Guidehouse

ComEd Business Instant Discounts Impact Evaluation Report

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

Presented to
ComEd

FINAL

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ComEd Business Instant Discounts Impact Evaluation Report

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1. Introduction

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

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 efficient lighting or high efficiency battery chargers by providing instant discounts at the point of sale.

The 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 CY2019 rebate values vary by technology. The program incented 2,875,033 measures in CY2019, comprised of 33% LED lamps, 51% TLEDs, 9% LED fixtures, 6% LFs and 1% LED exit signs as shown below in Table 2-1 and Figure 2-1.

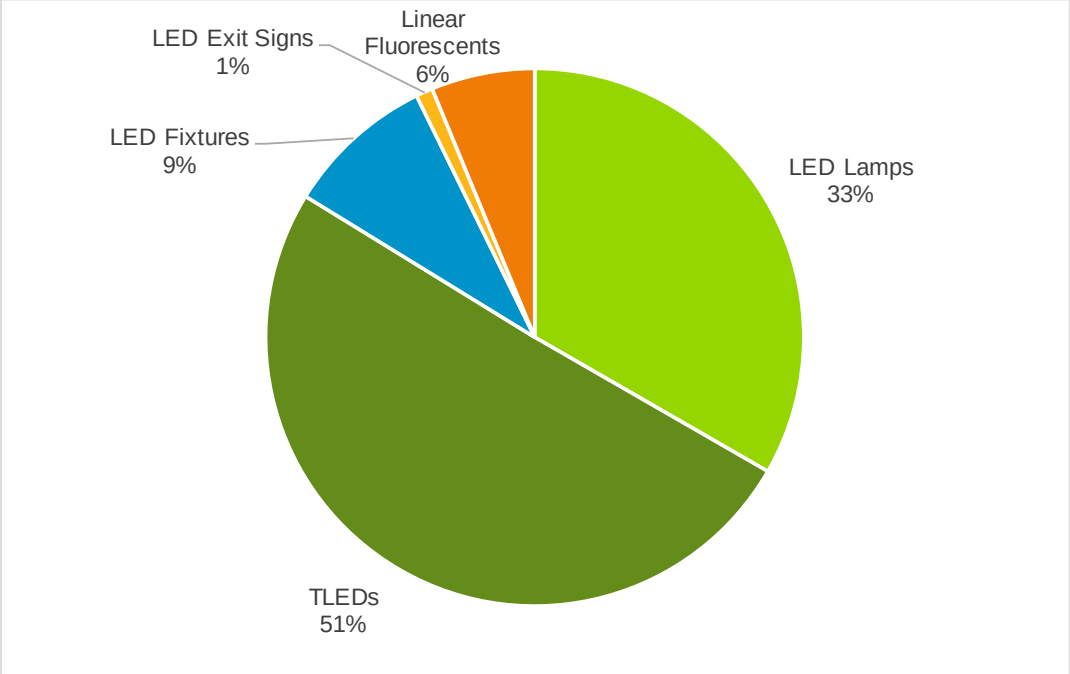
Table 2-1. CY2019 Volumetric Findings Detail

Participation	Total	LED Lamps	TLEDs	LED Fixtures	LED Exit Signs	Linear Fluorescents	Battery Chargers
CY2019 Incentivized Units	2,875,033	957,881	1,450,766	258,136	29,165	178,955	130
CY2019 1st Year Installed Units	2,555,369	790,014	1,355,030	213,530	29,165	167,500	130
PY9 Carryover – CY2019 Installs	10,316	8,692	475	1,030	-	119	-
CY2018 Carryover – CY2019 Installs	11,748	9,219	762	1,740	-	26	-
Total Installed Units in CY2018	2,577,432	807,925	1,356,267	216,300	29,165	167,645	130

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. Number of Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Instant Discounts Program achieved in CY2019. The verified savings values in Table 3-1 include carryover savings from PY9 and CY2018. Net verified savings for CY2019 is 249,177,524 kWh. There are no gas savings associated with this program.

Table 3-1. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	289,426,898	69,365	59,380
Program Gross Realization Rate	1.06	1.12	1.03
Verified Gross Savings	306,616,482	77,675	61,241
Program Net-to-Gross Ratio (NTG)	0.81	0.81	0.81
Verified Net Savings	249,177,524	63,151	49,771
Converted from Gas†			
Ex Ante Gross Savings	NA	NA	NA
Program Gross Realization Rate	NA	NA	NA
Verified Gross Savings	NA	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA	NA
Verified Net Savings	NA	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	289,426,898	69,365	59,380
Program Gross Realization Rate	1.06	1.12	1.03
Verified Gross Savings	306,616,482	77,675	61,241
Program Net-to-Gross Ratio (NTG)	0.81	0.81	0.81
Verified Net Savings	249,177,524	63,151	49,771.14

NR = Not reported (refers a piece of data that was not reported, i.e., non-coincident demand savings)
NA = Not applicable (refers a piece of data cannot be produced or does not apply)
* The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.
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 Instant Discounts Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 306,616,482 kWh (Table 4-1). Guidehouse found no gas savings for this program attributable to ComEd and as such electric CPAS is equivalent to total CPAS.

