



ComEd Instant Discounts Impact Evaluation Report

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

Prepared for:

ComEd
FINAL

April 30, 2021

Prepared by:

Amy Buege
Verdant Associates

Ethan Barquest
Verdant Associates

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

Rob Neumann, Associate Director
312.583.2176
rob.neumann@guidehouse.com

This report was prepared by Guidehouse for ComEd. The work presented in this report represents Guidehouse's professional judgment based on the information available at the time this report was prepared. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Guidehouse nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

Table of Contents

1. Introduction	1
2. Program Description.....	1
3. Program Savings Detail	2
4. Cumulative Persisting Annual Savings.....	3
5. Program Savings by Measure	5
6. Impact Analysis Findings and Recommendations.....	7
6.1 Impact Parameter Estimates	7
6.2 Other Impact Findings and Recommendations.....	9
Appendix A. Impact Analysis Methodology.....	A-1
A.1 Verified Gross Program Savings Analysis Approach Estimates	A-1
A.2 Verified Net Program Savings Analysis Approach.....	A-1
A.3 Carryover Savings Estimation.....	A-1
A.3.1 CY2020 Lighting Carryover Savings.....	A-1
A.3.2 CY2021 Lighting Carryover Savings.....	A-2
A.3.3 CY2022 Preliminary Partial Carryover Savings from CY2020.....	A-3
Appendix B. Impact Analysis Detail	B-1
Program Volumetric Detail.....	B-1
Appendix C. Total Resource Cost Detail.....	C-1

List of Tables, Figures, and Equations

Table 2-1. CY2020 Volumetric Findings Detail.....	1
Table 3-1. CY2020 Total Annual Incremental Electric Savings.....	3
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric and Total	4
Table 5-1. CY2020 Energy Savings by Measure – Electric and Total.....	6
Table 5-2. CY2020 Summer Peak Demand Savings by Measure	7
Table 6-1. Savings Parameters.....	9
Table 6-2. Measure-Level Savings and Realization Rates	9
Table A-1. CY2020 Carryover Savings from CY2018 and CY2019 Program Lighting Sales...A-2	
Table A-2. CY2021 Preliminary Carryover Savings Estimates from CY2019 and CY2020 Bulb Sales.....A-3	
Table A-3. CY2022 Preliminary Carryover Savings Estimates from CY2020 Bulb Sales.....A-4	
Table B-1. PY3 – CY2020 Volumetric Findings Detail	B-1
Table C-1. Total Resource Cost Savings Summary	C-1

1. Introduction

This report presents results from the CY2020 impact evaluation of ComEd's Instant Discounts 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

The Instant Discounts Program provides incentives to increase the market share of energy efficient products commonly sold to business customers. The Instant Discounts Program was launched as a pilot in Program Year 3 (PY3) and became a full-scale program in PY4.¹ The program is designed to provide an expedited, simple solution to business customers interested in purchasing high efficiency products by providing instant discounts at the point of sale. The Instant Discounts Program provides incentives for energy efficient LED lamps (screw based, pin based, and tubular), ES Fixtures (primarily trim kits), exit signs, and wall packs as well as reduced wattage Linear Fluorescent (LF) lamps. Three-phase, high-frequency battery chargers and commercial HVAC equipment are also offered through the Program.

The CY2020 Instant Discounts Program provides incentives on a mix of standard and specialty LEDs (lamps and fixtures), LED exit signs, linear fluorescent (LF) lamps, tubular LEDs (TLEDs), and battery chargers. The CY2020 program incented 2,349,454 measures including 1,342,037 TLEDs, 401,005 LED lamps, 391,329 LED fixtures, 43,324 LED HIDs, 32,605 LED exit signs, 138,867 LFs, and 287 battery chargers as shown below in Table 2-1 and Figure 2-1. An additional 155,468 carryover lamps and fixtures (13,745 from CY2018 and 141,723 from CY2019) are expected to be installed in CY2020.

