



ComEd Public Buildings in Distressed Communities Impact Evaluation Report

Energy Efficiency/Demand Response Plan:
Program Year 2021 (CY2021)
(1/1/2021-12/31/2021)

Prepared for:

ComEd

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Prepared by:

Wayne Leonard
Guidehouse

Eric Davis
Guidehouse

Dustin Bailey
Guidehouse

Submitted to:

ComEd
2011 Swift Drive
Oak Brook, IL 60523

Submitted by:

Guidehouse Inc.
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Charles Maglione, Partner
703.431.1983

cmaglione@guidehouse.com

Jeff Erickson, Director
608.616.4962

jeff.erickson@guidehouse.com

Nishant Mehta, Associate Director
608.616.5823

nishant.mehta@guidehouse.com

Sagar Phalke, Managing
Consultant

303.493.0350

sagar.phalke@guidehouse.com

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1. Introduction

This report presents the results of the impact evaluation of the CY2021 Public Buildings in Distressed Communities (PBDC) 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) analysis inputs. CY2021 covers January 1, 2021 through December 31, 2021. The PBDC Program was discontinued mid-year, so the tracking data does not include any participation data after October 8, 2021.

2. Program Description

The PBDC Program seeks to secure energy savings through the support of light-emitting diode (LED) lamp installations, lighting controls, and heating, ventilation, and air conditioning (HVAC) retrofits in public sector buildings in distressed communities. Distressed communities are defined using information provided by the Illinois Department of Commerce and Economic Opportunity and federal agencies.¹ The City of Chicago is not eligible to participate as a whole; however, several specific ZIP codes and census tracts within the city are eligible. This program is a third-party program targeting the commercial sector and is implemented by Energy360 Solutions.

The CY2021 program had 28 participants (entities) spanning 180 separate account IDs (sites) and distributed 84,549 measures through 188 individual projects (see Table 2-1).

Table 2-1. Number of Participants and Projects

Participation	Quantity
Projects	188
Participants	28
Total Measures	84,549

Source: ComEd tracking data and evaluation team analysis

The program included the measures shown in Table 2-2 and Figure 2-1. In CY2021, all measures installed were lighting fixtures, lamps, or controls. No HVAC retrofit measures were reported as part of the program in CY2021.

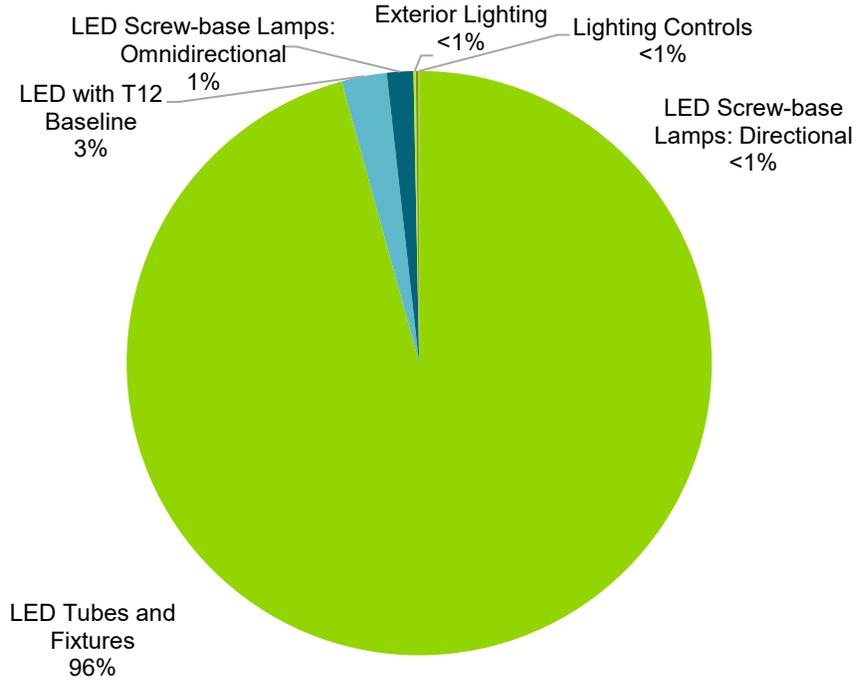
Table 2-2. Number of Measures by Type

End Use Type	Research Category	Quantity	Unit
Lighting	LED Tubes and Fixtures	80,939	Fixtures
Lighting	LED with T12 Baseline	2,112	Fixtures
Lighting	LED Screw-base Lamps: Omnidirectional	1,235	Lamps
Lighting	Exterior Lighting	108	Fixtures
Lighting	LED Screw-base Lamps: Directional	126	Lamps
Lighting	Lighting Controls	29	Fixtures
Total		84,549	

Source: ComEd tracking data and evaluation team analysis

¹ A summary of US Code, Title 42 Section 3161 defining the criteria for qualifying as a distressed community is available here: <https://www.law.cornell.edu/uscode/text/42/3161>.

