Evaluated	Tracking Data
Hours	Varies	Hours/year	Deemed	TRM v8.0 – Section 4.5
WHF_e	Varies	-	Deemed	TRM v8.0 – Section 4.5
WHF_d	Varies	-	Deemed	TRM v8.0 – Section 4.5
$-IF_{kWh}$	Varies	-	Deemed	TRM v8.0 – Section 4.5
Coincidence Factor (CF)	Varies	-	Deemed	TRM v8.0 – Section 4.5
In Service Rate (ISR)	Varies	-	Deemed	TRM v8.0 – Section 4.5
Midlife Adjustment	Varies on light type	%	Deemed	TRM v8.0 – Errata Sept. 25, 2020 – Section 4.5.4
EUL	Fixtures: 15 Lamps: 10	Years	Deemed	TRM v8.0 – Errata Sept. 25, 2020 – Section 4.5.4

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: Evaluation team analysis

The evaluation team estimated verified energy and demand savings for occupancy sensors using Equation 6-2, as specified in the TRM v8.0:

Equation 6-2. Occupancy Sensors TRM Algorithms

The variables in the following algorithms are defined in Table 6-2.

$$\Delta kWh = kWControlled^* Hours * ESF * WHFe$$
$$\Delta kWhheatpenalty = kWControlled^* Hours * ESF * -IFkWh$$
$$\Delta kW = kWcontrolled * WHFd * (CFbaseline – CFos)$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters not specified in the TRM v8.0 or the tracking data. Some of these measures were part of the midyear review, where the team audited their quantities against project files. Table 6-2 shows occupancy sensor savings parameters.

Table 6-2. Occupancy Sensors Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source*
Quantity	Varies	No. of measures	Evaluated	Tracking Data, Project Files
NTG	0.97	%	Deemed	Illinois SAG Consensus
$KW_{Controlled}$	Varies	kW	Evaluated	Tracking Data
Hours	Varies	Hours/year	Deemed	TRM v8.0 – Section 4.5
Energy Savings Factor (ESF)	Varies	%	Deemed	Tracking Data
WHF_e	Varies	-	Deemed	TRM v8.0 – Section 4.5
WHF_d	Varies	-	Deemed	TRM v8.0 – Section 4.5
$-IF_{kWh}$	Varies	-	Deemed	TRM v8.0 – Section 4.5
CF	Varies	-	Deemed	TRM v8.0 – Section 4.5
CF_{os}	0.15	-	Deemed	TRM v8.0 – Section 4.5.10
EUL	8	Years	Deemed	TRM v8.0 – Section 4.5.10

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: Evaluation team analysis

The evaluation team estimated verified energy and demand savings for LED exit signs using Equation 6-3, as specified in the TRM v8.0:

Equation 6-3. LED Exit Signs TRM Algorithms

The variables in the following algorithms are defined in Table 6-3.

$$\Delta kWh = ((WattsBase - WattsEE) / 1{,}000) * HOURS * WHFe$$
$$\Delta kWhheatpenalty = (((WattsBase-WattsEE)/1{,}000) * Hours * -IFkWh$$
$$\Delta kW = ((WattsBase - WattsEE) / 1{,}000) * WHFd * CF$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. Table 6-3 shows LED exit sign savings parameters used in this evaluation.

Table 6-3. LED Exit Signs Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source*
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.97	%	Deemed	Illinois SAG Consensus
$Watts_{base}$	Varies	W	Evaluated	Tracking Data
$Watts_{EE}$	Varies	W	Evaluated	Tracking Data
Hours	8766	Hours/year	Deemed	TRM v8.0 – Section 4.5.5
WHF_e	Varies	-	Deemed	TRM v8.0 – Section 4.5
WHF_d	Varies	-	Deemed	TRM v8.0 – Section 4.5
$-IF_{kWh}$	Varies	-	Deemed	TRM v8.0 – Section 4.5
CF	1	-	Deemed	TRM v8.0 – Section 4.5.5
EUL	5	Years	Deemed	TRM v8.0 – Section 4.5.5

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: Evaluation team analysis

The evaluation team estimated verified energy savings for vending machine control – refrigerated using Equation 6-4, as specified in the TRM v8.0. There are no demand savings for this measure.

