Guidehouse

ComEd Multi-Family Assessments 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 Multi-Family Assessments Impact Evaluation Report

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1. Introduction

This report presents the results of the impact evaluation of ComEd's CY2019 Multi-Family Assessments 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 Multi-Family Assessments Program is jointly implemented by ComEd and Nicor Gas Company, and ComEd and Peoples Gas (PGL) and North Shore Gas (NSG) companies. Franklin Energy is the implementation contractor for the joint program. The Multi-Family Assessments Program serves as a "one stop shop" to multi-family building owners and managers to generate electricity and natural gas savings throughout the property. Since this is a joint program, all the therm savings are claimed by the gas utilities and are reported in the PGL and NSG and Nicor Gas evaluation reports.

The electric and natural gas saving services include:

- Electric and gas energy assessments and provision of educational information.
- Direct installation of electric and gas saving measures in tenant and common area spaces.
- Energy Efficiency Service Provider (EESP) installation of electric and gas saving measures at no cost to customer, following agreed upon program pricing.
- In addition, the Multi-Family Assessments Program may provide information to building owners and managers as part of the assessment that explains how they can self-register for Business Energy Analyzer (BEA).

In CY2019 the program provided assessment services and installed various energy-saving measures, which included LEDs in tenant units, water-saving devices, programmable thermostats, pipe insulation, and LEDs in common area.

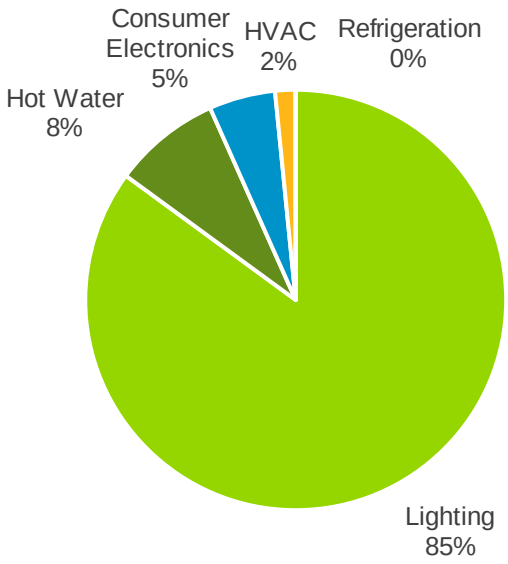
The program had 876 participants in CY2019 and distributed 204,136 measures as shown in the following table and graph. LED bulbs comprised 85% of all the measures installed, followed by hot water measures including bathroom and kitchen aerators and low flow showerheads which were 8% of total measures. Consumer electronics, represented by Tier 1 Advacned Power Strips, accounted for 5% of measures installed. Programmable, reprogrammable, and smart thermostats represented 2%.The balance, which is less than 1% of measures installed, is comprised of vending misers.

Table 2-1. CY2019 Volumetric Findings Detail

Participation	Direct Install	Prescriptive	Total
Participants*	591	285	876
Total Measures	170,671	33,465	204,136
Installed Projects	17,498	291	17,789

*Participants comprise of distinct ComEd account numbers.
Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Number of Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Multi-Family Assessments Program achieved in CY2019.

Table 3-1. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	15,436,840	NR	1,914
Program Gross Realization Rate	0.99	NA	1.00
Verified Gross Savings	15,285,371	6,883	1,907
Program Net-to-Gross Ratio (NTG)	Varies	Varies	Varies
Verified Net Savings	14,131,467	6,131	1,762
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	15,436,840	NR	1,914
Program Gross Realization Rate	0.99	NA	1.00
Verified Gross Savings	15,285,371	6,883	1,907
Program Net-to-Gross Ratio (NTG)	Varies	Varies	Varies
Verified Net Savings	14,131,467	6,131	1,762

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 cannnot 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 gas utilities will claim all gas savings.
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 Multi-Family Assessments Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 14,131,467 kWh (Table 4-1). The "historic" rows in each table are the CPAS contribution back to CY2018. The "Program Total Electric CPAS" and the "Program Total Gas CPAS" are the sum of the CY2019 contribution and the historic contribution. All verified kWh savings throughout this report account for the electric heating penalty incurred by ComEd for lighting measures implemented in building with an electric heating system, with the exception of Table 8-1.

ComEd did not claim any converted gas savings for the Multi-Family Assessments Program in CY2019 and, as such, electric CPAS is equivalent to total CPAS.

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

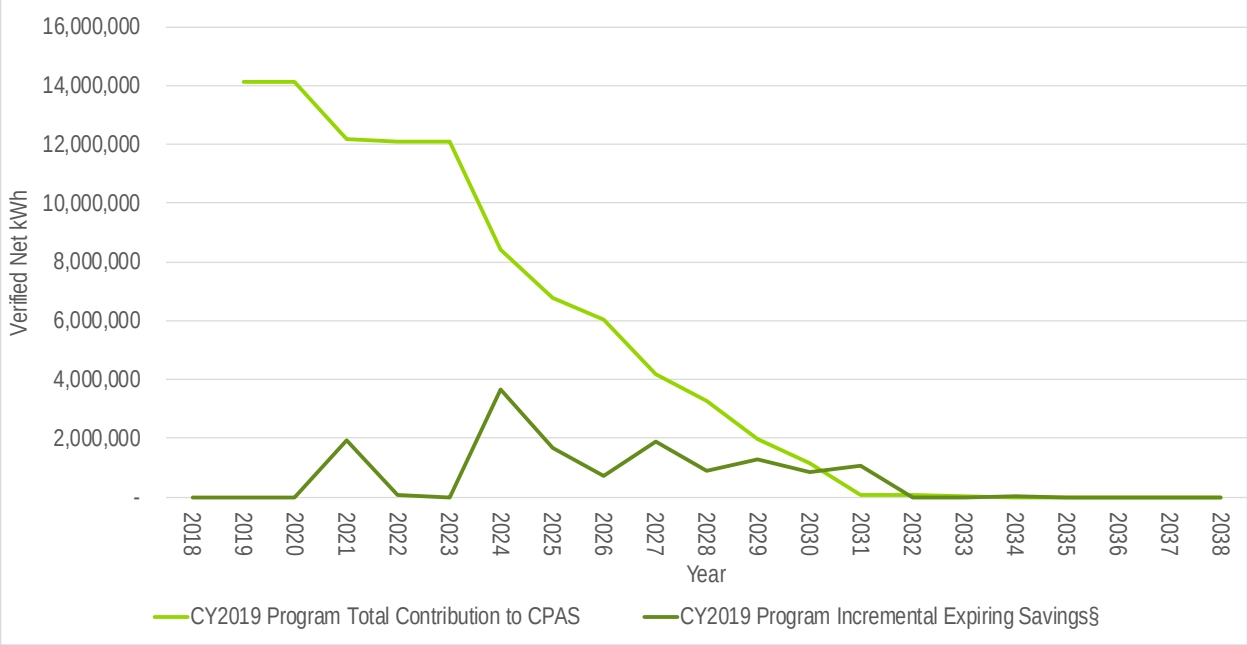
End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Lighting	LED IU Interior Incandescent	10.0	2,039,036	0.84	7,801,170		1,712,790	1,712,790	546,949	546,949	546,949	546,949	546,949	546,949
Lighting	LED Exterior HID	11.6	1,754,072	0.95	19,362,872		1,666,369	1,666,369	1,666,369	1,666,369	1,666,369	1,666,369	1,666,369	1,666,369
Lighting	LED CA Interior T8§§	8.6	1,726,939	0.95	14,127,774		1,640,592	1,640,592	1,640,592	1,640,592	1,640,592	1,640,592	1,640,592	1,640,592
Lighting	LED IU Specialty	10.0	1,524,792	0.84	7,283,935		1,280,825	1,280,825	1,280,825	1,280,825	1,280,825	175,962	175,962	175,962
Lighting	LED Exit Sign	5.0	1,411,677	0.95	6,705,467		1,341,093	1,341,093	1,341,093	1,341,093	1,341,093			
Lighting	LED 24/7 Garage HID	5.7	1,243,489	0.95	6,738,048		1,181,315	1,181,315	1,181,315	1,181,315	1,181,315	831,475		
Lighting	LED CA Interior Incandescent	8.4	1,090,976	0.95	4,472,461		1,036,427	1,036,427	374,742	374,742	374,742	374,742	374,742	374,742
Lighting	LED 24/7 Garage T8	5.7	879,644	0.95	4,766,495		835,662	835,662	835,662	835,662	835,662	588,185		
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	741,285	0.95	4,929,548		704,221	704,221	704,221	704,221	704,221	704,221	704,221	
Lighting	LED CA Interior T12§§	8.8	703,772	0.95	5,443,441		668,584	668,584	664,174	594,819	594,819	594,819	594,819	594,819
Lighting	LED CA Interior Specialty	8.4	571,601	0.95	2,992,570		543,021	543,021	543,021	543,021	543,021	81,526	81,526	81,526
Lighting	LED 24/7 Garage T12	5.7	420,989	0.95	2,070,341		399,939	394,465	344,489	344,489	344,489	242,470		
Lighting	LED CA Interior CFL	8.4	414,502	0.95	3,309,051		393,777	393,777	393,777	393,777	393,777	393,777	393,777	393,777
HVAC	Advanced Thermostat	11.0	182,561	NA††	2,008,173		182,561	182,561	182,561	182,561	182,561	182,561	182,561	182,561
HVAC	IU Programmable Thermostat	8.0	165,091	0.90	1,188,659		148,582	148,582	148,582	148,582	148,582	148,582	148,582	148,582
Hot Water	Low Flow Showerhead	10.0	87,766	1.00	877,659		87,766	87,766	87,766	87,766	87,766	87,766	87,766	87,766
Lighting	LED CA Exterior Incandescent	11.6	70,705	0.95	351,231		67,170	67,170	22,546	22,546	22,546	22,546	22,546	22,546
Lighting	LED CA Exterior Specialty	11.6	68,965	0.95	420,458		65,517	65,517	65,517	65,517	65,517	14,030	14,030	14,030
HVAC	CA Pipe Insulation	15.0	50,756	0.95	723,277		48,218	48,218	48,218	48,218	48,218	48,218	48,218	48,218
Lighting	LED CA Exterior CFL	11.6	44,023	0.95	485,964		41,822	41,822	41,822	41,822	41,822	41,822	41,822	41,822
Lighting	LED IU Exterior Incandescent	6.1	32,377	0.84	90,387		27,196	27,196	8,779	8,779	8,779	8,779	878	
Refrigeration	CA Vending Miser	5.0	20,968	0.95	99,599		19,920	19,920	19,920	19,920	19,920			
Hot Water	Low Flow Faucet Aerator	10.0	16,331	1.00	163,310		16,331	16,331	16,331	16,331	16,331	16,331	16,331	16,331
Lighting	LED Garage T12	14.7	9,119	0.95	104,516		8,663	8,663	8,663	8,663	8,432	6,332	6,332	6,332
Lighting	LED Garage CFL	14.1	5,800	0.95	77,826		5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510
HVAC	CA Programmable Thermostat	8.0	3,296	0.95	25,049		3,131	3,131	3,131	3,131	3,131	3,131	3,131	3,131
Lighting	LED Garage Incandescent	14.1	2,722	0.95	15,330		2,586	2,586	838	838	838	838	838	838
Lighting	LED IU Exterior Specialty	6.1	923	0.84	3,973		776	776	776	776	776	86	9	
HVAC	IU Reprogram Thermostat	2.0	596	0.90	1,073		537	537						
Lighting	Occupancy Sensor	8.0	595	0.95	4,519		565	565	565	565	565	565	565	565
CY2019 Program Total Electric Contribution to CPAS			15,285,371		96,644,176		14,131,467	14,125,994	12,178,755	12,109,400	12,109,168	8,428,186	6,758,076	6,052,969
Historic Program Total Electric Contribution to CPAS‡						11,768,297	11,303,190	11,300,406	9,444,652	9,444,652	9,299,982	9,138,185	8,482,472	5,525,231
Program Total Electric CPAS						11,768,297	17,484,846	17,434,115	14,222,928	14,222,928	14,078,258	12,487,291	11,470,576	8,022,020
CY2019 Program Incremental Expiring Electric Savings§								5,474	1,947,238	69,355	232	3,680,982	1,670,110	705,108
Historic Program Incremental Expiring Electric Savings‡§							465,107	2,784	1,855,754	-	144,670	161,797	655,713	2,957,241
Program Total Incremental Expiring Electric Savings§							465,107	8,258	3,802,992	69,355	144,902	3,842,779	2,325,823	3,662,349