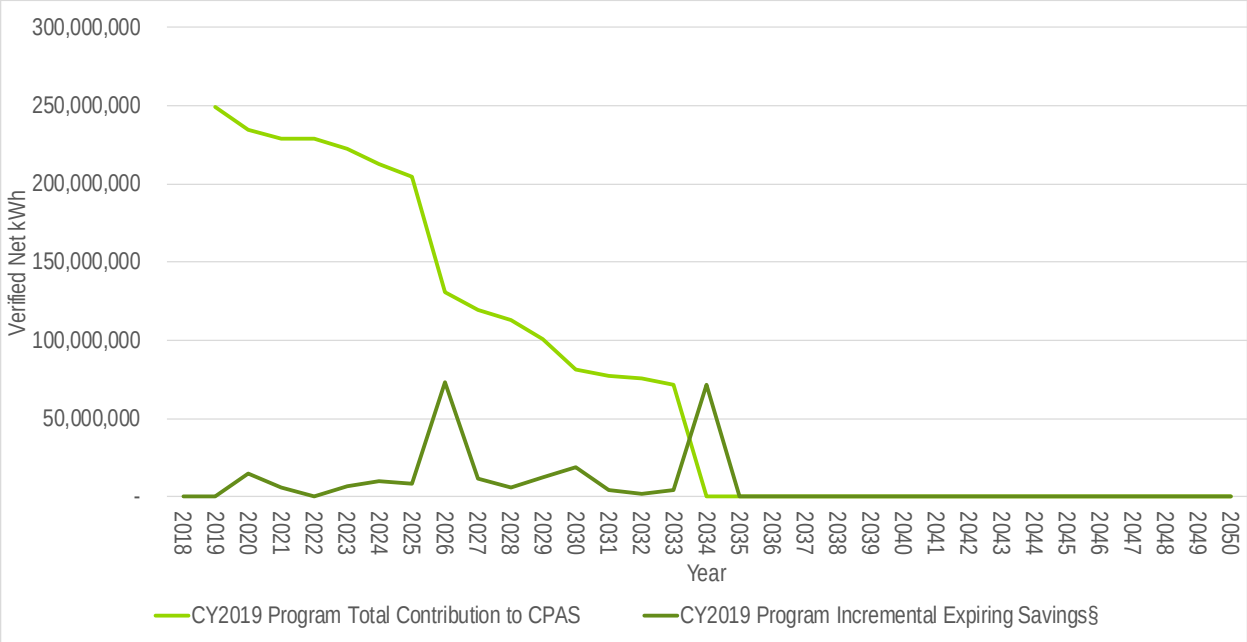
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Power Electronics	Battery Chargers	15.0	1,125,537	0.80	13,506,444		900,430	900,430	900,430	900,430	900,430	900,430	900,430	900,430
Lighting	LED Exit Signs	5.0	5,448,869	0.80	21,795,474		4,359,095	4,359,095	4,359,095	4,359,095	4,359,095			
Lighting	LED Fixtures	12.1	35,365,065	0.80	341,398,102		28,292,052	28,292,052	28,292,052	28,292,052	28,291,961	28,290,212	28,260,013	28,123,479
Lighting	LED HID	14.4	10,971,779	0.83	130,733,937		9,106,576	9,106,576	9,106,576	9,106,576	9,106,576	9,106,576	9,094,924	8,958,374
Lighting	LED Lamps	7.0	140,143,584	0.83	735,149,056		116,319,175	101,876,618	101,823,395	101,585,372	94,872,804	89,662,366	83,943,202	17,822,739
Lighting	TLEDs	13.2	99,787,793	0.80	1,051,348,325		79,830,234	79,830,234	79,830,234	79,830,234	79,830,234	79,829,778	77,643,025	72,600,958
Lighting	Linear Fluorescents	10.4	3,212,212	0.67	22,432,460		2,152,182	2,152,182	2,152,182	2,151,857	2,139,385	1,998,574	1,795,616	1,401,538
Lighting	Carryover	7.6	10,561,644	0.78	32,922,955		8,217,780	8,217,780	2,717,773	2,717,773	2,717,773	2,717,773	2,717,773	987,472
CY2019 Program Total Electric Contribution to CPAS			306,616,482		2,349,286,754		249,177,524	234,734,968	229,181,737	228,943,389	222,218,258	212,505,709	204,354,981	130,794,989
Historic Program Total Electric Contribution to CPAS‡						253,222,349	245,411,842	245,411,842	220,796,835	216,725,305	210,847,104	200,866,765	134,785,528	111,589,300
Program Total Electric 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
CY2019 Program Incremental Expiring Electric Savings§								14,442,556	5,553,231	238,348	6,725,131	9,712,549	8,150,728	73,559,992
Historic Program Incremental Expiring Electric Savings‡§							7,810,507	-	24,615,007	4,071,530	5,878,202	9,980,338	66,081,237	23,196,228
Program Total Incremental Expiring Electric Savings§							7,810,507	14,442,556	30,168,238	4,309,877	12,603,333	19,692,887	74,231,965	96,756,220