Figure 2-1. 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 PBDC Program achieved in CY2021. This program did not generate gas savings in CY2021.

Table 3-1. Total Annual Incremental Electric Savings

Savings Category	Units	Ex Ante Gross Savings	Program Gross Realization Rate	Verified Gross Savings	Program Net-to-Gross Ratio (NTG)	CY2019 Net Carryover Savings	CY2020 Net Carryover Savings	Verified Net Savings
Electric Energy Savings - Direct	kWh	10,916,482	0.83	9,091,363	0.97	N/A	N/A	8,818,622
Electric Energy Savings - Converted from Gas	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Electric Energy Savings	kWh	10,916,482	0.83	9,091,363	0.97	N/A	N/A	8,818,622
Summer Peak§ Demand Savings	kW	3,230	0.85	2,745	0.97	N/A	N/A	2,663

N/A = not applicable (refers to a piece of data that cannot be produced or does not apply).

§ The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.

The “Verified Net Savings” in row one (Electric Energy Savings – Direct) includes primary kWh savings as a result of measure implementation. It does not include carryover savings, secondary kWh savings from wastewater treatment or electric heating penalties.

Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 and Figure 4-1 show the measure-specific and total verified gross savings for the PBDC Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2021. The electric CPAS across all measures installed in 2021 is shown in Table 4-1. The historic rows are the CPAS contribution back to CY2020. The Program Total Electric CPAS is the sum of the CY2021 contribution and the historic contribution. Figure 4-1 shows the savings across the effective useful life (EUL) of the measures.

This program did not generate gas savings in CY2021 so electric CPAS is equivalent to total CPAS.

Table 4-1. Cumulative Persisting Annual Savings – Electric

End Use Type	Research Category	EUL	CY2021 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings										
						2018	2019	2020	2021	2022	2023	2024	2025	2026		
Lighting	LED Tubes and Fixtures	14.9	8,400,650	0.97	121,682,723				8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	
Lighting	LED with T12 Baseline	15.0	467,111	0.97	4,728,250				453,097	453,097	453,097	452,353	337,647	258,265		
Lighting	LED Screw-base Lamps: Omnidirectional	6.5	148,501	0.97	715,651				144,046	144,046	144,046	144,046	54,737	54,737		
Lighting	Exterior Lighting	11.6	51,722	0.97	582,966				50,170	50,170	50,170	50,170	50,170	50,170		
Lighting	LED Screw-base Lamps: Directional	8.1	21,827	0.97	136,433				21,172	21,172	21,172	21,172	12,703	12,703		
Lighting	Lighting Controls	10.0	1,553	0.97	15,062				1,506	1,506	1,506	1,506	1,506	1,506		
CY2021 Program Total Electric Contribution to CPAS			9,091,363		127,861,084				8,818,622	8,818,622	8,818,622	8,817,878	8,605,395	8,526,013		
Historic Program Total Electric Contribution to CPAS‡									9,765,827	9,765,132	9,705,388	9,705,388	9,705,388	9,705,388	9,705,388	
Program Total Electric CPAS									9,765,827	18,584,448	18,583,754	18,524,009	18,523,266	18,310,782	18,231,400	
CY2021 Program Incremental Expiring Electric Savings§												744	212,483	79,382		
Historic Program Incremental Expiring Electric Savings										694	59,745					
Program Total Incremental Expiring Electric Saving										694	59,745	744	212,483	79,382		