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED IU Interior Incandescent	546,949	546,949										
Lighting	LED Exterior HID	1,666,369	1,666,369	1,666,369	1,032,816								
Lighting	LED CA Interior T8§§	692,354	310,682										
Lighting	LED IU Specialty	175,962	175,962										
Lighting	LED Exit Sign												
Lighting	LED 24/7 Garage HID												
Lighting	LED CA Interior Incandescent	151,156											
Lighting	LED 24/7 Garage T8												
Consumer Electronics	Advanced Power Strip - Tier 1												
Lighting	LED CA Interior T12§§	312,906	155,097										
Lighting	LED CA Interior Specialty	32,885											
Lighting	LED 24/7 Garage T12												
Lighting	LED CA Interior CFL	158,834											
HVAC	Advanced Thermostat	182,561	182,561	182,561									
HVAC	IU Programmable Thermostat												
Hot Water	Low Flow Showerhead	87,766	87,766										
Lighting	LED CA Exterior Incandescent	22,546	22,546	22,546	13,974								
Lighting	LED CA Exterior Specialty	14,030	14,030	14,030	8,695								
HVAC	CA Pipe Insulation	48,218	48,218	48,218	48,218	48,218	48,218	48,218					
Lighting	LED CA Exterior CFL	41,822	41,822	41,822	25,921								
Lighting	LED IU Exterior Incandescent												
Refrigeration	CA Vending Miser												
Hot Water	Low Flow Faucet Aerator	16,331	16,331										
Lighting	LED Garage T12	6,332	6,332	6,332	6,332	6,332	6,332	4,442					
Lighting	LED Garage CFL	5,510	5,510	5,510	5,510	5,510	5,510	685					
HVAC	CA Programmable Thermostat												
Lighting	LED Garage Incandescent	838	838	838	838	838	838	104					
Lighting	LED IU Exterior Specialty												
HVAC	IU Reprogram Thermostat												
Lighting	Occupancy Sensor												
CY2019 Program Total Electric Contribution to CPAS		4,163,369	3,281,012	1,988,226	1,142,305	60,898	60,898	53,450	-	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		4,589,568	1,543,294	710,495	710,495	710,495	697,715	655,104	-	-	-	-	-
Program Total Electric CPAS		6,330,349	2,892,546	1,107,111	777,087	753,982	741,202	698,058	-	-	-	-	-
CY2019 Program Incremental Expiring Electric Savings§		1,889,600	882,357	1,292,786	845,921	1,081,407	-	7,449	53,450	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§		935,663	3,046,274	832,799	-	-	12,780	42,611	655,104	-	-	-	-
Program Total Incremental Expiring Electric Savings§		2,825,263	3,928,631	2,125,585	845,921	1,081,407	12,780	50,060	708,554	-	-	-	-

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 IL SAG web site here: https://www.ilsag.info/ntg_2019.

† Lifetime savings are the sum of CPAS savings through the EUL.
‡ Historical savings go back to CY2018
§ Incremental expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n
§§ The EUL for this measure is weighted average of the lighting measures that were combined together.
Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



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

5. Program Savings by Measure

The program includes 30 measures as shown in the following tables. The LED IU Interior Incandescent and LED Exterior HID measures contributed the most savings (see Table 5-1).