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Power Electronics	Battery Chargers	900,430	900,430	900,430	900,430	900,430	900,430	900,430					
Lighting	LED Exit Signs												
Lighting	LED Fixtures	27,932,525	27,618,097	20,319,934	10,150,551	10,036,669	9,930,902	9,275,550					
Lighting	LED HID	8,947,488	8,937,738	8,936,746	8,873,362	8,638,459	8,082,580	5,624,808					
Lighting	LED Lamps	7,996,079	6,095,671	5,601,478	4,693,942	1,198,794	956,562	700,860					
Lighting	TLEDs	71,649,538	67,700,227	63,201,292	55,348,657	55,235,387	54,831,003	54,157,289					
Lighting	Linear Fluorescents	1,277,933	1,213,580	1,168,736	1,012,648	791,245	590,227	434,575					
Lighting	Carryover	425,084	425,084	425,084	425,084	106,655	52,126	51,943					
CY2019 Program Total Electric Contribution tc		119,129,076	112,890,827	100,553,699	81,404,674	76,907,640	75,343,830	71,145,455	-	-	-	-	-
Historic Program Total Electric Contribution t		102,907,640	92,447,931	74,704,928	69,298,467	62,939,915	57,891,384	3,842,148	-	-	-	-	-
Program Total Electric CPAS		222,036,716	205,338,758	175,258,627	150,703,140	139,847,554	133,235,213	74,987,602	-	-	-	-	-
CY2019 Program Incremental Expiring Electric		11,665,914	6,238,249	12,337,127	19,149,026	4,497,034	1,563,810	4,198,375	71,145,455	-	-	-	-
Historic Program Incremental Expiring Electri		8,681,660	10,459,709	17,743,004	5,406,461	6,358,552	5,048,531	54,049,236	3,842,148	-	-	-	-
Program Total Incremental Expiring Electric S		20,347,574	16,697,958	30,080,131	24,555,487	10,855,586	6,612,341	58,247,611	74,987,602	-	-	-	-

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

Figure 4-1. Cumulative Persisting Annual Savings

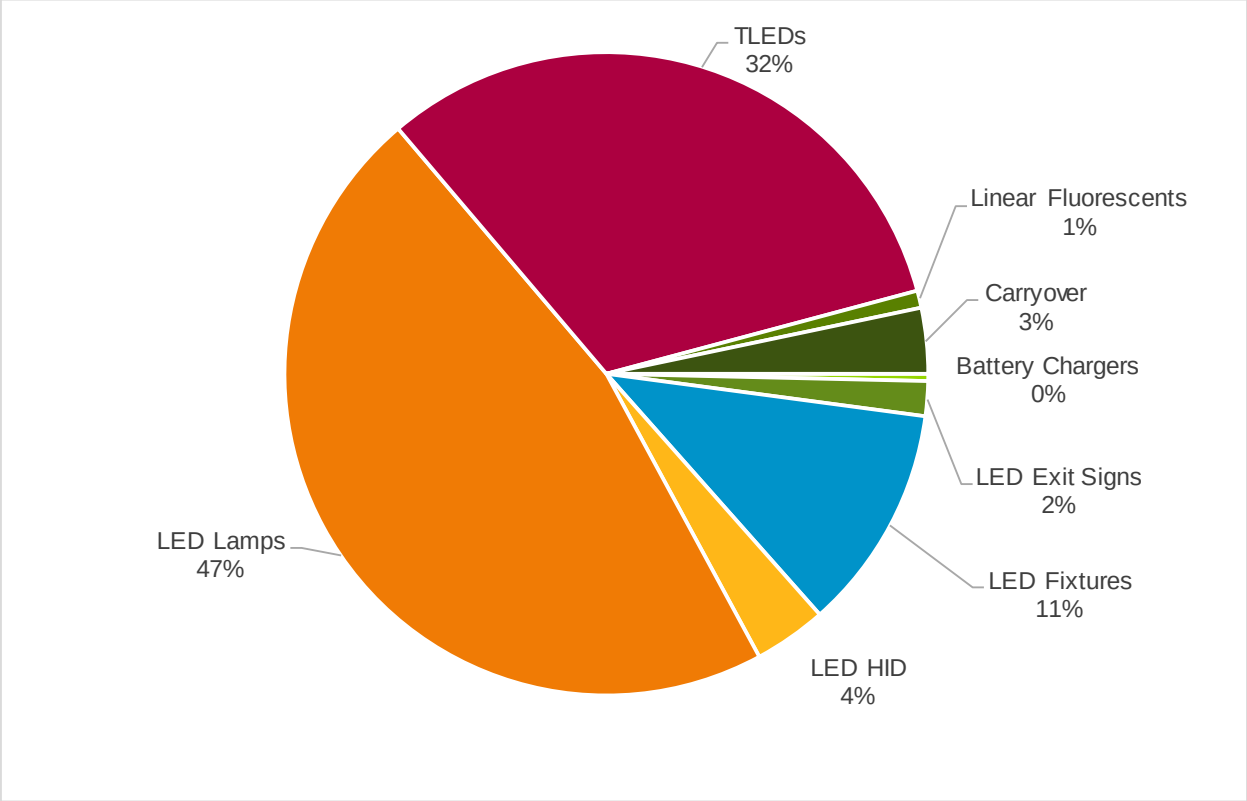


* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n.
Source: Evaluation team analysis