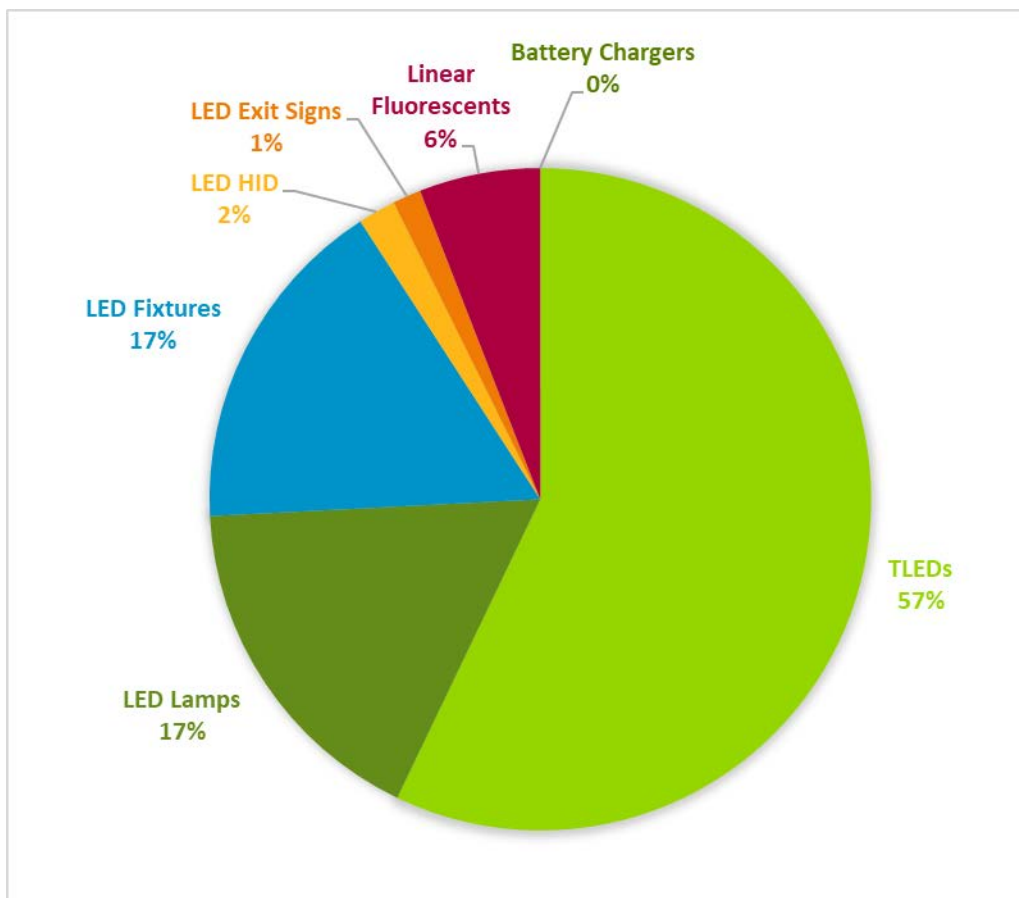
Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total	TLEDs	LED Lamps	LED Fixtures	LED HID	LED Exit Signs	Linear Fluorescents	Battery Chargers
CY2020 Incentivized Bulbs	2,349,454	1,342,037	401,005	391,329	43,324	32,605	138,867	287
CY2020 1 st Year Installed Bulbs	2,095,840	1,246,819	328,929	322,487	35,553	32,432	129,334	287
CY2019 Carryover – CY2020 Installs	141,723	36,077	76,590	21,263	3,538	0	4,256	0
CY2018 Carryover – CY2020 Installs	13,745	393	10,852	1,824	622	0	54	0
Total Installed Bulbs in CY2020	2,251,308	1,283,289	416,370	345,573	39,713	32,432	133,643	287

Source: ComEd tracking data and evaluation team analysis

¹ The Instant Discounts Program was initially branded as the Midstream Incentive Program and was rebranded as the Business Instant Lighting Discounts Program in PY5. In PY9, it was rebranded again as Instant Discounts due to the inclusion of non-lighting products.

Figure 2-1. Share of Measures Incentivized by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and peak demand savings the Instant Discount Program achieved in CY2020 from the first year installations of CY2020 measure sales and the carryover savings from CY2018 and CY2019 bulb purchases installed in CY2020. The Instant Discounts Program did not claim any gas savings in CY2020. The program’s verified gross kilowatt-hour (kWh) savings are approximately 2% lower than ex ante gross kWh 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§	252,855,430	57,363
Program Gross Realization Rate	0.98	0.98
Verified Gross Savings§	247,905,616	56,049
Program Net-to-Gross Ratio (NTG)	Varies	Varies
CY2018 Net Carryover Savings	1,873,320	412
CY2019 Net Carryover Savings	18,912,641	4,290
Verified Net Savings‡	223,468,489	50,529
Converted from Gas†		
Ex Ante Gross Savings	NA	NA
Program Gross Realization Rate	NA	NA
Verified Gross Savings	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA
Verified Net Savings	NA	NA
Total Electric Plus Gas		
Ex Ante Gross Savings§	252,855,430	57,363
Program Gross Realization Rate	0.98	NA
Verified Gross Savings§	247,905,616	56,049
Program Net-to-Gross Ratio (NTG)	Varies	Varies
CY2018 Net Carryover Savings	1,873,320	412
CY2019 Net Carryover Savings	18,912,641	4,290
Verified Net Savings‡	223,468,489	50,529

NR = not reported (refers to a piece of data that was not reported)

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.

§ Ex ante and verified gross savings exclude gross carryover savings from CY2018 and CY2019 bulb sales.

‡ Verified net savings includes net carryover savings from CY2018 and CY2019.

†The program claimed no gas savings for CY2020.

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 Instant Discounts 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 (from bulbs sold in CY2018, CY2019 and CY2020) is 223,468,489 kWh (Table 4-1). The historic rows in each table are the CPAS contribution back to CY2018. The Program Total Electric CPAS is the sum of the CY2020 contribution and the historic contribution. The evaluation team did not evaluate gas savings for this program; as such electric CPAS is equivalent to total CPAS.