Equation 6-4. Vending Machine Control – Refrigerated TRM Algorithms

The variables in the following algorithm are defined in Table 6-4Table 6-3.

$$\Delta kWh = WATTSbase / 1{,}000 * HOURS * ESF$$

The evaluation team estimated the lifetime energy savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. Table 6-4 shows vending machine control – refrigerated savings parameters.

Table 6-4. Vending Machine Control – Refrigerated Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.97	%	Deemed	Illinois SAG Consensus
$Watts_{base}$	400	W	Deemed	TRM v8.0 – Section 4.6.2
Hours	8766	Hours/year	Deemed	TRM v8.0 – Section 4.6.2
ESF	0.64	%	Deemed	TRM v8.0 – Section 4.6.2
EUL	5	Years	Deemed	TRM v8.0 – Section 4.6.2

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: Evaluation team analysis

6.2 Midlife Adjustment

The midlife adjustment for LED Lamps uses the factors seen in Table 6-5. These new savings values are applied from 2024 to the end of the measure's EUL.

LED Fixtures with a T12 baseline use the TRM v8.0 method shown in Equation 6-5. ComEd and Elevate provided supplemental tracking data details that enabled the evaluation team to identify the measures with T12 baselines. The evaluation team applied the midlife adjustment to these measures by mapping them to equivalent T8 measures. They calculated the percent adjustment in savings using the T12 and equivalent T8 (TOS) base wattages, and the measure's efficient wattage. This percent reduction is applied after the remaining useful life (RUL) of the fixture, calculated as one third of the measure's EUL. The evaluation team applied this adjustment to the CPAS, it does not affect the first-year savings. The RUL of each measure with a T12 baseline is provided in more detail in 6.3Appendix B. Impact Analysis Results. LED Fixtures with baseline measures other than T12 do not have any midlife adjustment.

Table 6-5. LED Lamp Midlife Adjustment Factor

Lamp Type	Midlife Adjustment %
Omnidirectional	40%
Decorative	56%
Directional	54%

Source: TRM v8.0

Equation 6-5. T12 Baseline Midlife Adjustment

$$\% \text{ Adjustment} = (\text{TOS Base Watts} - \text{Efficient Watts})/(\text{Existing T12 Watts} - \text{Efficient Watts})$$
$$\text{RUL of existing T12 Fixture} = (1/3 * 40{,}000)/\text{Hours}$$

6.3 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2020 evaluation. These findings suggest ways to improve the measure-level realization rates. The measure-level realization rates and program savings percentages are presented in Table 6-6 to give context to our recommendations.

Table 6-6. Measure-Level Savings and Realization Rates

Research Category	Verified Gross Realization Rate	Percent of Program Savings
LED Fixtures - Other	0.96	78.88%
LED Lamps	1.20	11.91%
LED Fixtures - Baseline T12	0.94	7.83%
Commercial Occupancy Sensors	0.88	0.84%
LED Exit Signs	0.89	0.49%
Vending Machine Control - Refrigerated	1.00	0.05%

Source: Evaluation team analysis

Finding 1. The evaluation team found that reported quantities for lighting measures and occupancy sensors in the tracking database differed from those found in sampled project files during the midyear review. This error was found in 6% of projects.

Recommendation 1. Guidehouse recommends the implementation contractor update the tracking data with the final reported quantities once a project is complete.

Finding 2. The evaluation team found the TRM deemed values (CF, waste heat factors, and hours of use) were incorrectly assigned to many of the measures in the program based on their reported building types.

- CF was incorrectly assigned in 35% of the projects.
- Waste heat factors for energy and demand were incorrectly assigned in 59% of the projects.
- Hours of use was incorrectly assigned to 37% of the projects.