5. Program Savings by Measure

The program includes seven measure types, as shown in the tables below. LED lamps and TLEDS contributed the most energy savings; 48% and 29%, respectively. The energy realization rate (RR) for LED Fixtures, LED HID and Linear Fluorescents is driven primarily by adjusted hours of operation and building specific parameters. Additional details on these differences and adjustments can be found in Section 8 (Appendix 2).

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



Source: Evaluation team analysis

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

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	EUL (years)
Power Electronics	Battery Chargers	1,125,537	1.00	1,125,537	0.80	900,430	15.0
Lighting	LED Exit Signs	5,448,869	1.00	5,448,869	0.80	4,359,095	5.0
Lighting	LED Fixtures	34,928,825	1.01	35,365,065	0.80	28,292,052	12.1
Lighting	LED HID	11,053,998	0.99	10,971,779	0.83	9,106,576	14.4
Lighting	LED Lamps	143,838,731	0.97	140,143,584	0.83	116,319,175	7.3
Lighting	TLEDs	90,188,790	1.11	99,787,793	0.80	79,830,234	13.9
Lighting	Linear Fluorescents	2,842,148	1.13	3,212,212	0.67	2,152,182	11.1
Lighting	Carryover	NR	NA	10,561,644	0.78	8,217,780	7.6
	Total	289,426,898	1.06	306,616,482	NA	249,177,524	NA

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

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

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Power Electronics	Battery Chargers	5.01	1.00	5.01	0.80	4.01
Lighting	LED Exit Signs	1,054.77	1.00	1,054.77	0.80	843.81
Lighting	LED Fixtures	8,260.11	1.17	9,627.88	0.80	7,702.31
Lighting	LED HID	2,484.88	1.12	2,792.78	0.83	2,318.01
Lighting	LED Lamps	32,252.03	1.13	36,288.52	0.83	30,119.47
Lighting	TLEDs	24,535.25	0.99	24,343.87	0.80	19,475.10
Lighting	Linear Fluorescents	773.19	1.00	769.39	0.67	515.49
Lighting	Carryover	NR	NA	2,792.54	0.78	2,172.54
	Total	69,365.24	1.12	77,674.77	NA	63,150.74

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

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

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Power Electronics	Battery Chargers	5.01	1.00	5.01	0.80	4.01
Lighting	LED Exit Signs	786.27	0.98	772.99	0.80	618.39
Lighting	LED Fixtures	7,361.98	1.02	7,491.59	0.80	5,993.27
Lighting	LED HID	2,214.68	1.01	2,240.00	0.83	1,859.20
Lighting	LED Lamps	29,081.91	0.96	28,011.47	0.83	23,249.52
Lighting	TLEDs	19,321.39	1.03	19,968.66	0.80	15,974.93
Lighting	Linear Fluorescents	608.69	1.05	640.52	0.67	429.15
Lighting	Carryover	NR	NA	2,111.16	0.78	1,642.67
	Total	59,379.93	1.03	61,241.40	NA	49,771.14

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

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

Energy and demand savings are estimated using the following formula as specified in the TRM:

Verified Gross Annual ΔkWh = ResSplit * Res ΔkWh + NonResSplit * NonRes ΔkWh

Where:

Res ΔkWh = Bulbs * DeltaWatts/1000 * ISR_r * (1-Leakage) * HOU_r * $WHFe_r$

NonRes ΔkWh = Bulbs * DeltaWatts/1000 * ISR_{nr} * (1-Leakage) * HOU_{nr}* $WHFe_{nr}$

Verified Gross Annual ΔkW = Delta Watts/1000 * ISR * (1-Leakage)

Verified Gross Annual Summer Peak ΔkW = Gross Annual ΔkW * Summer Peak CF * WHFd
Verified Gross Annual Winter Peak ΔkW = Gross Annual ΔkW * Winter Peak CF

Where:

- **Res/NonRes split** = Percentage of program bulbs installed in residential and non-residential locations. Deemed within Illinois (TRM) v7.
- **Bulbs** = Quantity of bulbs sold through the CY2019 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 v7.
  - WattsEE = Wattage of efficient program bulb, based on program tracking data.
- **ISR $_{r(nr)}$ =** First year installation rate (residential or non-residential), deemed in TRM v7.
- **Leakage** = Percentage of program bulbs installed outside of ComEd service territory, deemed in TRM v7.
- **HOU$_{r(nr)}$** = Annual hours of use (residential or non-residential), deemed in TRM v7.
- **WHFe$_{r(nr)}$** = Waste heat factor – Energy (residential or non-residential), deemed in TRM v7.
- **WHFd$_{r(nr)}$** = Waste heat factor – Demand (residential or non-residential), deemed in TRM v7.
- **Summer Peak CF** = Peak load coincidence factor, the percentage of program bulbs turned on during summer peak hours (weekdays from 1 to 5 P.M.).
- **Winter Peak CF** = Peak load coincidence factor, the percentage of program bulbs turned on during the PJM Winter Peak hours.[2]

The lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life (EUL) for each measure with a unique EUL value. The EM&V team conducted research to validate the parameters that were not specified in the TRM. The results are shown in the following table.