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

End Use Type	Research Category	CY2020			Lifetime Net Savings (kWh)†	Verified Net kWh Savings									
		EUL	Verified Gross Savings (kWh)	NTG*		2018	2019	2020	2021	2022	2023	2024	2025	2026	
Lighting	TLEDs	15.0	81,293,184	0.80	974,795,136			65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547
Lighting	LED Lamp	6.8	71,567,463	0.83	338,961,321			59,400,994	59,400,994	59,400,994	59,400,994	59,400,994	34,220,369	33,725,409	30,981,444
Lighting	LED Fixture	12.2	72,791,197	0.83	508,197,635			60,416,693	60,416,693	60,416,693	60,416,693	60,416,693	32,625,014	32,625,014	32,625,014
Lighting	LED HID	14.3	10,489,561	0.83	124,277,176			8,706,336	8,706,336	8,706,336	8,706,336	8,706,336	8,706,336	8,706,336	8,686,830
Lighting	LED Exit Signs	6.1	6,111,774	0.80	29,929,240			4,889,419	4,889,419	4,889,419	4,889,419	4,889,419	4,889,419	823,959	550,360
Lighting	Linear Fluorescents	11.9	2,210,852	0.67	17,664,042			1,481,271	1,481,271	1,481,271	1,481,271	1,481,271	1,481,271	1,481,268	1,481,235
Power Electronics	Battery Charger	15.0	3,441,584	0.80	41,299,008			2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267
Lighting	Carryover (CY2018)	8.5	2,401,437	0.78	13,933,263			1,873,320	1,873,320	1,873,320	1,873,320	1,873,320	1,445,322	1,445,322	1,445,322
Lighting	Carryover (CY2019)	9.0	22,886,016	0.83	148,026,118			18,912,641	18,912,641	18,912,641	18,912,641	18,912,641	14,403,621	14,403,621	14,403,621
CY2020 Program Total Electric Contribution to CPAS			273,193,069	0.82	2,197,082,939			223,468,489	223,468,489	223,468,489	223,468,489	223,468,489	165,559,167	160,998,743	157,961,640
Historic Program Total Electric Contribution to CPAS‡						253,222,349	494,589,366	480,146,810	449,978,572	445,668,695	433,065,362	413,372,474	339,140,509	242,384,289	
Program Total Electric CPAS						253,222,349	494,589,366	703,615,299	673,447,061	669,137,184	656,533,851	578,931,641	500,139,252	400,345,929	
CY2020 Program Incremental Expiring Electric Savings§													57,909,322	4,560,424	3,037,104
Historic Program Incremental Expiring Electric Savings‡§								30,168,238	4,309,877	12,603,333	19,692,887	74,231,965	96,756,220		
Program Total Incremental Expiring Electric Savings§								30,168,238	4,309,877	12,603,333	12,603,333	77,602,210	78,792,389	99,793,323	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	TLEDs	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	65,034,547	64,311,473	-	-	-	-
Lighting	LED Lamp	649,545	645,282	638,755	161,410	119,147	115,760	97,923	2,301	-	-	-	-
Lighting	LED Fixture	32,542,490	32,487,785	32,451,911	22,268,267	12,577,794	12,457,002	12,395,781	11,474,788	-	-	-	-
Lighting	LED HID	8,458,255	8,458,255	8,458,090	8,457,723	8,439,099	8,437,607	7,862,553	4,780,750	-	-	-	-
Lighting	LED Exit Signs	550,360	550,360	549,956	491,430	491,430	491,430	491,430	491,430	-	-	-	-
Lighting	Linear Fluorescents	1,321,573	1,256,219	1,022,031	1,012,123	919,317	803,651	577,311	382,959	-	-	-	-
Power Electronics	Battery Charger	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	2,753,267	-	-	-	-
Lighting	Carryover (CY2018)	1,445,322	658,694	-	-	-	-	-	-	-	-	-	-
Lighting	Carryover (CY2019)	14,403,621	14,403,621	357,453	-	-	-	-	-	-	-	-	-
CY2020 Program Total Electric Contribution to CPAS		127,158,980	126,248,029	111,266,010	100,178,767	90,334,601	90,093,264	89,212,812	84,196,968	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		222,036,716	205,338,758	175,258,627	150,703,140	139,847,554	133,235,213	74,987,602	0	-	-	-	-
Program Total Electric CPAS		349,195,696	331,586,788	286,524,637	250,881,907	230,182,155	223,328,478	164,200,415	84,196,968	-	-	-	-
CY2020 Program Incremental Expiring Electric Savings§		30,802,660	910,951	14,982,020	11,087,243	9,844,166	241,337	880,452	5,015,844	84,196,968	-	-	-
Historic Program Incremental Expiring Electric Savings‡§		20,347,574	16,697,958	30,080,131	24,555,487	10,855,586	6,612,341	58,247,611	74,987,602	0	-	-	-
Program Total Incremental Expiring Electric Savings§		51,150,233	17,608,908	45,062,150	35,642,730	20,699,752	6,853,677	59,128,063	80,003,446	84,196,968	-	-	-

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.

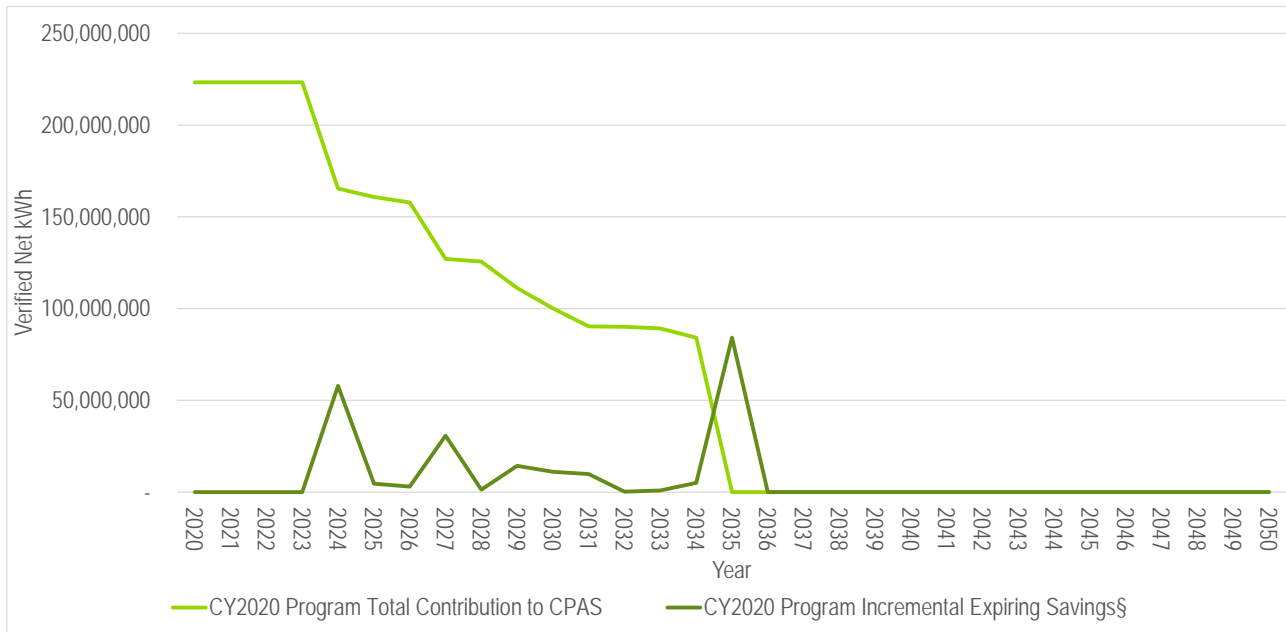
† Lifetime savings are the sum of CPAS savings through the effective useful life (EUL).