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

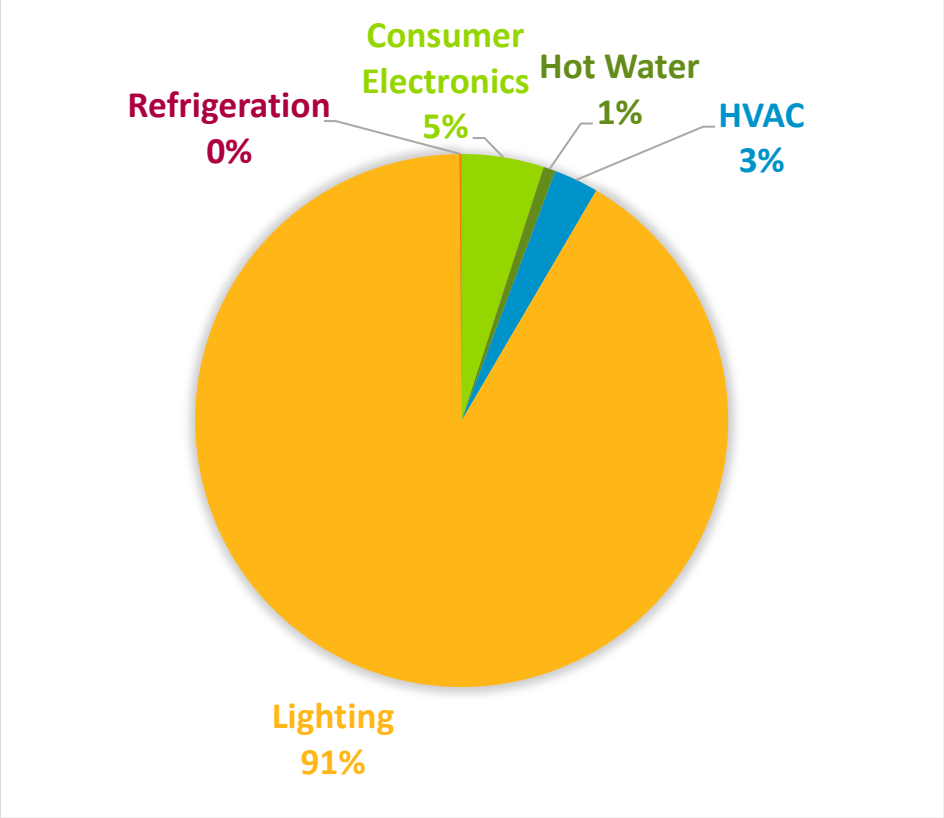


Table 5-1. CY2019 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	EUL (years)
Lighting	LED IU Interior Incandescent	1,927,383	1.06	2,039,036	0.84	1,712,790	10.0
Lighting	LED Exterior HID	1,754,070	1.00	1,754,072	0.95	1,666,369	11.6
Lighting	LED CA Interior T8	1,778,189	0.97	1,726,939	0.95	1,640,592	8.6
Lighting	LED IU Specialty	1,413,452	1.08	1,524,792	0.84	1,280,825	10.0
Lighting	LED Exit Sign	1,634,778	0.86	1,411,677	0.95	1,341,093	5.0
Lighting	LED 24/7 Garage HID	1,243,488	1.00	1,243,489	0.95	1,181,315	5.7
Lighting	LED CA Interior Incandescent	1,123,732	0.97	1,090,976	0.95	1,036,427	8.4
Lighting	LED 24/7 Garage T8	879,642	1.00	879,644	0.95	835,662	5.7
Consumer Electronics	Advanced Power Strip - Tier 1	737,422	1.01	741,285	0.95	704,221	7.0
Lighting	LED CA Interior T12	751,036	0.94	703,772	0.95	668,584	8.8
Lighting	LED CA Interior Specialty	599,165	0.95	571,601	0.95	543,021	8.4
Lighting	LED 24/7 Garage T12	420,988	1.00	420,989	0.95	399,939	5.7
Lighting	LED CA Interior CFL	421,281	0.98	414,502	0.95	393,777	8.4
HVAC	Advanced Thermostat	185,451	0.98	182,561	NA	182,561	11.0
HVAC	IU Programmable Thermostat	159,058	1.04	165,091	0.90	148,582	8.0
Hot Water	Low Flow Showerhead	85,311	1.03	87,766	1.00	87,766	10.0
Lighting	LED CA Exterior Incandescent	70,704	1.00	70,705	0.95	67,170	11.6
Lighting	LED CA Exterior Specialty	68,965	1.00	68,965	0.95	65,517	11.6
HVAC	CA Pipe Insulation	49,769	1.02	50,756	0.95	48,218	15.0
Lighting	LED CA Exterior CFL	44,023	1.00	44,023	0.95	41,822	11.6
Lighting	LED IU Exterior Incandescent	28,628	1.13	32,377	0.84	27,196	6.1
Refrigeration	CA Vending Miser	20,968	1.00	20,968	0.95	19,920	5.0
Hot Water	Low Flow Faucet Aerator	15,746	1.04	16,331	1.00	16,331	10.0
Lighting	LED Garage T12	9,119	1.00	9,119	0.95	8,663	14.7
Lighting	LED Garage CFL	5,800	1.00	5,800	0.95	5,510	14.1
HVAC	CA Programmable Thermostat	3,682	0.90	3,296	0.95	3,131	8.0
Lighting	LED Garage Incandescent	2,722	1.00	2,722	0.95	2,586	14.1
Lighting	LED IU Exterior Specialty	816	1.13	923	0.84	776	6.1
HVAC	IU Reprogram Thermostat	565	1.06	596	0.90	537	2.0
Lighting	Occupancy Sensor	882	0.67	595	0.95	565	8.0
	Total	15,436,840	0.99	15,285,371	NA	14,131,467	8.4

* A deemed value. Source: is to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2019.
Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd.
Source: ComEd tracking data and evaluation team analysis

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

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Lighting	LED IU Interior Incandescent	NR	NA	2,059.36	0.84	1,729.86
Lighting	LED Exterior HID	NR	NA	0.00	0.95	0.00
Lighting	LED CA Interior T8	NR	NA	384.10	0.95	364.89
Lighting	LED IU Specialty	NR	NA	2,155.52	0.84	1,810.64
Lighting	LED Exit Sign	NR	NA	210.13	0.95	199.62
Lighting	LED 24/7 Garage HID	NR	NA	141.85	0.95	134.76
Lighting	LED CA Interior Incandescent	NR	NA	236.39	0.95	224.57
Lighting	LED 24/7 Garage T8	NR	NA	100.35	0.95	95.33
Consumer Electronics	Advanced Power Strip - Tier 1	NR	NA	0.00	0.95	0.00
Lighting	LED CA Interior T12	NR	NA	166.32	0.95	158.00
Lighting	LED CA Interior Specialty	NR	NA	123.83	0.95	117.64
Lighting	LED 24/7 Garage T12	NR	NA	48.03	0.95	45.62
Lighting	LED CA Interior CFL	NR	NA	88.62	0.95	84.19
HVAC	Advanced Thermostat	NR	NA	316.59	NA	316.59
HVAC	IU Programmable Thermostat	NR	NA	0.00	0.90	0.00
Hot Water	Low Flow Showerhead	NR	NA	409.10	1.00	409.10
Lighting	LED CA Exterior Incandescent	NR	NA	0.00	0.95	0.00
Lighting	LED CA Exterior Specialty	NR	NA	0.00	0.95	0.00
HVAC	CA Pipe Insulation	NR	NA	4.63	0.95	4.40
Lighting	LED CA Exterior CFL	NR	NA	0.00	0.95	0.00
Lighting	LED IU Exterior Incandescent	NR	NA	13.08	0.84	10.99
Refrigeration	CA Vending Miser	NR	NA	0.00	0.95	0.00
Hot Water	Low Flow Faucet Aerator	NR	NA	418.64	1.00	418.64
Lighting	LED Garage T12	NR	NA	2.68	0.95	2.55
Lighting	LED Garage CFL	NR	NA	1.64	0.95	1.56
HVAC	CA Programmable Thermostat	NR	NA	0.00	0.95	0.00
Lighting	LED Garage Incandescent	NR	NA	0.77	0.95	0.73
Lighting	LED IU Exterior Specialty	NR	NA	0.37	0.84	0.31
HVAC	IU Reprogram Thermostat	NR	NA	0.00	0.90	0.00
Lighting	Occupancy Sensor	NR	NA	0.55	0.95	0.52
	Total	NR	NA	6,882.55	NA	6,130.52

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 cannnot be produced or does not apply)
* A deemed value. Source: is to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

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

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Lighting	LED IU Interior Incandescent	233.03	1.13	263.60	0.84	221.42
Lighting	LED Exterior HID	0.00	NA	0.00	0.95	0.00
Lighting	LED CA Interior T8	349.43	0.78	271.17	0.95	257.61
Lighting	LED IU Specialty	207.76	1.13	234.95	0.84	197.36
Lighting	LED Exit Sign	233.11	0.90	210.13	0.95	199.62
Lighting	LED 24/7 Garage HID	141.85	1.00	141.85	0.95	134.76
Lighting	LED CA Interior Incandescent	139.95	1.23	172.77	0.95	164.13
Lighting	LED 24/7 Garage T8	100.35	1.00	100.35	0.95	95.33
Consumer Electronics	Advanced Power Strip - Tier 1	82.75	0.99	81.93	0.95	77.83
Lighting	LED CA Interior T12	147.59	0.83	122.26	0.95	116.15
Lighting	LED CA Interior Specialty	74.62	1.18	88.02	0.95	83.62
Lighting	LED 24/7 Garage T12	48.03	1.00	48.03	0.95	45.62
Lighting	LED CA Interior CFL	52.46	1.23	64.78	0.95	61.54
HVAC	Advanced Thermostat	73.83	1.00	73.76	NA	73.76
HVAC	IU Programmable Thermostat	0.00	NA	0.00	0.90	0.00
Hot Water	Low Flow Showerhead	11.37	1.00	11.37	1.00	11.37
Lighting	LED CA Exterior Incandescent	0.00	NA	0.00	0.95	0.00
Lighting	LED CA Exterior Specialty	0.00	NA	0.00	0.95	0.00
HVAC	CA Pipe Insulation	0.00	NA	4.63	0.95	4.40
Lighting	LED CA Exterior CFL	0.00	NA	0.00	0.95	0.00
Lighting	LED IU Exterior Incandescent	3.16	1.13	3.57	0.84	3.00
Refrigeration	CA Vending Miser	0.00	NA	0.00	0.95	0.00
Hot Water	Low Flow Faucet Aerator	8.98	1.00	8.97	1.00	8.97
Lighting	LED Garage T12	2.47	1.00	2.47	0.95	2.34
Lighting	LED Garage CFL	1.51	1.00	1.51	0.95	1.43
HVAC	CA Programmable Thermostat	0.00	NA	0.00	0.95	0.00
Lighting	LED Garage Incandescent	0.71	1.00	0.71	0.95	0.67
Lighting	LED IU Exterior Specialty	0.09	1.13	0.10	0.84	0.09
HVAC	IU Reprogram Thermostat	0.00	NA	0.00	0.90	0.00
Lighting	Occupancy Sensor	0.52	0.98	0.51	0.95	0.48
	Total	1,913.56	1.00	1,907.42	NA	1,761.51

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 cannnot be produced or does not apply)
* A deemed value. Source: is to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

The Multi-Family Assessments Program includes measures that save water. That reduction in water produces secondary kWh savings from water supply and wastewater treatment. Table 5-4 shows the secondary measure level savings. The savings in this table are included within the electricity savings in the previous tables in this section.