Table 6-1. Savings Parameters

Verified Savings Parameters	Data Source	Deemed or Evaluated?
Program Bulbs	CY2019 Program Tracking Data	Evaluated
Delta Watts	TRM v7*	Deemed
Installation Rate	TRM v7	Deemed
Leakage	PY9 End User Surveys	Evaluated
Res / Non-Res Split	TRM v7	Deemed
Hours of Use (HOU)	TRM v7	Deemed
Summer Peak Coincidence Factor (CF)	TRM v7	Deemed
Energy Interactive Effects	TRM v7	Deemed
Demand Interactive Effects	TRM v7	Deemed
NTG†	SAG Consensus	Deemed

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

[2] The Winter Peak Period is defined by PJM as the period from 6-8 am and 5-7 pm, Central Time Zone, between January 1 and February 28.

6.2 Other Impact Findings and Recommendations

The evaluation team has developed several recommendations based on findings from the CY2019 evaluation, as follows:

Finding 1: Overall, the tracking data contained the relevant information needed for verification and participant information was well populated. However, there are several improvements that can be made to data and the eTRACK system.

Finding 1-1: The evaluation team found that the EUL for all Wall Pack measures was listed as zero, and that roughly 32% of transactions had either a missing or zero value for the "Unit_Lamp_Life".

Recommendation 1: The evaluation team recommends including an EUL for the Wall Pack measures and including lamp lives for all transactions included in the tracking data in order to verify EULs reported in the tracking data.

Finding 1-2: The evaluation team found 991 transactions of PAR30 LED lamps that did not specify if the lamp was a PAR30L or PAR30S lamp. As a result, the verification team assumed that these lamps were PAR30S lamps for purposes of lumen mapping.

Recommendation 2: The team recommends including the specific PAR30 type designation whenever possible to more accurately estimate program savings.

Finding 2: The evaluation team found that the building type field was always populated as unknown and the unknown building type and associated parameters were applied for all transactions.

Recommendation 3: ComEd can improve their ex ante savings estimates by assigning preliminary business types, based on the end user and applying the associated parameters from the TRM. (See Table 7-1 for business types the evaluation team assigned to participants.)

Finding 3: ComEd is using a standard deemed EUL for all measures instead of using the hours of operation with the lamp life to calculate the EUL.

Recommendation 4: When applicable by the TRM, the evaluation team recommends using the lamp life and the building hours of use to calculate a more accurate EUL.

Finding 4: Several of the PAR, MR and Wall Pack wattage baselines included in the tracking data did not align with the verified baseline wattage values. The majority of these were Wall Pack fixtures where the lumens did not fit into the range buckets provided.

Recommendation 5: The evaluation team recommends confirming that the lumen level has been mapped to the correct wattage baseline.

7. Appendix 1. Impact Analysis Methodology

7.1 Tracking System Review

The tracking system review for the CY2019 Instant Discounts Program was an iterative process. ComEd provided a comprehensive dataset that included the current program year data. The evaluation team ran checks and found that the current program year records were complementary and non-overlapping with bulb sales attributed to previous program years. The evaluation team also checked the records to verify that the bulbs were bought and installed in ComEd territory in 2019.

7.1.1 Customer Information

The completeness of the purchaser and end user contact information is important in establishing the samples for the evaluation research purchaser surveys and attempting to determine the end user business types of installations of instant discounts products. Overall, the purchaser information is well populated. Every transaction contains a purchaser name and its associated address. However, there were approximately 14% of records where the email addresses for purchasers were missing. Additionally, there are many instances of purchases made by the same company, but under varying combinations of slightly different names, phone numbers, or emails. The actual unique purchasers and associated contact information is only able to be determined after a manual review and update of distinct combinations prior to sampling.

7.1.2 Building Type Lookups

The tracking data did not provide unique building types for any records, and instead used an unknown building type. The evaluation team attempted to assign business types to large transactions, as specified in the TRM. The evaluation team used the business name and address to assign a more accurate business type to each end user. The evaluation team looked up the top 50% of non-contractor sales volume, and assigned them building types as specified in the TRM v7.0. Additionally, where the evaluation team identified the purchaser as a contractor, the business type was also assigned as "Unknown" because contractors may install lamps at a variety of business types. After this process, the evaluation team was able to establish business type for 7% of Instant Discounts transactions (29% of total sales volume and approximately 23% of the Ex Ante energy savings). Table 7-1 shows the distribution of the assigned business types used in the analysis. The evaluators recommend that ComEd and the implementation team continue to work collaboratively with evaluation efforts to improve business type assignments.