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED Tubes and Fixtures	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	8,148,630	7,601,896			
Lighting	LED with T12 Baseline	258,265	258,265	258,265	258,265	258,265	258,265	258,265	258,265	254,568			
Lighting	LED Screw-base Lamps: Omnidirectional	29,994											
Lighting	Exterior Lighting	50,170	50,170	50,170	50,170	50,170	31,095						
Lighting	LED Screw-base Lamps: Directional	12,703	12,703	931									
Lighting	Lighting Controls	1,506	1,506	1,506	1,506								
CY2021 Program Total Electric Contribution to CPAS		8,501,269	8,471,275	8,459,504	8,458,572	8,457,066	8,437,991	8,406,896	8,406,896	7,856,464			
Historic Program Total Electric Contribution to CPAS‡		9,705,388	9,704,608	9,704,608	9,704,608	9,704,608	9,508,659	9,508,659	9,508,659				
Program Total Electric CPAS		18,206,657	18,175,883	18,164,111	18,163,180	18,161,674	17,946,650	17,915,555	17,915,555	7,856,464			
CY2021 Program Incremental Expiring Electric Savings§		24,744	29,994	11,772	931	1,506	19,075	31,095		550,432	7,856,464		
Historic Program Incremental Expiring Electric Savings			780				195,949			9,508,659			
Program Total Incremental Expiring Electric Saving		24,744	30,774	11,772	931	1,506	215,023	31,095		10,059,091	7,856,464		

Note: The green highlighted cell shows program total first-year electric savings. The gray cells are blank, indicating values irrelevant to the CY2021 contribution to CPAS.

* A deemed value. Source: Illinois Stakeholder Advisory Group (SAG) website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2021>.

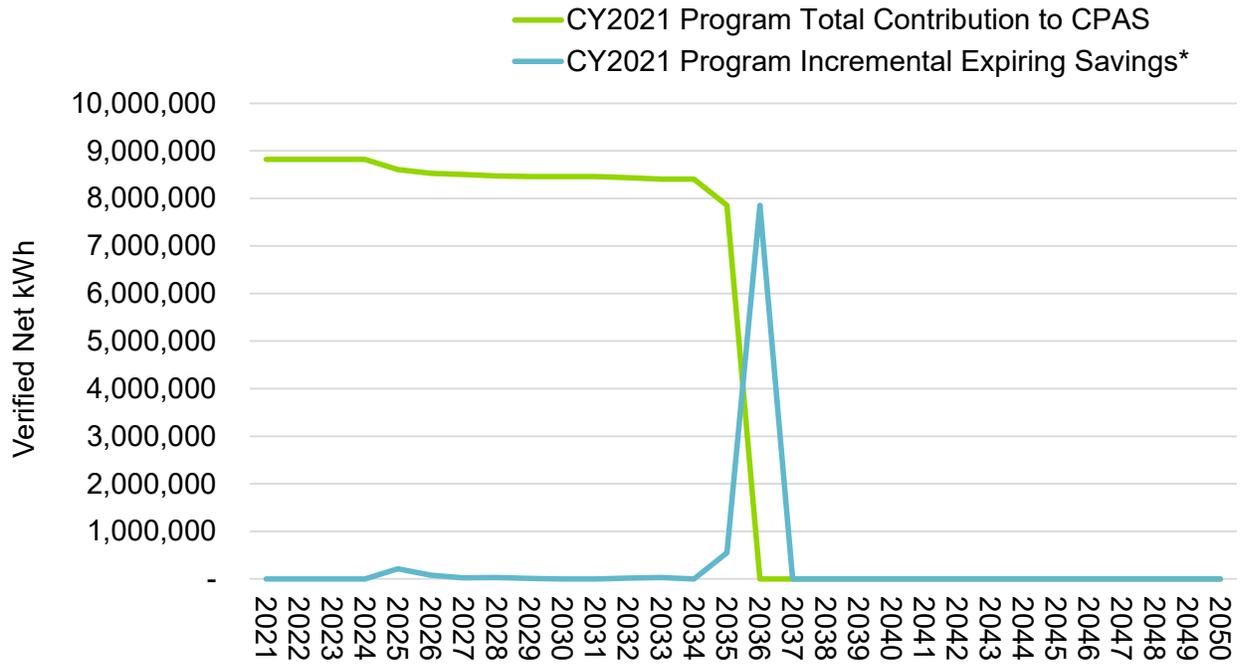
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ Historic savings go back to CY2020.

§ 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 .

Source: Evaluation team analysis

5. Program Savings by Measure

The evaluation team analyzed savings for the PBDC Program at a strata level, using a statistically valid, stratified random sample. The verified savings for each measure are summed by project; projects are divided into strata based on the magnitude of ex ante gross kWh savings; and strata-level realization rates are extrapolated to determine the final program-level results.

The program achieved 99.98% of verified net program savings through lighting lamps and fixtures; the remaining 0.02% are attributed to lighting controls. Although the program can include HVAC measures, none were installed in CY2021.