Table 5-4. Secondary Energy Savings from Water Reduction by Measure – Electric

End Use Type	Research Category	Ex Ante Annual Water Savings (gallons)	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate (RR_{water})	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Lighting	LED IU Interior Incandescent	0	NR	NA	0	0.84	0
Lighting	LED Exterior HID	0	NR	NA	0	0.95	0
Lighting	LED CA Interior T8	0	NR	NA	0	0.95	0
Lighting	LED IU Specialty	0	NR	NA	0	0.84	0
Lighting	LED Exit Sign	0	NR	NA	0	0.95	0
Lighting	LED 24/7 Garage HID	0	NR	NA	0	0.95	0
Lighting	LED CA Interior Incandescent	0	NR	NA	0	0.95	0
Lighting	LED 24/7 Garage T8	0	NR	NA	0	0.95	0
Consumer Electronics	Advanced Power Strip - Tier 1	0	NR	NA	0	0.95	0
Lighting	LED CA Interior T12	0	NR	NA	0	0.95	0
Lighting	LED CA Interior Specialty	0	NR	NA	0	0.95	0
Lighting	LED 24/7 Garage T12	0	NR	NA	0	0.95	0
Lighting	LED CA Interior CFL	0	NR	NA	0	0.95	0
HVAC	Advanced Thermostat	0	NR	NA	0	NA	0
HVAC	IU Programmable Thermostat	0	NR	NA	0	0.90	0
Hot Water	Low Flow Showerhead	14,230	NR	NA	2,478	1.00	2,478
Lighting	LED CA Exterior Incandescent	0	NR	NA	0	0.95	0
Lighting	LED CA Exterior Specialty	0	NR	NA	0	0.95	0
HVAC	CA Pipe Insulation	0	NR	NA	0	0.95	0
Lighting	LED CA Exterior CFL	0	NR	NA	0	0.95	0
Lighting	LED IU Exterior Incandescent	0	NR	NA	0	0.84	0
Refrigeration	CA Vending Miser	0	NR	NA	0	0.95	0
Hot Water	Low Flow Faucet Aerator	4,490	NR	NA	652	1.00	652
Lighting	LED Garage T12	0	NR	NA	0	0.95	0
Lighting	LED Garage CFL	0	NR	NA	0	0.95	0
HVAC	CA Programmable Thermostat	0	NR	NA	0	0.95	0
Lighting	LED Garage Incandescent	0	NR	NA	0	0.95	0
Lighting	LED IU Exterior Specialty	0	NR	NA	0	0.84	0
HVAC	IU Reprogram Thermostat	0	NR	NA	0	0.90	0
Lighting	Occupancy Sensor	0	NR	NA	0	0.95	0
	Total	18,720	NR	NA	3,129	NA	3,129

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 cannnot be produced or does not apply)
Note: The savings in this table reflects only secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd, not those claimed by gas utilities.
* A deemed value. Source: is to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team used the savings algorithms and inputs deemed by the Illinois Technical Reference Manual (IL TRM) v7.0 and IL TRM v7.0 Errata, where applicable, to calculate the energy and demand

savings for each measure installed as a part of the program in CY2019. The lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life for each measure. The EM&V team conducted research to validate the parameters that were not specified in the IL TRM. The results are shown in the following table.

Table 6-1. Savings Parameters

Measure	Custom Input Parameters	Deemed Input Parameters	Source *
LED Lighting	Watts_EE, Watts_Base	Watts_Base, Hours, WHF_e, ISR, WHF_d, CF, NTG	IL TRM v7.0 Section 4.5.4, Section 4.5.5, Section 5.5.6, Section 5.5.8
Advacned Power Strip – Tier 1	None	kWh, Hours, kW_wkday, kW_wkend, hrs_wkday, hrs_wkend, hrs_wkday-open, hrs_wkend-open, ISR, CF, NTG	IL TRM v7.0 Section 5.2.1, Section 4.8.7
Low Flow Faucet Aerator	None	%DHW, GPM_base, GPM_low, L_base, L_low, Household, FPH, DF, EPG_electric, ISR, Hours, Usage, E_water total, CF, NTG	IL TRM v7.0 Section 5.4.4, Section 4.3.2 and Errata
Low Flow Showerhead	None	%DHW, GPM_base, GPM_low, L_base, L_low, Household, SPH, SPCD, EPG_electric, ISR, Hours, Usage, E_water total, CF, NTG	IL TRM v7.0 Section 5.4., Section 4.3.3, and Errata
CA Pipe Insulation	Q_base, Q_eff	TRF, NTG, Hours, NTG	IL TRM v7.0 Section 4.4.14
IU Programmable Thermostat, IU Reprogram Thermostat	None	%Electric Heat, Elec_heating_consumption, Heating_reduction, HF, ISR, F_e, FLH, SEER, EER, CF, NTG	IL TRM v7.0 Section 5.3.11
CA Programmable Thermostat	Output Heating Capacity, Cooling Capacity	CZ, Tc, Th, Fo, Fu, Ws	IL TRM v7.0 Section 4.4.18
Advanced Thermostat	None	%Electric Heat, Elec_heating_consumption, Heating_reduction, Cooloing_reduction, HF, ISR, F_e, FLH, SEER, EER, CF, NTG	IL TRM v7.0 Section 5.3.16
Occupancy Sensor	kW_controlled	Hours, ESF, WHF_e, WHF_d, CF_baseline, CF_os, NTG	IL TRM v7.0 Section 4.5.10
CA Vending Miser	None	Watts_base, ESF, Hours, NTG	IL TRM v7.0 Section 4.6.2

* 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 IL SAG web site here: https://www.ilsag.info/ntg_2019.

6.2 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2019 evaluation. The findings are separated by measure and are outlined in the following sections.

6.2.1 LED Lighting

Finding 1. LED Lighting (CA Interior Linear) – The ex ante savings are calculated using the annual operating hours, waste heat factor for energy (WHFe), waste heat factor for demand (WHFd) and coincidence factor values valid for a mid-rise multifamily building type for all

measures irrespective of the building type in which they are installed. IL TRM v7.0 broke out these parameters for both mid-rise and high-rise multifamily building types.
Recommendation 1. Guidehouse recommends using the building type specific annual operating hours, WHFe, WHFd and coincidence factor in the calculations for these measures as per section 4.5.4 of the IL TRM v7.0.

Finding 2. LED Lighting (CA Interior Incandescent, CA Interior Specialty, CA Interior CFL) – The ex ante savings are calculated using the WHFe, WHFd and coincidence factor values valid for a high-rise multifamily building type for all measures irrespective of the building type in which they are installed. IL TRM v7.0 broke out these parameters for both mid-rise and high-rise multifamily building types.
Recommendation 2. Guidehouse recommends using the building type specific WHFe, WHFd and coincidence factor values in the calculations for these measures as per section 4.5.4 of the IL TRM v7.0.

Finding 3. LED Lighting (CA Interior Delamp 2L U-tube T8 to 2L 2ft LED) – The ex ante savings are calculated using the baseline wattage of 50.4W.
Recommendation 3. Guidehouse recommends updating the baseline wattage to 51.04W. This represents (2) RWT8 F29T8 Lamp U-tube per IL TRM v7.0 pg. 417 (25.52 * 2 = 51.04).

Finding 4. LED Lighting (Exit Signs) – The ex ante savings are calculated using the WHFe and WHFd values valid for a mid-rise multifamily building type for all measures irrespective of the building type in which they are installed. IL TRM v7.0 broke out these parameters for both mid-rise and high-rise multifamily building types.
Recommendation 4. Guidehouse recommends using the building specific WHFe and WHFd values in the calculations for these measures as per section 4.5.5 of the IL TRM v7.0.