Table 7-1. Distribution of End User Business Types

End-User Business Type	Transactions	Percent	Total Units Sold	Percent
Unknown	28,151	46%	1,131,263	39%
Contractor (Unknown)	28,865	47%	901,023	31%
Office - Low Rise	482	1%	105,240	4%
Hospital - VAV econ	1,015	2%	76,516	3%
High School	173	0.3%	75,440	3%
Manufacturing	264	0.4%	83,807	3%
Grocery	62	0.1%	47,435	2%
College	307	0.5%	47,462	2%
Office - High Rise	535	1%	68,650	2%
Hotel/Motel - Guest	119	0.2%	39,697	1%
Warehouse	274	0.4%	64,842	2%
Retail - Department	76	0.1%	47,066	2%
Office - Mid Rise	251	0.4%	38,781	1%
Assisted Living	203	0.3%	31,986	1%
Hotel/Motel - Common	228	0.4%	26,895	1%
MF - High Rise	53	0.1%	16,888	1%
Religious Building	41	0.1%	16,445	1%
Elementary School	97	0.2%	28,360	1%
Healthcare Clinic	231	0.4%	13,388	0.5%
Exterior	13	0.0%	6,720	0.2%
MF - Mid Rise	14	0.0%	3,387	0.1%
Retail - Strip Mall	6	0.0%	1,119	0.0%
Garage	1	0.0%	960	0.0%

Source: ComEd tracking data and Guidehouse team analysis.

7.1.3 Make and Model Lookups

The evaluation team also reviewed lamp information by manufacturer and model number. The wattage and lumens were verified for the top two-thirds (66.7%) of lighting sales volume. For directional LEDs, the CBCP, beam spread, and lamp diameter were also verified. This resulted in a handful of minor changes to these fields to increase the accuracy of impact calculations. The evaluation team also looked up reflector types (e.g., PAR38, BR20, etc.) for each of the directional LEDs and found minimal differences with the provided tracking data. These are necessary to use the lumen or wattage mappings in the TRM v7.0 to determine delta watts of these bulbs.

8. Appendix 2. Impact Analysis Detail

8.1 HID Lamps

The TRM v7 utilizes the lumen output match to determine a baseline wattage for LED fixtures, but older metal halide and sodium vapor lamps have a much higher lumen rating than the LED equivalent, therefore the TRM-prescribed baseline wattage would be much higher than what was actually assigned. The evaluation team consulted previous evaluations of lighting in California and consulted lighting manufacturers to determine an appropriate factor to use to determine the baseline wattage. Per discussions with ComEd and the Implementation team, all HID's baseline wattage was determined by wattage ranges based on 2.5x the measure wattage.

8.2 EUL

While EULs were provided for most transactions, the EUL for all Wall Pack measures were zero. In addition, a large portion of the reported measure lives in the "Unit_Lamp_Life" variable was either missing or reported as zero. Roughly 36% of transactions, across a variety of lamp types, had either a missing or zero value for "Unit_Lamp_Life". It is important to include the measure lives for all transactions, so the evaluation team can verify EULs reported in the tracking data, which are used for CPAS estimates. This is particularly important for measures that do not receive a deemed measure life. For example, LED lamps and fixtures (A-lamps, reflectors, globes, candelabras, and others) have measure lives and EULs reported as the rated measure life divided by the deemed hours of use. In addition, the lamp life is important in calculating a weighted average measure life for the residential/non-residential split.

8.3 Program Volumetric Detail

As shown in Table 8-1, the total number of units sold during the CY2019 Instant Discounts Program was 2,875,033, which is an 11% increase from the total units sold in CY2018. This was largely due to the increase in LED sales between CY2018 and CY2019. LEDs[3] comprised nearly 94% of CY2019 Instant Discount sales. Compared to CY2018, the total sales of LEDs increased by 12% and total sales of LF lamps decreased by 4%.

[3] Including LED lamps, TLEDs, fixtures and exit signs.

Table 8-1. CY2019 Volumetric Findings Detail

Program Year	Standard CFLs	Specialty CFLs	LEDs	Linear FLs	HIDs	LF Ballasts	Battery Chargers	Total
CY2019	N/A	N/A	2,695,948	178,955	N/A	N/A	130	2,875,033
CY2018	N/A	N/A	2,399,886	186,701	N/A	N/A	121	2,586,708
PY9	N/A	N/A	1,749,883	303,331	N/A	N/A	169	2,053,383
PY8	N/A	N/A	1,131,992	503,948	N/A	N/A	76	1,636,016
PY7	279320	261262	1,109,148	791,443	2025	67331	160	2,510,689
PY6	343,577	362,332	804,299	840,903	2607	67,391	N/A	2,421,109
PY5	249,799	347,639	211,955	503,627	2,799	N/A	N/A	1,315,819
PY4	194,180	381,072	N/A	N/A	N/A	N/A	N/A	575,252
PY3	4173	929	N/A	N/A	N/A	N/A	N/A	5,102

Note: PY9 was 19 months long. All other years were 12 months.
NA = Not applicable
Source: ComEd tracking data and Navigant team analysis.