Recommendation 2. Guidehouse recommends the implementation contractor use the most current TRM version in the ex ante savings calculations, ensuring the deemed values line up with the reported building types.

Recommendation 3. Guidehouse recommends the implementation contractor provide an additional column in the project data that identifies the measures or projects that used custom or site-specific values as opposed to the TRM deemed values for the building type.

Finding 3. The evaluation team found the implementation contractor did not provide the additional necessary TRM deemed values for $Watts_{base}$ and ESF for the vending machine control-refrigerated measure. These variables were reported as 0, even though the TRM v8.0 has deemed specific values for them.

Recommendation 4. Guidehouse recommends the implementation contractor include values for all input variables in their tracking data, where applicable.

Finding 4. The evaluation team found the implementation contractor did not include electric heating penalty values in the energy savings for measures in locations with electric fuel heating.

Recommendation 5. Guidehouse recommends the implementation contractor update the ex ante savings at these locations to include the electric heating penalty.

Finding 5. The evaluation team found that the implementation contractor did not originally include baseline measure type for lighting fixtures, specifically indicating what fixture replacements had T12 and T8 baseline. This detail would enable the evaluation team to appropriately apply TRM midlife adjustment for T12 measures. In CY2020, as per the TRM v8.0 Errata Memo, the remaining useful life (RUL) for T12 midlife adjustment should be calculated as one-third of the 40,000-hour ballast life divided by the average HOU per year. The remaining life savings are then calculated using equivalent T8 baseline wattages, which would require a baseline measure type field for identification.

Recommendation 6. The evaluation team recommends the implementation contractor include baseline measure type for lighting fixtures in the tracking data to enable the evaluation team to determine the measure's EUL and midlife adjustment CPAS values. The implementation contractor should track the T12 baseline measures specifically, using the TRM guidelines. The implementation contractor should also consider tracking the equivalent T8 baseline wattage. The original tracking data contains the baseline wattage of lighting measures, but this is not enough to determine EUL and midlife adjustment without identifying the measure type.

Recommendation 7. The evaluation team acknowledges the supplemental data provided by the implementation contactor which enabled us to create the midlife adjustment for T12 baseline measures. In the future, the supplemental data should be included in the original tracking data.

Appendix A. Impact Analysis Methodology

The evaluation team calculated the verified gross savings for each measure in the program using the following methodology:

- Review energy and demand savings algorithm inputs in the measure workbook for agreement with the TRM v8.0 and Errata.
- Recalculate ex ante savings using reported values in the tracking data as a check.
- Apply the TRM v8.0 algorithms to the measures using TRM-verified inputs.
- Calculate electric heating penalties for measures in buildings with electric heat.
- Multiply the verified per-unit savings by the quantity reported in the tracking data for all measures. The per-unit savings were also multiplied by the quantity audited during the midyear review for midyear projects' invoices; reported quantities were used for new end of year projects. The team weighted these two verified savings groups, savings based on reported measures and savings based on audited measures, together against the ex ante savings to get comprehensive realization rates.

The evaluation team calculated energy and demand verified net savings by multiplying the verified gross savings achieved with the methodology above by a NTG of 0.97. For CY2020, the Nonprofit Organizations Program's NTG value was agreed upon through consensus with the Illinois SAG.

Appendix B. Impact Analysis Results

The evaluation team analyzed the electric savings for each individual measure in the program. This can be seen in the tables below, grouped by End Use Type. Table B-2 includes the remaining useful life (RUL) for LED Fixtures with a T12 baseline. The numeric identification next to the measure names identify the measure building type.