The program included the measures shown in Table 5-1 and Figure 5-1.

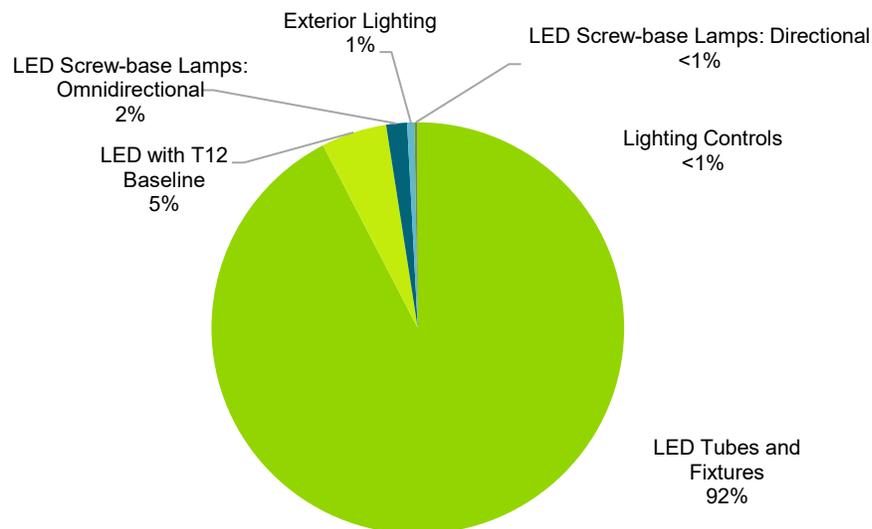
Table 5-1. Number of Measures by Type

End Use Type	Research Category	Quantity	Unit
Lighting	LED Tubes and Fixtures	80,939	Fixtures
Lighting	LED with T12 Baseline	2,112	Fixtures
Lighting	LED Screw-base Lamps: Omnidirectional	1,235	Lamps
Lighting	Exterior Lighting	108	Fixtures
Lighting	LED Screw-base Lamps: Directional	126	Lamps
Lighting	Lighting Controls	29	Fixtures
Total		84,549	

Note: This is the same table as Table 2-2.

Source: ComEd tracking data and evaluation team analysis

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



Source: ComEd tracking data and evaluation team analysis

Measure-level energy and demand savings are provided in Table 5-2 and Table 5-3.

Table 5-2. 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 Tubes and Fixtures	10,117,577	0.83	8,400,650	0.97	8,148,630	14.9
Lighting	LED with T12 Baseline	540,254	0.86	467,111	0.97	453,097	15.0
Lighting	LED Screw-base Lamps: Omnidirectional	158,223	0.94	148,501	0.97	144,046	6.5
Lighting	Exterior Lighting	70,845	0.73	51,722	0.97	50,170	11.6
Lighting	LED Screw-base Lamps: Directional	27,618	0.79	21,827	0.97	21,172	8.1
Lighting	Lighting Controls	1,965	0.79	1,553	0.97	1,506	10.0
Total		10,916,482	0.83	9,091,363		8,818,622	

* A deemed value. Source: Illinois SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2021>.

Source: ComEd tracking data and evaluation team analysis

Table 5-3. 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 Tubes and Fixtures	3,000	0.85	2,540	0.97	2,463
Lighting	LED with T12 Baseline	160	0.89	142	0.97	138
Lighting	LED Screw-base Lamps: Omnidirectional	58	0.94	54	0.97	52
Lighting	Exterior Lighting	0	N/A	0	0.97	0
Lighting	LED Screw-base Lamps: Directional	10	0.79	8	0.97	8
Lighting	Lighting Controls	2	0.79	2	0.97	1
Total		3,230	0.85	2,745		2,663

N/A = not applicable (refers to a piece of data that cannot be produced or does not apply).

* A deemed value. Source: Illinois SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2021>.

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

The PBDC Program was discontinued mid-way through 2021. The findings and recommendations in this section are set forth to document adjustments made to savings and in the hopes that they help improve any future work in this area.

The issues that had the largest effect on adjusting ex ante gross savings were missing project documentation and instances where the savings shown in the ex ante calculators do not align with the program tracking database delivered to Guidehouse.

The evaluation team developed several recommendations based on findings from the CY2021 evaluation.