8.4 Gross Program Impact Parameter Estimates

The EM&V team conducted research to validate and supplement parameters that were not fully specified in the tracking system. Evaluation research verified specialty bulb type classifications (globe, candelabra, PAR30, etc.) and ensured that TRM parameters that vary by bulb type were applied correctly. The evaluation team also applied the residential and non-residential splits for each product type (detailed in section 8.4.4). Finally, where possible, the evaluation team assigned building type based on business name and address and applied the building type specific parameters from the TRM. The resulting verified savings parameters used in CY2019 that are independent of installation location (residential versus non-residential) are included in Table 8-2 and those parameters that may vary are included in Table 8-3. These tables include both ex ante and verified savings parameter estimates. The differences are explained in the section after the tables.

Table 8-2. Verified Gross Savings Parameters

Gross Savings Input Parameters	Product Type	CY2019 Ex Ante Value	CY2019 Verified Savings Value	Deemed ‡ or Evaluated?
Program Unit Sales	LED Lamps	957,881	957,881	Evaluated
	TLEDs	1,450,766	1,450,766	Evaluated
	LED Fixtures	258,136	258,136	Evaluated
	LED Exit Signs	29,165	29,165	Evaluated
	Linear Fluorescents	178,955	178,955	Evaluated
	Battery Chargers	130	130	Evaluated
	Carryover Bulbs	22,063	22,063	Evaluated
	Total	2,897,096	2,897,096	Evaluated
Delta Watts	LED Lamps	49.6	48.9	Deemed
	TLEDs	18.1	18.1	Deemed
	LED Fixtures	45.1	45.4	Deemed
	LED Exit Signs	19.8	19.8	Deemed
	Linear Fluorescents	4.6	4.6	Deemed
	Battery Chargers	.	.	Deemed
Res/NonRes Split	LED Lamps, LED Fixtures	2%/98%	2%/98%	Deemed
	Linear Fluorescents, TLEDs	1%/99%	1%/99%	Deemed
	LED Exit Signs, Battery Chargers, LED HID	0%/100%	0%/100%	Deemed
Leakage	All	NR	0.53%	Evaluated

NR = Not reported
* State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html.
Source: ComEd tracking data and Navigant team analysis.

Table 8-3. Verified Gross Savings Parameters – Residential vs. Non-Residential

Gross Impact Parameters	Product Type	CY2019 ComEd Reported (Ex Ante)	CY2019 Verified (Ex Post)		Deemed ‡ or Evaluated?
			Res	Non-Res	
Installation Rate	LED Lamps	82.5%	81.2%	82.5%	Deemed
	TLEDs	93.4%	93.5%	93.4%	Deemed
	LED Fixtures	82.5%	93.5%	82.5%	Deemed
	LED Exit Signs	100.0%	100.0%	100.0%	Deemed
	Linear Fluorescents	93.4%	93.5%	93.6%	Deemed
	Battery Chargers	100.0%	100.0%	100.0%	Deemed
Hours of Use	LED Lamps	3,612	1,090	3,550	Both
	TLEDs	3,379	1,377	3,741	Both
	LED Fixtures	3,386	1,377	3,399	Both
	LED Exit Signs	8,766	8,766	8,766	Both
	Linear Fluorescents	3,379	1,377	3,696	Both
	Battery Chargers	8,348	8,348	8,348	Both
Coincidence Factor	LED Lamps	0.58	0.08	0.58	Both
	TLEDs	0.58	0.09	0.62	Both
	LED Fixtures	0.58	0.09	0.58	Both
	LED Exit Signs	1.00	1.00	1.00	Both
	Linear Fluorescents	0.58	0.09	0.60	Both
	Battery Chargers	0.58	.	0.58	Both
Energy Waste Heat Factor	LED Lamps	1.09	1.06	1.11	Both
	TLEDs	1.09	1.06	1.10	Both
	LED Fixtures	1.09	1.06	1.09	Both
	LED Exit Signs	1.09	1.04	1.09	Both
	Linear Fluorescents	1.09	1.06	1.11	Both
	Battery Chargers	1	.	1.09	Both
Demand Waste Heat Factor	LED Lamps	1.36	1.11	1.36	Both
	TLEDs	1.36	1.11	1.34	Both
	LED Fixtures	1.36	1.11	1.36	Both
	LED Exit Signs	1.36	1.07	1.36	Both
	Linear Fluorescents	1.36	1.11	1.38	Both
	Battery Chargers	1.00	.	1.36	Both

NR = Not reported
NA = Not applicable
‡ State of Illinois Technical Reference Manual version 7.0 from * A value of "Both" indicates that business type specific parameters from the TRM were used, but that evaluation activities were necessary to identify business types.

8.4.1 Unit Sales

There were no misclassifications of lamp categories in the tracking system; therefore, there were no differences in unit sales in any lamp category between ex ante and ex post.