‡ 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

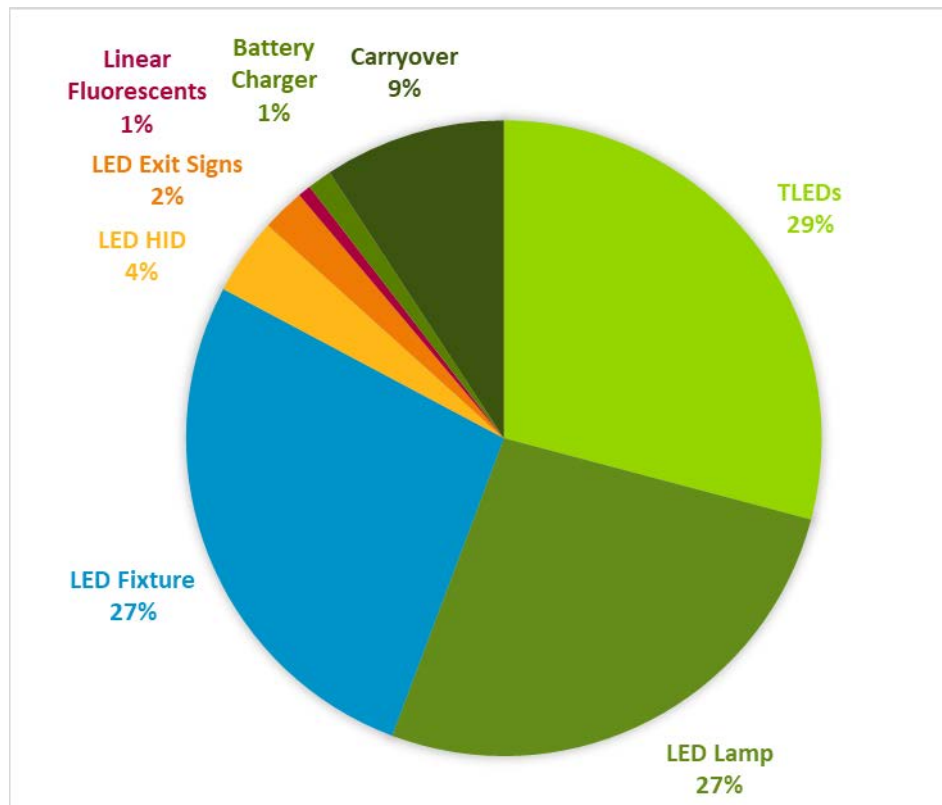


§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n .

Source: Evaluation team analysis

5. Program Savings by Measure

The Instant Discounts Program includes eight distinct lighting measure groups, as the following tables show. These groups include LED lamps, fixtures, HID LEDs, and exit signs, TLEDs, linear fluorescents, battery chargers, and carryover lamps/fixtures from purchases in CY2018 and CY2019 participants will install in CY2020 using assumptions from the Illinois Statewide Technical Reference Manual (TRM). TLEDs and LED lamps and fixtures contributed the majority of net savings in CY2020 (see Figure 5-1). Figure 5-1 and Table 5-1 present energy and summer peak demand savings by measure group for the Instant Discounts Program.

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


Source: ComEd tracking data and evaluation team analysis

Table 5-1. CY2020 Energy Savings by Measure – Electric and Total

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	TLEDs	85,749,464	0.95	81,293,184	0.80	65,034,547	15.0
Lighting	LED Lamp	72,064,367	0.99	71,567,463	0.83	59,400,994	6.8
Lighting	LED Fixture	72,687,591	1.00	72,791,197	0.83	60,416,693	12.2
Lighting	LED HID	10,545,452	0.99	10,489,561	0.83	8,706,336	14.3
Lighting	LED Exit Signs	6,144,339	0.99	6,111,774	0.80	4,889,419	6.1
Lighting	Linear Fluorescents	2,222,632	0.99	2,210,852	0.67	1,481,271	11.9
Power Electronics	Battery Charger	3,441,584	1.00	3,441,584	0.80	2,753,267	15.0
Lighting	Carryover (CY2018)	NR	NA	2,401,437	0.78	1,873,320	8.5
Lighting	Carryover (CY2019)	NR	NA	22,886,016	0.83	18,912,641	9.0
	Total	252,855,430	1.08†	273,193,069	0.82	223,468,489	11.3

NR = not reported (refers to a piece of data that was not reported).

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

Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd. The savings account for electric heating penalties, where applicable.

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† The overall program realization rate does not include ex ante carryover savings and includes verified gross carryover savings in program savings totals. The overall program realization rate excluding verified carryover savings is 0.98.