6.1 Documentation Findings

Finding 1. Guidehouse consistently encountered missing files for entire phases of projects in the sample. For example, 10 out of 29 sampled projects had at least one verification (VER) phase without any documentation. Wherever possible, the evaluation team used more recent project phase documentation to validate measures installed in previous phases.

Recommendation 1. Adjust program procedures to ensure project documentation is complete. Having complete project documentation should improve the accuracy and verifiability of the program savings and reduce the potential for discrepancies.

Finding 2. Projects are often completed in multiple phases, however progress was not consistently tracked or documented across the various phases of a given project. This was particularly apparent in project calculators where tabs were mislabeled or contained measures from another phase (e.g., VER 1 tab had measures installed in VER 2). The calculator versions provided did not always align with the database, indicating savings may have been entered before the project was finalized or the final calculator was not included with the supporting documents.

Recommendation 2. Adopt a consistent project documentation approach. It would be helpful to have a properly labeled tab in project calculators to document any updates made to earlier VER phase calculators as additional measures are installed in following VER phases. Alternatively, maintain documentation from previous phases in subsequent versions (phases) of a project's documentation so that the final workbook for any given site contains a complete record of all measures installed at that site within the given year, delineated by phase.

Finding 3. The reported efficient wattages of lighting fixtures and lamps were sourced from the product specification sheets. These sheets are often inconsistent with the product wattages determined through independent testing by DesignLights Consortium (DLC) and reported in the Reported Input Wattages field of the DLC Qualified Product List. Guidehouse used the fixture and lamp model numbers to confirm DLC-listed efficient wattages and used these wattages to calculate verified savings.

Recommendation 3. Use DLC-listed efficient wattages for lighting fixtures and lamps as savings inputs rather than the wattages reported in the name of the product model number or wattages found in manufacturer specification sheets.

Finding 4. Invoices of purchased fixtures and lamps often indicated additional equipment was purchased beyond what calculators and other supporting documentation support as installed. However, ComEd provided additional documentation accounting for the uninstalled equipment. Based on this additional supporting documentation, Guidehouse verified that the uninstalled equipment was not included in the reported measure quantity. Therefore, Guidehouse used an in-service rate of 1.0 for all reported fixtures for the PBDC Program.

Recommendation 4. Ensure each batch of fixtures is installed in a timely manner, perhaps using a direct install approach to program delivery. The implementer can then more easily track and maintain signed install verification forms from the participants on completion of each project phase. This will also reduce the likelihood of version control issues noted in Finding 2.

6.2 Project Detail Findings

Finding 5. Many sampled projects were missing a signature on one or more VER phase customer selection forms (CSF) used to confirm progress of the measures installed. For example, Project ID 221 had a signed CSF for Phase 1 VER 1; VER 2 files were missing; and VER 3, VER 4, and VER 5 CSF forms were unsigned.

Recommendation 5. Ensure that reviewing the VER CSF files with the customer is a consistent part of project administration.

Finding 6. Program tracking data does not include data on measure-level costs or total project costs. The program is designed such that material costs are covered and reported as the incentive. However, reported incentives are not always consistent with the invoiced material costs.

Recommendation 6. Track incremental measure cost separately from the incentive. Ensure total measure cost for each project aligns with the incentive.

6.3 Program Diversity Findings

Finding 7. 99.98% of savings from the PBDC program in CY2021 is attributed to an LED lighting fixture or lamp. Only 0.02% of program savings were attributed to lighting controls, and they represented an even smaller portion (less than 0.01%) of the quantity of measures installed.

Recommendation 7. Work with customers to identify non-lighting measures that would suit each customer site to achieve additional savings. More comprehensive projects also maximize the benefit to the participant without raising the administrative burden excessively.

Finding 8. The program was identified to be highly focused on facilities belonging to a single entity—77% of measures installed and 85% of the program's total claimed electric savings (kWh) are attributed to a single participant. However, within that cluster of projects, 139 unique sites participated in CY2021.

Appendix A. Impact Analysis Methodology

Guidehouse initiated the impact evaluation process by designing a sample of the CY2021 PBDC Program participants. This method is used to increase sampling efficiency while maintaining a high degree of confidence in the overall results and representation across the full range of project sizes and participants with a distribution of measures that organically tracks with the overall representation in the overall program.