Table B-1. Electric Savings for LED Lamp Measures

End Use Category	Measure	Building Type	EUL	First Year Gross Verified kWh Savings
LED Lamps	Decorative Lamp 1	Assisted Living	6.4	15,153
LED Lamps	Decorative Lamp 3	Elementary School	10.0	806
LED Lamps	Globe Lamp 9	Religious Building	10.0	572
LED Lamps	Interior LED 3 - 11W	Elementary School	10.0	1,062
LED Lamps	Interior LED 6 - 11W	High School	10.0	4,549
LED Lamps	Interior LED 8 - 11W	Office - Low Rise	10.0	2,618
LED Lamps	Interior LED 9 - 11W	Religious Building	10.0	34,916
LED Lamps	Interior LED 1 - 15W	Assisted Living	6.4	6,130
LED Lamps	Interior LED 3 - 15W	Elementary School	10.0	3,962
LED Lamps	Interior LED 4 - 15W	Exterior - dusk to dawn	10.0	1,962
LED Lamps	Interior LED 6 - 15W	High School	10.0	44,807
LED Lamps	Interior LED 8 - 15W	Office - Low Rise	10.0	10,657
LED Lamps	Interior LED 9 - 15W	Religious Building	10.0	14,375
LED Lamps	Interior LED 6 - Candelabra	High School	10.0	1,223
LED Lamps	Interior LED 9 - Candelabra	Religious Building	10.0	1,798
LED Lamps	Interior LED 6 - Track Light	High School	10.0	6,911
LED Lamps	Interior LED 8 - Track Light	Office - Low Rise	10.0	2,935
LED Lamps	Interior LED 9 - Track Light	Religious Building	10.0	301
LED Lamps	Interior LED 1 - 9W	Assisted Living	6.4	137,129
LED Lamps	Interior LED 3 - 9W	Elementary School	10.0	4,297
LED Lamps	Interior LED 6 - 9W	High School	10.0	67,827
LED Lamps	Interior LED 8 - 9W	Office - Low Rise	10.0	17,658
LED Lamps	Interior LED 9 - 9W	Religious Building	10.0	476
LED Lamps	R ER BR Lamp 1	Assisted Living	6.4	948
LED Lamps	R ER BR Lamp 4 - 10W	Exterior - dusk to dawn	10.0	575
LED Lamps	Globe Lamp 7 - 3W	MF Mid Rise	9.6	549
LED Lamps	Globe Lamp 7 - 4W	MF Mid Rise	9.6	1,084
LED Lamps	R ER BR Lamp 4 - 23W	Exterior - dusk to dawn	10.0	9,088
LED Lamps	R ER BR Lamp 8 - 23W	Office - Low Rise	10.0	165
LED Lamps	R ER BR Lamp 3	Elementary School	10.0	3,489
LED Lamps	R ER BR Lamp 4 - 29W	Exterior - dusk to dawn	10.0	253
LED Lamps	R ER BR Lamp 8 - 29W	Office - Low Rise	10.0	1,571

Source: Evaluation team analysis

Table B-2. Electric Savings for LED Fixture Measures

End Use Category	Measure	Building Type	EUL	RUL	First Year Gross Verified kWh Savings
LED Fixtures - Baseline T12	Commercial Lighting Fixture 3 - T12	Elementary School	15.0	4.4	60,609
LED Fixtures - Baseline T12	Commercial Lighting Fixture 4 - T12	Exterior - dusk to dawn	11.6	3.1	1,360
LED Fixtures - Baseline T12	Commercial Lighting Fixture 6 - T12	High School	15.0	4.4	11,631
LED Fixtures - Baseline T12	Commercial Lighting Fixture 7 - T12	MF Mid Rise	9.6	2.6	45,218
LED Fixtures - Baseline T12	Commercial Lighting Fixture 8 - T12	Office - Low Rise	15.0	4.9	119,581
LED Fixtures - Baseline T12	Commercial Lighting Fixture 9 - T12	Religious Building	15.0	6.4	24,571
LED Fixtures - Other	Commercial Lighting Fixture 1	Assisted Living	6.4	NA	304,364
LED Fixtures - Other	Commercial Lighting Fixture 2	Childcare	15.0	NA	16,587
LED Fixtures - Other	Commercial Lighting Fixture 3	Elementary School	15.0	NA	235,688
LED Fixtures - Other	Commercial Lighting Fixture 4	Exterior - dusk to dawn	11.6	NA	554,210
LED Fixtures - Other	Commercial Lighting Fixture 5	Garage	14.7	NA	4,707
LED Fixtures - Other	Commercial Lighting Fixture 6	High School	15.0	NA	536,348
LED Fixtures - Other	Commercial Lighting Fixture 7	MF Mid Rise	9.6	NA	43,458
LED Fixtures - Other	Commercial Lighting Fixture 8	Office - Low Rise	15.0	NA	519,305
LED Fixtures - Other	Commercial Lighting Fixture 9	Religious Building	15.0	NA	319,375
LED Fixtures - Other	Commercial Lighting Fixture 10	Unknown	14.8	NA	80,661
LED Fixtures - Other	Commercial Lighting Fixture 11	Warehouse	15.0	NA	33,639