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	TLEDs	20,463	0.95	19,403	0.80	15,522
Lighting	LED Lamp	16,049	0.99	15,938	0.83	13,229
Lighting	LED Fixture	17,093	0.99	16,969	0.83	14,084
Lighting	LED HID	2,355	0.99	2,342	0.83	1,944
Lighting	LED Exit Signs	844	0.99	839	0.80	671
Lighting	Linear Fluorescents	530	0.99	528	0.67	354
Power Electronics	Battery Charger	29	1.00	29	0.80	24
Lighting	Carryover (CY2018)	NR	NA	528	0.78	412
Lighting	Carryover (CY2019)	NR	NA	5,192	0.83	4,290
	Total	57,363	1.08†	61,768	0.82	50,529

NR = not reported (refers to a piece of data that was not reported).

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.

† The overall program realization rate does not include ex ante carryover savings and includes verified gross carryover savings in program savings totals. The overall program summer peak demand realization rate excluding verified carryover savings is 0.98.

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team estimated energy and demand savings for lighting measures sold through the Instant Discounts Program using Equation 6-1, as specified in the TRM v8.0:

Equation 6-1. Gross Annual Energy and Peak Demand Savings for Lighting Measures

Verified Gross Annual Δ kWh = ResSplit * Res Δ kWh + NonResSplit * NonRes Δ kWh

Where:

- **Res Δ kWh** = Lamps * DeltaWatts/1000 * ISR_r * (1-Leakage) * HOU_r * WHF_{e_r}
- **NonRes Δ kWh** = Lamps * DeltaWatts/1000 * ISR_{nr} * (1-Leakage) * HOU_{nr} * $WHF_{e_{nr}}$

Verified Gross Annual Summer Peak Δ kW = Gross Annual Δ kW * Summer Peak CF * WHF_d

Where:

- **Res/NonRes Split** = Percentage of program lamps or fixtures installed in residential and nonresidential locations, deemed within TRM v8.0.
- **Lamps** = Quantity of lamps sold through the CY2020 program based on program tracking data.
- **Delta Watts** = Difference in wattage between the baseline bulb (WattsBase) and the efficient program bulb (WattsEE):
 - WattsBase = Baseline bulb wattage, mapping deemed in TRM v8.0.
 - WattsEE = Wattage of efficient program bulb, based on program tracking data.
- **$ISR_{r(nr)}$** = First year installation rate (residential or nonresidential), deemed in TRM v8.0.
- **Leakage** = Percentage of program lamps or fixtures installed outside of ComEd service territory, deemed within TRM v8.0.

- **HOU_{r(nr)}** = Annual hours-of-use (residential/nonresidential), deemed within TRM v8.0.
- **WHF_{e(nr)}** = Waste heat factor – Energy (residential/nonresidential), deemed within TRM v8.0.
- **WHF_{d(nr)}** = Waste heat factor – Demand (residential/nonresidential), deemed within TRM v8.0.
- **Summer Peak CF** = Peak load coincidence factor, the average runtime percentage of program lamps or fixtures during summer peak hours (weekdays from 1 p.m. to 5 p.m.), deemed in TRM v8.0.

The evaluation team estimated energy and demand savings for high frequency battery charging measures per the TRM v8.0, as Equation 6-2 shows.

Equation 6-2. Gross Annual Energy and Peak Demand Savings for High Frequency Battery Chargers

$$\text{Verified Gross Annual } \Delta \text{kWh} = (\text{CAP} * \text{DOD}) * \text{CHG} * (\text{CR}_b / \text{PC}_b - \text{CR}_e / \text{PC}_e)$$

$$\text{Verified Gross Peak } \Delta \text{kW} = (\text{PF}_b / \text{PC}_b - \text{PF}_e / \text{PC}_e) * \text{Volts}_{\text{DC}} * \text{Amps}_{\text{DC}} / 1000 * \text{CF}$$

Where:

- **CAP** = Capacity of Battery, QPL input, TRM v8.0 deems the capacity to be 35 kWh if capacity is not known.
- **DOD** = Depth of Discharge, 80%, deemed within TRM v8.0.
- **CR_b** = Baseline charge return factor, 1.2485, deemed within TRM v8.0.
- **PC_b** = Baseline power conversion efficiency, 0.84, deemed within TRM v8.0.
- **CR_e** = Efficient charge return factor, QPL input, 1.107, deemed within TRM v8.0.
- **PC_e** = Efficient power conversion efficiency, QPL input 0.89, deemed within TRM v8.0.
- **CHG** = Number of Chargers per year, varies based on hours the battery charger is used daily, determined based on program tracking data.

Standard Operation	Number of Charges per Year
1 shift (8 hours/day – 5 days/week)	520
2 shift (16 hours/day – 5 days/week)	1,040
3 shift (24 hours/day – 5 days/week)	1,560
4 shift (24 hours/day – 7 days/week)	2,184
3- and 4-shift average for 24 hour battery chargers	1,872

- **PF_b** = Power factor of baseline charger, 0.9095, deemed within TRM v8.0.
- **PF_e** = Power factor of efficient charger, 0.9370, deemed within TRM v8.0.
- **Volts_{DC}** = DC rated voltage of charger, 48 V, deemed within TRM v8.0.
- **Amps_{DC}** = DC rated amperage of charger, 81 A, deemed within TRM v8.0.
- **CF** = Summer coincidence peak factor for measure, varies based on hours the battery charger is used daily, value of 0 for 1- and 2-shift operation and 1.0 for 3- and 4-shift operation.