Finding 5. LED Lighting (Interior IU, Exterior IU, Specialty IU) –The savings in the program tracking database do not match the savings in the ex ante calculator. The savings values in the ex ante calculator are correct and match the ex post savings.
Recommendation 5. Guidehouse recommends the implementer revise the unit savings for these measures in the program tracking database to match the ex ante calculator.

Per section 4.5.4 of the IL TRM v7.0, the baseline for linear LEDs replacing T12s shifts to a T8 in 2020 to account for the upcoming Energy Independence and Security Act (EISA) standards. Similar baseline shifts also occur for LED Omnidirectional measures in 2021 and LED Specialty measures in 2024.

6.2.2 Occupancy Sensors

Finding 6. The savings are calculated using the annual operating hours, waste heat factor for energy (WHFe), waste heat factor for demand (WHFd) and coincidence factor values valid for a mid-rise multifamily building. The program data shows that the occupancy sensors were installed in a high-rise multifamily building.
Recommendation 6. Guidehouse recommends the implementer revise the WHFe, WHFd and coincidence factor used in the calculations to match the values from the IL TRM v7.0 for the building type where the sensors are installed.

Finding 7. Occupancy Sensor (CA, non 24/7)- The CA occupancy sensors are broken down into 24/7 CA and non-24/7 CA measures in the ex ante calculations. The non 24/7 occupancy sensor calculations use 5216 as the hours of use (HOU) and 0.82 as the coincidence factor. However, these values represent an average for all multifamily common area spaces which includes both 24/7 and non 24/7 lighting.

Recommendation 7. If these measures are to be broken down as such, Guidehouse recommends using the custom values of 3,242 for HOU and 0.90 for the coincidence factor for the non 24/7 occupancy sensor measure. These values represent the non 24/7 lighting spaces of the common area and are used in the IL TRM v7.0 to calculate the average multifamily common area parameters.

6.2.3 Thermostats (Programmable, Reprogram, Advanced)

Finding 8. The savings in the ex ante calculator for IU Programmable and Reprogram thermostats do not match the savings in the program tracking database. The savings values in the ex ante calculator are correct and match the ex post savings.
Recommendation 8. Guidehouse recommends the implementer revise the unit savings for the IU thermostat measures in the program tracking database to match the ex ante calculator.

Finding 9. The savings for CA Electric Only thermostats are calculated using the commercial algorithm from section 4.4.18 of the IL TRM v7.0. While the savings for all other CA thermostat measures are calculated using a custom heating reduction (calculated using the commercial algorithm) and the residential algorithm from section 5.3.11 of the IL TRM v7.0. The IL TRM v7.0 does not allow the use of a custom heating reduction value as per section 5.3.11. Guidehouse calculated savings for all CA thermostat measures using the commercial algorithm from section 4.4.18 of the IL TRM v7.0.
Recommendation 9. Guidehouse recommends using the commercial algorithm from section 4.4.18 of the IL TRM v7.0 to calculate savings for all CA thermostat measures.

Finding 10. Individual Unit Thermostats (Programmable, Advanced) – Savings for more than one thermostat are claimed at individual households in the program tracking data for the following Project IDs 3781194, 3781206, 3781208,3781222, 4051208. Section 5.3.11 of IL TRM v7.0 caps the savings at one thermostat per household, or in this case, individual apartment unit.
Recommendation 10. Guidehouse recommends the implementer only claim savings for one thermostat per individual apartment unit as per Section 5.3.11 of the IL TRM v7.0.

Finding 11. Individual Unit Thermostats (Programmable, Reporgram, Advanced) – Property addresses including apartment unit numbers are duplicated throughout the tracking database for IU thermostat measures due to the presence of same apartment unit numbers in multiple buildings at the facility, incorrectly indicating that savings for multiple IU thermostat measures are being claimed at the same unit. Based on how property addresses including apartment units are currently reported in the tracking data, IU thermostat measures claiming savings for more than one thermostat at the same apartment unit represent over 28% of the IU thermostat measures. Based on implementer feedback, Guidehouse calculated savings for these measures by considering each unique project ID as a unique apartment unit.
Recommendation 11. Guidehouse recommends the implementer add a new data field to the tracking data base to capture the building number/name in addition to the apartment unit number in order to indicate distinct apartment units at a multifamily facility with multiple buildings.

Finding 12. The ex ante savings for IU Programmable Thermostats use the electric heating consumption values for Climate Zone 2 from the IL TRM v7.0 for all measure quantities. However, the program tracking data shows that 65 measures were installed in Climate Zone 1.
Recommendation 12. Guidehouse recommends using parameters corresponding to the correct climate zone for all Programmable Thermostat savings calculations as per the IL TRM v7.0, Section 5.3.11.

Finding 13. The ex ante savings for Advanced Thermostats use the FLH_Cool values for Climate Zone 2 from the IL TRM v7.0 for all measure quantities. However, the program tracking data shows that 291 Advanced Thermostat measures were installed in Climate Zone 1.
Recommendation 13. Guidehouse recommends using parameters corresponding tothe correct climate zone for all Advanced Thermostat savings calculations as per section 5.3.16 of the IL TRM v7.0.

6.2.4 Low Flow Faucet Aerators and Low Flow Showerheads

Finding 14. The ex ante savings do not include the kWh energy savings from water savings for the low flow aerator and low flow showerhead measures. IL TRM v7.0 allows for secondary kWh savings derived from water supply and wastewater treatment savings to be included in total savings for these measures. Errata (v7.0) was published on July 31, 2019 to differentiate the total water energy factor (kWh/Million Gallons) between Cook County and the rest of Illinois. Secondary savings from water are included in the ex post kWh calculations for these hot water measures.
Recommendation 14. Guidehouse recommends that the implementer continue tracking gallons of water saved from these measures. ComEd informed that implementer will only be reporting gallons of water saved in CY2019. It is our understanding the ComEd and implementer will work together to incorporate necessary calculations and include secondary kWh savings from water in ex ante savings going forward. Table 5-4 shows the secondary kWh savings for these measures. As the secondary kWh savings vary by location, both the bathroom and kitchen aerator measures should be broken down into two measures: Cook County and outside of Cook County.

Finding 15. The savings in the program tracking database for CA electric aerators and CA showerheads do not match the savings in the ex ante calculator. The savings values in the ex ante calculator are correct and match the ex post savings (not including secondary kWh).
Recommendation 15. Guidehouse recommends the implementer revise the unit savings for the CA electric aerator and CA showerhead measures in the program tracking database to match the ex ante calculator.

6.2.5 CA Pipe Insulation

Finding 16. The ex ante savings do not take into account the recovery efficiency of the electric water heater, while the verified savings are calculated using a 98% recovery efficiency for the electric water heater.
Recommendation 16. Guidehouse recommends updating the savings algorithm to account for the recovery efficiency of the electric water heater.

Finding 17. No peak demand savings are claimed for the electric CA DHW Pipe Insulation measures.
Recommendation 17. Claim peak demand savings for electric CA DHW Pipe Insulation measures as summarized in Table 6-3.

Table 6-2. Gross Peak Demand Savings for Electric DHW Pipe Insulation Measures

End Use Type	Research Category	Unit	Peak Demand Savings kW/linear ft.	Source
HVAC	CA - Electric Pipe Insulation - DHW Small <=1.25	Linear ft.	0.00681	IL TRM v7.0-Section 4.4.14
HVAC	CA - Electric Pipe Insulation - DHW Medium 1.26-2	Linear ft.	0.01188	IL TRM v7.0-Section 4.4.14
HVAC	CA - Electric Pipe Insulation - DHW Large >2	Linear ft.	0.02041	IL TRM v7.0-Section 4.4.14

Source: Guidehouse Analysis of CY2019 ComEd Tracking Data

6.2.6 Advacned Power Strips – Tier 1

Finding 18. The ex ante savings calculations for common area advanced power strips are calculated using the Section 5.2.1 from the residential volume of the IL TRM v7.0.
Recommendation 18. Guidehouse recommends using the Section 4.8.7 from the commercial volume of the IL TRM v7.0 for advanced power strips installed in common areas.

6.2.7 Electric heating penalty

Finding 19. The verified savings accounted for heating penalty reduction from electric heating interactive effects due to projects or measures installed in electrically heated buildings. This approach is consistent with the TRM v7.0 instructions.
Recommendation 19. The tracking data should continue to include a field to track whether the facility heating system is electric or gas. Also, considering that the evaluation process is now reporting electric heating penalties, Guidehouse recommends that the program tracks electric heating penalties for affected measures and account for those in ex ante gross and net savings.