NA = not applicable (refers to a piece of data that cannot be produced or does not apply)

Source: Evaluation team analysis

Table B-3. Electric Savings for Other Measures

End Use Category	Measure	Building Type	EUL	First Year Gross Verified kWh Savings
Commercial Occupancy Sensors	Commercial Occupancy Sensor	NA	8	28,313
LED Exit Signs	LED Exit Signs	NA	5	16,547
Vending Machine Control - Refrigerated	Vending Machine Control - Refrigerated	NA	5	1,613

Source: Evaluation team analysis

Appendix C. Total Resource Cost Detail

Table C-1 shows the 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) is not included in this table and will be provided to the evaluation team later.

Table C-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Gross Electric Energy Savings (kWh)	Gross Peak Demand Reduction (kW)	Gross Gas Savings (Therms)	Gross Secondary Savings due to Water Reduction (kWh)	Gross Heating Penalty (kWh)†§	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Net Electric Energy Savings (kWh)	Net Peak Demand Reduction (kW)	Net Gas Savings (Therms)	Net Secondary Savings due to Water Reduction (kWh)	Net Heating Penalty (kWh)†§	Net Heating Penalty (Therms)
Lighting	LED Fixtures - Other	Fixture	10,898	13.2	NO	2,648,340	493.78	0	0	-1,097	-29,828	0.97	0.97	0.97	2,568,889	478.96	0	0	-1,064	-28,934
Lighting	LED Lamps	Lamp	2,375	8.5	NO	399,846	74.97	0	0	-44	-7,395	0.97	0.97	0.97	387,851	72.72	0	0	-43	-7,174
Lighting	LED Fixtures - Baseline T12	Fixture	925	14.1	NO	262,970	61.26	0	0	-96	-3,418	0.97	0.97	0.97	255,081	59.42	0	0	-93	-3,316
Lighting	Commercial Occupancy Sensors	Each	359	8.0	NO	28,313	20.32	0	0	-209	-464	0.97	0.97	0.97	27,464	19.71	0	0	-203	-450
Lighting	LED Exit Signs	Each	55	5.0	NO	16,547	2.74	0	0	0	-302	0.97	0.97	0.97	16,050	2.66	0	0	0	-293
Refrigeration	Vending Machine Control - Refrigerated	Each	1	5.0	NO	1,613	0.00	0	0	0	0	0.97	0.97	0.97	1,565	0.00	0	0	0	0
	Total			NA		3,357,628	653	0	0	-1,446	-41,408	0.97	0.97	0.97	3,256,899	633	0	0	-1,402	-40,166

Table C-1 represents the kWh savings from Table 5-1 as there are no water savings in this program.

*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.

†§ The kWh savings account for electric heating penalties, where applicable. The electric heating penalties columns show the magnitude of adjustments applied to the program savings. Gas heating penalties represent the program therms heating penalties. The therms penalties are not required to be applied to the program savings.

Source: ComEd tracking data and evaluation team analysis