Table 6-1 shows the source of verified first year gross and net savings parameters. The sources of the parameters used to calculate the second and third-year lighting carryover savings (for

lighting measures purchased in CY2018 or CY2019 and installed in CY2020) are presented in the carryover section (Section 6.5.1). The lifetime energy and peak demand savings are estimated by multiplying the verified savings by the effective useful life for each measure.

Table 6-1. Savings Parameters

Gross Savings Input Parameters	Deemed or Evaluated?	Source*
Program Lamps/Fixtures	Evaluated	Instant Discounts Program Tracking Data
DeltaWatts	Deemed	TRM v8.0 and TRM v8.0 Errata
Installation Rate (ISR)	Deemed	TRM v8.0 and TRM v8.0 Errata
Leakage	Deemed	TRM v8.0 and TRM v8.0 Errata
Residential/Nonresidential Split	Deemed	TRM v8.0 and TRM v8.0 Errata
Hours-of-Use (HOU)	Deemed	TRM v8.0 and TRM v8.0 Errata
Summer Peak Coincidence Factor (CF)	Deemed	TRM v8.0 and TRM v8.0 Errata
Waste Heat Factor (Energy)	Deemed	TRM v8.0 and TRM v8.0 Errata
Waste Heat Factor (Demand)	Deemed	TRM v8.0 and TRM v8.0 Errata
NTG	Deemed	SAG Consensus
EUL	Mixture	TRM v8.0 and TRM v8.0 Errata

* 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 Other Impact Findings and Recommendations

The evaluation team developed two recommendations based on findings from the CY2020 evaluation. These findings suggest ways to improve the measure-level realization rates. The lighting end use measures represent 90% of program verified net savings and have a realization rate of 0.98 (see Table 6-2). The power electronics end use (battery chargers) has a 100% realization rate and represented 1% of program verified net savings and lighting carryover savings from bulbs sold in CY2018 and CY2019 made up 9% of program verified net savings. No realization rate is calculated for lighting carryover measures as the ex ante data did not include carryover.

Table 6-2. Measure-Level Savings and Realization Rates

End Use	Realization Rate	Percentage of Verified Net Savings
Lighting	98%	90%
Power Electronics	100%	1%
Lighting Carryover	NA	9%

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

Source: Evaluation team analysis

Finding 1. The overall program gross realization rate for the Instant Discounts Program is 0.98. This realization rate adjustment primarily resulted from TLED measures, which had a realization rate of 0.95 and represented 29% of the verified net program savings. This realization rate

resulted from a discrepancy between the ex ante and verified nonresidential installation rate (ISR) applied (98% and 93.4%, respectively), which the evaluation team identified during the Wave 1 review process and will be updated for CY2021.

Recommendation 1. The evaluation team recommends ComEd facilitate alignment between program workpapers and the version of the TRM approved for the program year.

Finding 2. The ex ante savings do not account for program leakage and thus include saving from lamps installed outside of the ComEd service territory. The evaluation team applied a leakage rate of 0.0053 (0.53%)² to the program savings from lighting measures, which account for 90% of program savings, to account for program leakage.

Recommendation 2. Guidehouse recommends that the leakage level over the past few years be reviewed to determine if it should be added as a deemed parameter to the IL TRM v10. Adding it to the TRM would allow ComEd to update eTrack to incorporate the leakage rate into ex ante savings estimates for lighting measures and, thus, more closely align the ex ante and verified savings estimates.

² Leakage rate is based on PY9 and CY2018 program evaluation research.

Appendix A. Impact Analysis Methodology

A.1 Verified Gross Program Savings Analysis Approach Estimates

The evaluation team calculated verified savings for all measures with available data. For CY2020, the team determined the verified savings for LED lamps, fixtures, HID LEDs, and exit signs, TLEDs, LFs, and battery chargers using the following steps:

1. Reviewing the savings algorithm inputs in the measure workpapers for agreement with the TRM v8.0, TRM v8.0 Errata Memo, or secondary research where applicable.
2. Validating that the savings algorithms were applied correctly for all measures.
3. Cross-checking the per-unit savings values in the tracking data with the evaluation team's calculations.
4. Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

The evaluation team downloaded the final tracking data for the CY2020 impact evaluation from the ComEd Evaluation ShareFile site. The team relied on the following documents to verify the per-unit savings for each program measure:

- Final CY2020 tracking database file: "BILD_CY2020_EOY_Data_Rev2_01262021.xlsx"
- High Frequency Battery Chargers Workpaper^[1]
- Lamps and bulbs Workpaper^[2]
- TRM v8.0 and TRM v8.0 Errata Memo for deemed input parameters or secondary evaluation research to verify any custom inputs used in the ex ante calculations
- T12 and EISA baseline and midlife analysis using the TRM v8.0 Errata Memo

A.2 Verified Net Program Savings Analysis Approach

Verified net energy and coincident summer peak demand savings are calculated by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio. For the CY2020 Instant Discounts Program, the NTG ratio estimates are 0.83 for LED lamps, fixtures, and HID bulbs; 0.80 for LED exit signs, TLEDs, and battery chargers; and 0.67 for linear fluorescents. These NTG ratio estimates are developed by the Guidehouse team and approved through the Illinois SAG consensus process.