7. Appendix 1. Impact Analysis Methodology

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

- Reviewing the savings algorithm inputs in the measure workbook for agreement with the IL TRM v7.0 and IL TRM Errata v7.0, where applicable.
- Validating the savings algorithm was applied correctly.
- Cross-checking per-unit savings values in the program tracking data with the verified values in the measure workbook or in Guidehouse's calculations if the workbook did not agree with the TRM.
- Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

The evaluation team calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio. In CY2019, NTG estimates used to calculate the net verified savings were based on past evaluation research and defined by a concenses process through Illinois Stakeholder Advisory Group (SAG).

8. Appendix 2. Impact Analysis Detail

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

- Final CY2019 tracking data: “MCA_CY2019_EOY_Data_Rev2_01132020.xlsx”
- Illinois Technical Reference Manual (TRM v7.0) for deemed input parameters or secondary evaluation research to verify any custom inputs used in the ex ante calculations.
- Implementer Savings Calculations: “Residential MMDB – 2019_MFES.xlsx”

Table 8-1: Verified Measure Per Unit Impact Detail - Electric

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	11W LED Directional PAR30 (IU, 65W Equivalent)	Lamp	36.71	0.01	41.52	113%	0.01	113%	5.5.6
Lighting	1L 4ft TLED (Garage 24/7, T12)	Lamp	71.18	0.01	71.18	100%	0.01	100%	4.5.4
Lighting	1L 4ft TLED (Garage 24/7, T8)	Lamp	64.17	0.01	64.17	100%	0.01	100%	4.5.4
Lighting	1L 8ft TLED (Garage 24/7, T12)	Lamp	286.65	0.03	286.65	100%	0.03	100%	4.5.4
Lighting	1L 8ft TLED (Garage 24/7, T8)	Lamp	209.51	0.02	209.51	100%	0.02	100%	4.5.4
Lighting	2L 4ft TLED (Garage 24/7, T12)	Lamp	214.77	0.02	214.77	100%	0.02	100%	4.5.4
Lighting	2L 4ft TLED (Garage 24/7, T8)	Lamp	207.40	0.02	207.40	100%	0.02	100%	4.5.4
Lighting	2L 8ft TLED (Garage 24/7, T12)	Lamp	573.30	0.07	573.30	100%	0.07	100%	4.5.4
Lighting	2L 8ft TLED (Garage 24/7, T8)	Lamp	419.01	0.05	419.01	100%	0.05	100%	4.5.4
Lighting	2L 2ft TLED (Garage 24/7, T8)	Lamp	106.95	0.01	106.95	100%	0.01	100%	4.5.4
Lighting	3L 4ft TLED (Garage 24/7, T8)	Lamp	347.83	0.04	347.83	100%	0.04	100%	4.5.4
Lighting	4L 4ft TLED (Garage 24/7, T12)	Lamp	547.70	0.06	547.70	100%	0.06	100%	4.5.4
Lighting	4L 4ft TLED (Garage 24/7, T8)	Lamp	485.99	0.06	485.99	100%	0.06	100%	4.5.4
Lighting	2L 4ft TLED (Garage 24/7, Delamp 2L 8ft T12)	Lamp	865.20	0.10	865.20	100%	0.10	100%	4.5.4
Lighting	2L 4ft TLED (Garage 24/7, Delamp 2L 8ft T8)	Lamp	710.92	0.08	710.92	100%	0.08	100%	4.5.4
Lighting	2L 2ft TLED (Garage 24/7, Delamp 2L U-tube T12)	Lamp	394.47	0.05	394.47	100%	0.05	100%	4.5.4
Lighting	2L 4Ft TLED (Garage 24/7, Delamp 4L 4Ft T12)	Lamp	757.21	0.09	757.21	100%	0.09	100%	4.5.4
Lighting	LED (Garage 24/7 Outdoor, <=175W HID)	Lamp	925.69	0.11	925.69	100%	0.11	100%	4.5.4
Lighting	LED (Garage 24/7 Outdoor, 176-250W HID)	Lamp	1345.58	0.15	1345.58	100%	0.15	100%	4.5.4
Lighting	LED (Garage 24/7 Outdoor, 251-400W HID)	Lamp	1954.38	0.22	1954.38	100%	0.22	100%	4.5.4
Lighting	11W LED (CA Exterior, 18W CFL)	Lamp	24.85	0.00	24.85	100%	0.00	NA	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	11W LED (CA Exterior, 75W Incandescent)	Lamp	149.10	0.00	149.10	100%	0.00	NA	4.5.4
Lighting	15W LED (CA Exterior, 100W Incandescent)	Lamp	202.35	0.00	202.35	100%	0.00	NA	4.5.4
Lighting	15W LED (CA Exterior, 23W CFL)	Lamp	28.40	0.00	28.40	100%	0.00	NA	4.5.4
Lighting	15W LED Flood (CA Exterior, 100W Incandescent)	Lamp	301.75	0.00	301.75	100%	0.00	NA	4.5.4
Lighting	15W LED Flood (CA Exterior, 23W CFL)	Lamp	28.40	0.00	28.40	100%	0.00	NA	4.5.4
Lighting	5W LED Candelabra (CA Exterior, 40W Incandescent)	Lamp	124.25	0.00	124.25	100%	0.00	NA	4.5.4
Lighting	5W LED Candelabra (CA Exterior, 9W CFL)	Lamp	14.20	0.00	14.20	100%	0.00	NA	4.5.4
Lighting	8W LED Flood (CA Exterior, 15W CFL)	Lamp	24.85	0.00	24.85	100%	0.00	NA	4.5.4
Lighting	8W LED Flood (CA Exterior, 65W Incandescent)	Lamp	202.35	0.00	202.35	100%	0.00	NA	4.5.4
Lighting	9W LED (CA Exterior, 13W CFL)	Lamp	14.20	0.00	14.20	100%	0.00	NA	4.5.4
Lighting	9W LED (CA Exterior, 60W Incandescent)	Lamp	120.70	0.00	120.70	100%	0.00	NA	4.5.4
Lighting	6W LED (CA Exterior, 9W CFL)	Lamp	10.65	0.00	10.65	100%	0.00	NA	4.5.4
Lighting	15W LED (CA Garage, 100W Incandescent)	Lamp	166.47	0.04	166.47	100%	0.04	100%	4.5.4
Lighting	15W LED (CA Garage, 23W CFL)	Lamp	23.36	0.01	23.36	100%	0.01	100%	4.5.4
Lighting	6W LED (CA Garage, 40W Incandescent)	Lamp	67.17	0.02	67.17	100%	0.02	100%	4.5.4
Lighting	6W LED (CA Garage, 9W CFL)	Lamp	8.76	0.00	8.76	100%	0.00	100%	4.5.4
Lighting	9W LED (CA Garage, 13W CFL)	Lamp	11.68	0.00	11.68	100%	0.00	100%	4.5.4
Lighting	9W LED (CA Garage, 60W Incandescent)	Lamp	99.30	0.03	99.30	100%	0.03	100%	4.5.4
Lighting	11W LED (CA Garage, 18W CFL)	Lamp	20.44	0.01	20.44	100%	0.01	100%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	11W LED (CA Interior High Rise, 18W CFL)	Lamp	39.17	0.00	39.17	100%	0.00	100%	4.5.4
Lighting	11W LED (CA Interior, 18W CFL)	Lamp	39.17	0.00	42.61	109%	0.01	150%	4.5.4
Lighting	11W LED (CA Interior High Rise, 75W Incandescent)	Lamp	235.03	0.03	235.03	100%	0.03	100%	4.5.4
Lighting	11W LED (CA Interior, 75W Incandescent)	Lamp	235.03	0.03	255.65	109%	0.04	150%	4.5.4
Lighting	15W LED (CA Interior High Rise, 100W Incandescent)	Lamp	318.97	0.04	318.97	100%	0.04	100%	4.5.4
Lighting	15W LED (CA Interior, 100W Incandescent)	Lamp	318.97	0.04	346.95	109%	0.06	150%	4.5.4
Lighting	15W LED (CA Interior High Rise, 23W CFL)	Lamp	44.77	0.01	44.77	100%	0.01	100%	4.5.4
Lighting	15W LED (CA Interior, 23W CFL)	Lamp	44.77	0.01	48.69	109%	0.01	150%	4.5.4
Lighting	5W LED Candelabra (CA Interior High Rise, 40W Incandescent)	Lamp	195.86	0.02	195.86	100%	0.02	100%	4.5.4
Lighting	5W LED Candelabra (CA Interior, 40W Incandescent)	Lamp	195.86	0.02	213.04	109%	0.04	150%	4.5.4
Lighting	5W LED Candelabra (CA Interior High Rise, 9W CFL)	Lamp	22.38	0.00	22.38	100%	0.00	100%	4.5.4
Lighting	5W LED Candelabra (CA Interior, 9W CFL)	Lamp	22.38	0.00	24.35	109%	0.00	150%	4.5.4
Lighting	6W LED (CA Interior High Rise, 40W Incandescent)	Lamp	128.71	0.02	128.71	100%	0.02	100%	4.5.4
Lighting	6W LED (CA Interior, 40W Incandescent)	Lamp	128.71	0.02	140.00	109%	0.02	150%	4.5.4
Lighting	6W LED (CA Interior High Rise, 9W CFL)	Lamp	16.79	0.00	16.79	100%	0.00	100%	4.5.4
Lighting	6W LED (CA Interior, 9W CFL)	Lamp	16.79	0.00	18.26	109%	0.00	151%	4.5.4
Lighting	6W LED Globe (CA Interior High Rise, 40/60W Incandescent)	Lamp	246.22	0.03	246.22	100%	0.03	100%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	6W LED Globe (CA Interior, 40/60W Incandescent)	Lamp	246.22	0.03	267.82	109%	0.05	150%	4.5.4
Lighting	6W LED Globe (CA Interior High Rise, 9W CFL)	Lamp	16.79	0.00	16.79	100%	0.00	100%	4.5.4
Lighting	6W LED Globe (CA Interior, 9W CFL)	Lamp	16.79	0.00	18.26	109%	0.00	151%	4.5.4
Lighting	7W LED Tracklight GU 5.3 (CA Interior High Rise, 50W Incandescent)	Lamp	240.63	0.03	240.63	100%	0.03	100%	4.5.4