8.4.2 Delta Watts

The differences in delta watts between ex ante and ex post were marginal for each of the measure groups. ComEd accurately defined ex ante assignments of baseline and measure, with only small discrepancies for a handful of line items. Average delta watts for each lighting measure differed by no more than 0.7W between ex ante and ex post. These remaining small differences were due to the updates of lamp specifications based on the evaluation team's bulb information lookups and a small number of misclassified lamp types.

8.4.3 Installation Rates

The installation rates defined by ComEd match the TRM v7.0 for non-residential installations.). The ex ante ISR applied to LFs was derived from the high performance T8 measure value of 93.4% whereas the evaluation team also applied the ISR for T5 Fixtures and Lamps (98.0%) when applicable. In addition the TRM does not have an explicit value for the TLED ISR, so both the evaluation and implementation team applied the high performance T8 ISR to TLEDs.

ComEd correctly applied the residential and non-residential split in their ex ante estimates as defined by the TRM v7.0. . The tracking data provided all necessary information to calculate the non-residental and the residential split savings. A majority of the res/non-res fields were confusing, but the values were applied correctly per the TRM. For example, the residential hours of use were reported the same for the residential (HOU_res) and non-residential (HOU_Com) fields, but the annual hours of operation (HOU_Annual) reported non-residential hours.

8.4.4 Residential/Non-residential Installation Location Split

The residential installations for Instant Discounts products is applied across all of the measure in the tracking data and is built into the ComEd savings calculations. For LED bulbs and fixtures, the split was 2% residential and 98% non-residential. For LED exit signs and for T8 lamps and fixtures, the split was 100% non-residential. For T5 LFs, the split was 1% residential and 99% non-residential. For LED HID, the split was 100% non-residential based on discussion and agreement between ComEd and the evaluators.

8.4.5 Leakage

Based on the end user telephone interviews conducted for the PY9 evaluation, leakage of program bulbs outside of ComEd territory appears to be a very small issue for the Instant Discounts Program. Of the 529 respondents, only 28 indicated that some bulbs of the program bulbs they purchased were installed outside of the ComEd service territory. The estimated percentage of bulbs reported to have been installed outside of ComEd territory was approximately 0.53% of the total bulbs purchased by survey respondents. Additional details on leakage from CY2019 and the end user survey will be presented in a future? evaluation research report. The evaluation team recommends that ComEd apply the leakage rate from the previous evaluation period's Evaluation Research Report to more accurately estimate savings.

8.4.6 Hours of Use and Interactive Effects

In ComEd's tracking system, all end user business types were classified as "Unknown." As mentioned above, the evaluation team used the business name to assign a more accurate business type for the top 50% of non-contractor sales volume. This resulted in varying values for hours of use and interactive effects. For energy and demand interactive effects, there were only small differences between ex ante and non-residential ex post values. Residential interactive effects values, which are lower, were applied to a small portion of sales in accordance with the residential and non-residential split. In addition, while residential installations make up a small portion of sales, the residential HOU values for the lighting measures were much lower than their non-residential counterparts.

9. Appendix 3. Total Resource Cost Detail

Table 9-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

Table 9-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Verified Gross Electric Energy Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Gas Savings (Therms)	Gross Heating Penalty (kWh)	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Verified Net Electric Energy Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Gas Savings (Therms)	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Power Electronics	Battery Chargers	Units	130	15.0	No	1,125,537	5.01	0	0	NA	0.80	0.80	0.80	900,430	4.01	0	0	0
Lighting	LED Exit Signs	Lamp	29,165	5.0	No	5,448,869	772.99	0	-110,904	NA	0.80	0.80	0.80	4,359,095	618.39	0	0	-88,723
Lighting	LED Fixtures	Lamp	258,136	12.1	No	35,365,065	7,491.59	0	-956,700	NA	0.80	0.80	0.80	28,292,052	5,993.27	0	0	-765,360
Lighting	LED HID	Lamp	42,343	14.4	No	10,971,779	2,240.00	0	-219,806	NA	0.83	0.83	0.83	9,106,576	1,859.20	0	0	-182,439
Lighting	LED Lamps	Lamp	915,538	7.0	No	140,143,584	28,011.47	0	-3,471,698	NA	0.83	0.83	0.83	116,319,175	23,249.52	0	0	-2,881,509
Lighting	TLEDs	Lamp	1,450,766	13.2	No	99,787,793	19,968.66	0	-2,258,812	NA	0.80	0.80	0.80	79,830,234	15,974.93	0	0	-1,807,049
Lighting	Linear Fluorescents	Lamp	178,955	10.4	No	3,212,212	640.52	0	-62,692	NA	0.67	0.67	0.67	2,152,182	429.15	0	0	-42,004
Lighting	Carryover	Lamp	22,063	7.6	No	10,561,644	2,111	0	-18,129	NA	0.78	0.78	0.78	8,217,780	1,642.67	0	0	-14,076
	Total			9.9		306,616,482	61,241.40	0	-7,098,741	NA	NA	NA	NA	249,177,524	49,771.14	0	0	-5,781,161

* 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.