The team categorized measures into strata by annual gross ex ante energy savings, defined as follows:

- **Large:** More than 80,000 kWh
- **Mid:** 50,000 kWh-80,000 kWh
- **Small:** 13,500 kWh-50,000 kWh
- **Very Small:** Less than 13,500 kWh (cumulatively, smallest 2%)

To achieve the 85% confidence interval and 15% maximum relative precision, the evaluation team selected 29 projects according to the following distribution numbers:

- **Large:** 9
- **Mid:** 7
- **Small:** 13
- **Very Small:** 0

The team requested the documentation associated with the sampled projects for review. Guidehouse determined the final verified values through a detailed review of the sampled projects. The evaluation team developed realization rates for each stratum based on the verified savings for the projects sampled within that stratum (see further detail on this process below). These strata-level realization rates were then extrapolated to the remainder of projects within each stratum to determine the program realization rate. The final verified savings resulted in 85% confidence and 6% relative precision, which is within the 85/15 target.

The evaluation team determined verified gross savings for each program measure by:

- Reviewing the savings algorithm inputs in the implementation contractor's measure calculations for agreement with the Illinois Technical Reference Manual v.9.0² (TRM) and the TRM Errata, where applicable.
- Validating the savings algorithm was applied correctly.
- Where savings reported in the database do not agree with the verified values in Guidehouse's calculations, cross-checking IL-TRM deemed inputs with the implementation contractor's supporting calculations and the other project files.
- Verifying the reported measure quantity with invoices, as able.

² In this report, unless stated otherwise, IL-TRM refers to version 9.0 (v9.0).

The team used the following documents to verify the per-unit savings for each program measure:

- Final ComEd CY2021 tracking data: PBDC_CY2021_Wave2_Data_Rev0_2021-10-08.xlsx.
- IL-TRM for deemed input parameters or secondary evaluation research to verify any custom inputs used in the ex ante calculations (e.g., participant interviews to confirm hours of use).
- Implementation contractor savings calculations (e.g., 2021-PBDC-Calculator V1.1 [site name] Phase 2.xlsm). The ex ante analysis used calculator versions 2020 V1.3.1, 2021 V1.0, and 2021 V1.1.
- Implementation contractor's W-9s, program applications, measure specifications, and measure invoices for each sample project.

The Change Log within the calculators indicates no differences in how lighting energy or demand savings are evaluated between the three versions in use for CY2021. The calculators are based on IL-TRM methodology and deemed inputs for hours of use, default wattages, and coincidence factors. The evaluation team reviewed the calculator template in the year preceding its active use for the program and found it to be accurate and consistent with the methodology outlined in the IL-TRM. Therefore, the ex ante and verified savings analysis used the same analysis format that the implementation contractor developed specifically for this program.

Net savings are determined by multiplying the verified gross savings estimates by the program-specific net-to-gross (NTG) ratio of 0.97 as approved by the Illinois SAG.³

³ Source: <https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx>

Appendix B. Total Resource Cost Detail

Table B-1 shows the TRC cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. This table does not include additional required cost data (e.g., measure costs, program-level incentives, and non-incentive costs). ComEd will provide this data to the evaluation team later.

Table B-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Gross Electric 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 Tubes and Fixtures	Fixtures	80,939	14.9	NO	8,400,650	2,539.51	0	0	0	-162,857	0.97	0.97	0.97	8,148,630	2,463.33	0	0	0	-157,971
Lighting	LED with T12 Baseline‡	Fixtures	2,112	15.0	YES	467,111	142.26	0	0	0	-8,649	0.97	0.97	0.97	453,097	137.99	0	0	0	-8,389
Lighting	LED Screw-base Lamps: Omnidirectional‡	Lamps	1,235	6.5	YES	148,501	53.89	0	0	0	-2,305	0.97	0.97	0.97	144,046	52.27	0	0	0	-2,236
Lighting	Exterior Lighting	Fixtures	108	11.6	NO	51,722	0.00	0	0	0	0	0.97	0.97	0.97	50,170	0.00	0	0	0	0
Lighting	LED Screw-base Lamps: Directional‡	Lamps	126	8.1	YES	21,827	7.99	0	0	0	-573	0.97	0.97	0.97	21,172	7.75	0	0	0	-555
Lighting	Lighting Controls	Fixtures	29	10.0	NO	1,553	1.54	0	0	0	0	0.97	0.97	0.97	1,506	1.50	0	0	0	0
Total				14.8		9,091,363	2,745	0	0	0	-174,383				8,818,622	2,663	0	0	0	-169,152

Note: this program does not generate secondary energy savings from water reduction measures.

* 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 EUL for this measure varies over time. See the CPAS table (Table 4-1)

Source: ComEd tracking data and evaluation team analysis