Lighting	7W LED Tracklight GU 5.3 (CA Interior, 50W Incandescent)	Lamp	240.63	0.03	261.73	109%	0.05	150%	4.5.4
Lighting	7W LED Tracklight GU 10 (CA Interior High Rise, 50W Incandescent)	Lamp	240.63	0.03	240.63	100%	0.03	100%	4.5.4
Lighting	7W LED Tracklight GU 10 (CA Interior, 50W Incandescent)	Lamp	240.63	0.03	261.73	109%	0.05	150%	4.5.4
Lighting	8W LED Flood (CA Interior High Rise, 15W CFL)	Lamp	39.17	0.00	39.17	100%	0.00	100%	4.5.4
Lighting	8W LED Flood (CA Interior, 15W CFL)	Lamp	39.17	0.00	42.61	109%	0.01	150%	4.5.4
Lighting	8W LED Flood (CA Interior High Rise, 65W Incandescent)	Lamp	318.97	0.04	318.97	100%	0.04	100%	4.5.4
Lighting	8W LED Flood (CA Interior, 65W Incandescent)	Lamp	318.97	0.04	346.95	109%	0.06	150%	4.5.4
Lighting	9W LED (CA Interior High Rise, 13W CFL)	Lamp	22.38	0.00	22.38	100%	0.00	100%	4.5.4
Lighting	9W LED (CA Interior, 13W CFL)	Lamp	22.38	0.00	24.35	109%	0.00	150%	4.5.4
Lighting	9W LED (CA Interior High Rise, 60W Incandescent)	Lamp	190.26	0.02	190.26	100%	0.02	100%	4.5.4
Lighting	9W LED (CA Interior, 60W Incandescent)	Lamp	190.26	0.02	206.95	109%	0.04	150%	4.5.4
Lighting	6/12/19W 3-Way LED (CA Interior High Rise, 50/100/150W)	Lamp	380.53	0.05	380.53	100%	0.05	100%	4.5.4
Lighting	6/12/19W 3-Way LED (CA Interior, 50/100/150W)	Lamp	380.53	0.05	413.91	109%	0.07	150%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	7W Mini-Flood PAR20 (CA Interior High Rise, 45W)	Lamp	212.65	0.03	212.65	100%	0.03	100%	4.5.4
Lighting	7W Mini-Flood PAR20 (CA Interior, 45W)	Lamp	212.65	0.03	231.30	109%	0.04	150%	4.5.4
Lighting	LED (Exterior DD Outdoor, <=175W HID)	Lamp	454.40	0.00	454.40	100%	0.00	NA	4.5.4
Lighting	LED (Exterior DD Outdoor, 176-250W HID)	Lamp	660.51	0.00	660.51	100%	0.00	NA	4.5.4
Lighting	LED (Exterior DD Outdoor, 251-400W HID)	Lamp	959.35	0.00	959.35	100%	0.00	NA	4.5.4
Lighting	LED (Exterior DD Outdoor, 401-650W HID)	Lamp	1730.02	0.00	1730.02	100%	0.00	NA	4.5.4
Lighting	5W LED Candelabra (IU Exterior, 40W Incandescent)	Lamp	74.22	0.01	83.94	113%	0.01	113%	5.5.6
Lighting	6W LED (IU Exterior, 40W Incandescent)	Lamp	48.77	0.01	55.16	113%	0.01	113%	5.5.8
Lighting	9W LED (IU Exterior, 60W Incandescent)	Lamp	72.10	0.01	81.54	113%	0.01	113%	5.5.8
Lighting	1L 8ft TLED (Garage , T12)	Lamp	111.21	0.03	111.21	100%	0.03	100%	4.5.4
Lighting	1L 2ft TLED (CA Interior High Rise, T8)	Lamp	33.50	0.01	36.25	108%	0.00	66%	4.5.4
Lighting	1L 2ft TLED (CA Interior High Rise, T12)	Lamp	56.27	0.01	60.88	108%	0.01	66%	4.5.4
Lighting	1L 2ft TLED (CA Interior Mid Rise, T12)	Lamp	56.27	0.01	56.27	100%	0.01	100%	4.5.4
Lighting	1L 3ft TLED (CA Interior High Rise, T12)	Lamp	84.41	0.02	91.32	108%	0.01	66%	4.5.4
Lighting	1L 3ft TLED (CA Interior, T12)	Lamp	84.41	0.02	84.41	100%	0.02	100%	4.5.4
Lighting	1L 3ft TLED Retrokit (CA Interior, T8)	Lamp	44.56	0.01	44.56	100%	0.01	100%	4.5.4
Lighting	1L 3ft TLED (CA Interior High Rise, T8)	Lamp	44.56	0.01	48.21	108%	0.01	66%	4.5.4
Lighting	1L 3ft TLED (CA Interior, T8)	Lamp	44.56	0.01	44.56	100%	0.01	100%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	1L 4ft TLED (CA Interior High Rise, T12)	Lamp	52.52	0.01	56.82	108%	0.01	66%	4.5.4
Lighting	1L 4ft TLED (CA Interior, T12)	Lamp	52.52	0.01	52.52	100%	0.01	100%	4.5.4
Lighting	1L 4ft TLED (CA Interior High Rise, T8)	Lamp	47.34	0.01	51.22	108%	0.01	66%	4.5.4
Lighting	1L 4ft TLED (CA Interior, T8)	Lamp	47.34	0.01	47.34	100%	0.01	100%	4.5.4
Lighting	1L 8ft TLED (CA Interior High Rise, T8)	Lamp	154.58	0.03	167.24	108%	0.02	66%	4.5.4
Lighting	1L 8ft TLED (CA Interior, T12)	Lamp	211.50	0.04	211.50	100%	0.04	100%	4.5.4
Lighting	2L 2ft TLED (CA Interior High Rise, T8)	Lamp	78.91	0.02	85.37	108%	0.01	66%	4.5.4
Lighting	2L 2ft TLED (CA Interior, T8)	Lamp	78.91	0.02	78.91	100%	0.02	100%	4.5.4
Lighting	2L 2ft TLED (CA Interior High Rise, T12)	Lamp	112.54	0.02	121.75	108%	0.01	66%	4.5.4
Lighting	2L 2ft TLED (CA Interior, T12)	Lamp	112.54	0.02	112.54	100%	0.02	100%	4.5.4
Lighting	2L 4ft TLED (CA Interior High Rise, T12)	Lamp	158.46	0.03	171.43	108%	0.02	66%	4.5.4
Lighting	2L 4ft TLED (CA Interior, T12)	Lamp	158.46	0.03	158.46	100%	0.03	100%	4.5.4
Lighting	2L 4ft TLED (CA Interior High Rise, T8)	Lamp	153.03	0.03	165.56	108%	0.02	66%	4.5.4
Lighting	2L 4ft TLED (CA Interior, T8)	Lamp	153.03	0.03	153.03	100%	0.03	100%	4.5.4
Lighting	2L 8ft TLED (CA Interior High Rise, T12)	Lamp	423.00	0.08	457.62	108%	0.06	66%	4.5.4
Lighting	2L 8ft TLED (CA Interior, T12)	Lamp	423.00	0.08	423.00	100%	0.08	100%	4.5.4
Lighting	2L 8ft TLED Retrokit (CA Interior High Rise, T12)	Lamp	423.00	0.08	457.62	108%	0.06	66%	4.5.4
Lighting	2L 8ft TLED Retrokit (CA Interior, T12)	Lamp	423.00	0.08	423.00	100%	0.08	100%	4.5.4
Lighting	2L 8ft TLED (CA Interior High Rise, T8)	Lamp	309.16	0.06	334.47	108%	0.04	66%	4.5.4
Lighting	2L 8ft TLED (CA Interior, T8)	Lamp	309.16	0.06	309.16	100%	0.06	100%	4.5.4
Lighting	3L 4ft TLED (CA Interior High Rise, T12)	Lamp	290.79	0.06	314.60	108%	0.04	66%	4.5.4
Lighting	3L 4ft TLED (CA Interior, T12)	Lamp	290.79	0.06	290.79	100%	0.06	100%	4.5.4
Lighting	3L 4ft TLED (CA Interior High Rise, T8)	Lamp	256.64	0.05	277.65	108%	0.03	66%	4.5.4
Lighting	3L 4ft TLED (CA Interior, T8)	Lamp	256.64	0.05	256.64	100%	0.05	100%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	4L 4ft TLED (CA Interior High Rise, T12)	Lamp	404.11	0.08	437.19	108%	0.05	66%	4.5.4
Lighting	4L 4ft TLED (CA Interior, T12)	Lamp	404.11	0.08	404.11	100%	0.08	100%	4.5.4
Lighting	4L 4ft TLED (CA Interior High Rise, T8)	Lamp	358.58	0.07	387.93	108%	0.05	66%	4.5.4
Lighting	4L 4ft TLED (CA Interior, T8)	Lamp	358.58	0.07	358.58	100%	0.07	100%	4.5.4
Lighting	2L 4ft TLED (CA Interior High Rise, Delamp 2L 8ft T12)	Lamp	638.38	0.13	690.64	108%	0.08	66%	4.5.4
Lighting	2L 4ft TLED (CA Interior, Delamp 2L 8ft T12)	Lamp	638.38	0.13	638.38	100%	0.13	100%	4.5.4
Lighting	2L 2ft TLED Retrokit (CA Interior High Rise, Delamp 2L U-Tube T12)	Lamp	291.05	0.06	314.88	108%	0.04	66%	4.5.4
Lighting	2L 2ft TLED Retrokit (CA Interior, Delamp 2L U-Tube T12)	Lamp	291.05	0.06	291.05	100%	0.06	100%	4.5.4
Lighting	2L 2ft TLED (CA Interior High Rise, Delamp 2L U-Tube T12)	Lamp	291.05	0.06	314.88	108%	0.04	66%	4.5.4
Lighting	2L 2ft TLED (CA Interior, Delamp 2L U-Tube T12)	Lamp	291.05	0.06	291.05	100%	0.06	100%	4.5.4
Lighting	2L 2ft TLED Retrokit (CA Interior High Rise, Delamp 2L U-Tube T8)	Lamp	161.70	0.03	179.41	111%	0.02	68%	4.5.4
Lighting	2L 2ft TLED Retrokit (CA Interior, Delamp 2L U-Tube T8)	Lamp	161.70	0.03	165.84	103%	0.03	103%	4.5.4
Lighting	2L 2ft TLED (CA Interior High Rise, Delamp 2L U-Tube T8)	Lamp	161.70	0.03	179.41	111%	0.02	68%	4.5.4
Lighting	2L 2ft TLED (CA Interior, Delamp 2L U-Tube T8)	Lamp	161.70	0.03	165.84	103%	0.03	103%	4.5.4
Lighting	2L 4ft TLED (CA Interior High Rise, Delamp 4L 4ft T12)	Each	558.69	0.11	604.43	108%	0.07	66%	4.5.4
Lighting	2L 4ft TLED (CA Interior, Delamp 4L 4ft T12)	Each	558.69	0.11	558.69	100%	0.11	100%	4.5.4
Lighting	2L 4ft TLED (CA Interior High Rise, Delamp 4L 4ft T8)	Lamp	513.16	0.10	555.17	108%	0.07	66%	4.5.4