A.3 Carryover Savings Estimation

A.3.1 CY2020 Lighting Carryover Savings

The evaluation team calculated the CY2020 lighting carryover savings estimates using the TRM (v6.0, v7.0, and v8.0) and the CY2018 and CY2019 impact evaluation reports. The team

^[1] Battery Chargers (Instant Discounts).doc

^[2] Lamps and Bulbs (Instant Discounts).doc

calculated energy and peak demand savings from second-year CY2019 and third-year CY2018 lighting measure installations based on the following parameters:

- **Deltawatts:** Verified delta watts for lighting measures installed in CY2020 based on the baseline wattage values associated with the installation year (source: TRM v8.0)
- **Residential/nonresidential split:** Verified residential/nonresidential split from the year the lighting measures were purchased (source: TRM v6.0 and 7.0)
- **HOU and summer peak CF:** Verified hours-of-use (HOU) and summer peak coincidence factor (CF) from the installation year (source: TRM v8.0)
- **Energy and demand waste heat factors:** Verified waste heat factors (WHFs) from the year the lighting measures are installed (source: TRM v8.0)
- **ISR:** Verified in-service rate (ISR) from the year the lighting measures were purchased (source: TRM v6.0 and v7.0)
- **NTG:** Deemed NTG based on evaluation research from the year the lighting measures were purchased (source: SAG consensus)

Table A-1 shows that 13,745 lighting measures purchased in CY2018 and 141,723 lighting measures purchased in CY2019 are expected to be installed within ComEd's service territory in CY2020. The table provides both the gross and net energy and summer peak demand savings from these carryover bulbs that will be counted in CY2020. The evaluation team estimated total CY2020 net carryover savings to be 20,785,691 kWh and summer peak carryover savings of 4,701 kW.

Table A-1. CY2020 Carryover Savings from CY2018 and CY2019 Program Lighting Sales

Claimed CY2020 Carryover Savings	Second-Year Installation CY2019 Bulbs	Third-Year Installation CY2018 Bulbs	Total CY2020 Carryover
Carryover Lighting Measures Installed During CY2020	141,723	13,745	155,468
Gross kWh Impact Per Unit	161.5	174.7	162.7
Gross Peak kW Impact Per Unit	0.037	0.038	0.037
Carryover Gross Energy Savings (kWh)	22,886,016	2,401,437	25,287,453
Carryover Gross Summer Peak Demand Savings (kW)	5,192	528	5,720
Net-to-Gross Ratio	0.83	0.78	0.82
Carryover Net Energy Savings (kWh)	18,912,641	1,873,320	20,785,961
Carryover Net Summer Peak Demand Savings (kW)	4,290	412	4,701
EUL	9.0	8.5	9.0

Source: ComEd tracking data and Guidehouse team analysis.

A.3.2 CY2021 Lighting Carryover Savings

The evaluation team calculated a preliminary CY2021 carryover savings estimate using the TRM (v7.0, v8.0, and v9.0) and the CY2019 and CY2020 impact evaluation reports. The energy and demand savings from these CY2019 third-year and CY2020 second-year installations are calculated based on the following parameters:

- **Deltawatts:** Verified deltaxwatts for bulbs installed in CY2021 based on the baseline wattage values associated with the installation year (source: TRM v9.0)
- **Res/Nonres split:** Verified res/nonres split from the year the bulbs were purchased (source: TRM v7.0 and v8.0)
- **HOU and summer peak CF:** Verified hours-of-use and summer peak coincidence factor from the installation year (source: TRM v9.0)
- **Energy and demand waste heat factors:** Verified WHFs from the year the bulbs are installed (source: TRM v9.0)
- **ISR:** Verified installation rate from the year the bulbs were purchased (source: TRM v7.0 and v8.0)
- **NTG:** Deemed NTG based on evaluation research from the year the bulbs were purchased (source: SAG consensus)

Table A-2 shows that 225,380 bulbs purchased in CY2019 or CY2020 are expected to be installed within ComEd's service territory in CY2021 (carryover). The table provides the gross and net energy and demand savings from these carryover bulbs. Total **preliminary** net carryover savings is estimated to be 30,797,741 kWh and 7,021 summer peak kW.

Table A-2. CY2021 Preliminary Carryover Savings Estimates from CY2019 and CY2020 Bulb Sales

Preliminary CY2021 Carryover Savings	CY2019 Bulbs	CY2020 Bulbs	Total Preliminary CY2021 Carryover
Carryover Bulbs Installed During CY2021	119,476	105,904	225,380
Gross Energy Savings (kWh)	19,324,985	17,953,939	37,278,923
Gross Peak Summer Peak Demand Savings (kW)	4,384	4,116	8,500
Net-to-Gross Ratio	0.83	0.83	0.83
Net Energy Savings (kWh)	15,970,225	14,827,515	30,797,741
Net Summer Peak Demand Savings (kW)	3,623	3,398	7,021
EUL Res	10.0	10.0	10.0
EUL NonRes	9.0	10.4	9.7

Source: Evaluation team analysis

A.3.3 CY2022 Preliminary Partial Carryover Savings from CY2020

The evaluation team calculated a preliminary partial CY2022 carryover savings estimate based on the bulbs sold during CY2020 (CY2021 sales are not known at this time) that are estimated to be installed in CY2022. This estimate is preliminary because several of the parameters used to estimate these CY2022 carryover savings are based on deemed parameters from the year of install (delta watts, HOU and peak CF, and waste heat factors of energy and demand), which would be based on TRM v10.0 for CY2022. Because TRM v10.0 is not yet finalized, the team used v9.0 of the TRM to estimate these parameters. The **preliminary** parameters for the partial CY2022 carryover savings are based on the following:

- **Delta watts:** Verified savings estimate from the installation year (source: TRM v9.0); this value is subject to change and will ultimately use the values from TRM v10.0.

- **Residential/nonresidential split:** Verified savings from the purchase year (source: TRM v8.0); this value is not subject to change.
- **HOU and peak CF:** Verified savings estimate from the installation year (source: TRM v9.0); this value is subject to change and will ultimately use the values from TRM v10.0.
- **Energy and demand IE:** Verified savings estimate from the installation year (source: TRM v9.0); this value is subject to change and will ultimately use the values from TRM v10.0.
- **Installation rate:** Verified savings estimate from the purchase year (source: TRM v8.0); this value is not subject to change.
- **NTG:** Deemed net-to-gross values from the purchase year; this value is not subject to change.

Table A-3 shows that 89,328 bulbs purchased in CY2020 are expected to be installed within ComEd’s service territory in CY2022. The table provides the gross and net energy and demand savings from these carryover bulbs. Total preliminary CY2022 partial net carryover energy savings is estimated to be 12,523,774 kWh and 2,870 summer peak kW.

Table A-3. CY2022 Preliminary Carryover Savings Estimates from CY2020 Bulb Sales

Preliminary Partial CY2022 Carryover Savings	CY2020 Bulbs
Carryover Bulbs Installed During CY2022	89,328
Gross Energy Savings (kWh)	15,164,032
Gross Peak Summer Peak Demand Savings (kW)	3,476
Net-to-Gross Ratio	0.83
Net Energy Savings (kWh)	12,523,774
Net Summer Peak Demand Savings (kW)	2,870
EUL Res	10.0
EUL NonRes	10.4

Source: Evaluation team analysis

Appendix B. Impact Analysis Detail

Program Volumetric Detail

During CY2020, 2,349,454 lighting and battery charging measures were sold through the Instant Discounts Program, which is an 18% reduction from the measures sold in CY2019. This drop primarily stemmed from a reduction in the sales of LED, TLED, and linear fluorescent lamps. The sales of LED fixtures exit signs and battery chargers all increased in CY2020. Table B-1 shows the volume of measure types incentivized through the Instant Discounts Program in PY3 through CY2020 (PY9 numbers represent sales over a 19-month period).

Table B-1. PY3 – CY2020 Volumetric Findings Detail

Program Year	Standard CFLs	Specialty CFLs	LEDs Lamps	LED Fixtures	TLEDs	HIDs	Linear FLs	LED Exit Signs	LF Ballasts	Battery Chargers	Total
CY2020	NA	NA	401,005	391,329	1,342,037	43,324	138,867	32,605	NA	287	2,349,454
CY2019	NA	NA	957,881	258,136	1,450,766	NA	178,955	29,165	NA	130	2,875,033
CY2018	NA	NA	856,282	156,469	1,360,970	NA	186,701	26,165	NA	121	2,586,708
PY9	NA	NA	781,645	92,651	847,833	NA	303,331	27,754	NA	169	2,053,383
PY8	NA	NA	1,045,905	60,790	NA	NA	503,948	25,297	NA	76	1,636,016
PY7	279,320	261,262	983,982	108,529	NA	2,025	791,443	16,637	67,331	160	2,510,689
PY6	343,577	362,332	702,716	101,583	NA	2,607	840,903	NA	67,391	NA	2,421,109
PY5	249,799	347,639	202,433	9,522	NA	2,799	503,627	NA	NA	NA	1,315,819
PY4	194,180	381,072	NA	NA	NA	NA	NA	NA	NA	NA	575,252
PY3	4,173	929	NA	NA	NA	NA	NA	NA	NA	NA	5,102

† PY9 consisted of a 19-month program year, all prior program years consisted of 12 months.

Source: ComEd tracking data and evaluation team analysis.

Appendix C. Total Resource Cost Detail

Table C-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) 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	TLEDs	Lamp	1,342,037	15.0	No	81,293,184	19,403	NA	NA	NA	-1,129,072	0.80	0.80	0.80	65,034,547	15,522	NA	NA	NA	-903,258
Lighting	LED Lamp	Lamp	401,005	6.8	No	71,567,463	15,938	NA	NA	NA	-996,224	0.83	0.83	0.83	59,400,994	13,229	NA	NA	NA	-826,866
Lighting	LED Fixture	Fixture	391,329	12.2	No	72,791,197	16,969	NA	NA	NA	-992,927	0.83	0.83	0.83	60,416,693	14,084	NA	NA	NA	-824,129
Lighting	LED HID	Lamp	43,324	14.3	No	10,489,561	2,342	NA	NA	NA	-145,688	0.83	0.83	0.83	8,706,336	1,944	NA	NA	NA	-120,921
Lighting	LED Exit Signs	Unit	32,605	6.1	No	6,111,774	839	NA	NA	NA	-84,886	0.80	0.80	0.80	4,889,419	671	NA	NA	NA	-67,909
Lighting	Linear Fluorescents	Lamp	138,867	11.9	No	2,210,852	528	NA	NA	NA	-30,706	0.67	0.67	0.67	1,481,271	354	NA	NA	NA	-20,573
Power Electronics	Battery Charger	Unit	287	15.0	No	3,441,584	29	NA	NA	NA	0	0.80	0.80	0.80	2,753,267	24	NA	NA	NA	0
Lighting	Carryover (CY2018)	Lamp	13,745	8.5	No	2,401,437	528	NA	NA	NA	-34,125	0.78	0.78	0.78	1,873,320	412	NA	NA	NA	-26,621
Lighting	Carryover (CY2019)	Lamp	141,723	9.0	No	22,886,016	5,192	NA	NA	NA	-317,117	0.83	0.83	0.83	18,912,641	4,290	NA	NA	NA	-262,060
	Total			11.3		273,193,069	61,768	NA	NA	NA	-3,730,745	NA	NA	NA	223,468,489	50,529	NA	NA	NA	-3,052,337

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

* 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