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	2L 4ft TLED (CA Interior, Delamp 4L 4ft T8)	Lamp	513.16	0.10	513.16	100%	0.10	100%	4.5.4
Lighting	3L 4ft TLED (CA Interior, Delamp 4L 4ft T8)	Lamp	438.78	0.09	438.78	100%	0.09	100%	4.5.4
Lighting	2L 8ft TLED (CA Interior High Rise, Delamp 4L 8ft T12)	Lamp	1276.75	0.25	1381.27	108%	0.17	66%	4.5.4
Lighting	Occupancy Sensor (CA Interior, >=100W)	Lamp	155.23	0.10	88.70	57%	0.10	95%	4.5.10
Lighting	Occupancy Sensor (24/7 Interior, >=100W)	Lamp	260.88	0.10	239.84	92%	0.11	108%	4.5.10
Lighting	11W LED (IU Interior, 75W)	Lamp	40.76	0.00	46.09	113%	0.01	113%	5.5.8
Lighting	15W LED (IU Interior, 100W)	Lamp	55.31	0.01	62.55	113%	0.01	113%	5.5.8
Lighting	5W LED Candelabra (IU Interior, 40W)	Lamp	23.80	0.00	26.91	113%	0.00	113%	5.5.6
Lighting	6/12/19W 3-Way LED (IU Interior, 50/100/150W)	Lamp	46.23	0.01	52.29	113%	0.01	113%	5.5.6
Lighting	6W LED (IU Interior, 40W)	Lamp	22.32	0.00	25.24	113%	0.00	113%	5.5.8
Lighting	6W LED Globe (IU Interior, 40/60W)	Lamp	29.92	0.00	33.83	113%	0.00	113%	5.5.6
Lighting	7W LED Mini-Flood PAR20 (IU Interior, 50W)	Lamp	25.84	0.00	29.22	113%	0.00	113%	5.5.6
Lighting	7W LED Tracklight GU10 (IU Interior, 50W)	Lamp	29.24	0.00	33.06	113%	0.00	113%	5.5.6
Lighting	7W LED Tracklight Pin Base GU5.3 (IU Interior, 50W)	Lamp	29.24	0.00	33.06	113%	0.00	113%	5.5.6
Lighting	8W LED Flood (IU Interior, 65W)	Lamp	38.75	0.01	43.83	113%	0.01	113%	5.5.6
Lighting	9W LED (IU Interior, 60W)	Lamp	32.99	0.00	37.31	113%	0.00	113%	5.5.8
Lighting	LED Exit Sign (High Rise, CFL Dual Sided)	Lamp	108.70	0.02	99.93	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign (CFL Dual Sided)	Lamp	108.70	0.02	108.70	100%	0.02	100%	4.5.5
Lighting	LED Exit Sign (High Rise, CFL Single Sided)	Lamp	54.35	0.01	49.97	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign (CFL Single Sided)	Lamp	54.35	0.01	54.35	100%	0.01	100%	4.5.5

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Lighting	LED Exit Sign (High Rise, Incandescent)	Lamp	336.97	0.05	309.79	92%	0.04	85%	4.5.5
Lighting	LED Exit Sign (Incandescent)	Lamp	336.97	0.05	336.97	100%	0.05	100%	4.5.5
Lighting	LED Exit Sign Fixture (High Rise, CFL Dual Sided)	Lamp	108.70	0.02	99.93	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign Fixture (CFL Dual Sided)	Lamp	108.70	0.02	108.70	100%	0.02	100%	4.5.5
Lighting	LED Exit Sign Fixture (High Rise, CFL Single Sided)	Lamp	54.35	0.01	49.97	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign Fixture (CFL Single Sided)	Lamp	54.35	0.01	54.35	100%	0.01	100%	4.5.5
Lighting	LED Exit Sign Fixture (High Rise, Incandescent)	Lamp	336.97	0.05	309.79	92%	0.04	85%	4.5.5
Lighting	LED Exit Sign Fixture (Incandescent)	Lamp	336.97	0.05	336.97	100%	0.05	100%	4.5.5
Lighting	LED Exit Sign Fixture BB (High Rise, CFL Dual Sided)	Lamp	108.70	0.02	99.93	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign Fixture BB (CFL Dual Sided)	Each	108.70	0.02	108.70	100%	0.02	100%	4.5.5
Lighting	LED Exit Sign Fixture BB (High Rise, CFL Single Sided)	Each	54.35	0.01	49.97	92%	0.01	85%	4.5.5
Lighting	LED Exit Sign Fixture BB (CFL Single Sided)	Each	54.35	0.01	54.35	100%	0.01	100%	4.5.5
Lighting	LED Exit Sign Fixture BB (High Rise, Incandescent)	Each	336.97	0.05	309.79	92%	0.04	85%	4.5.5
Lighting	LED Exit Sign Fixture BB (Incandescent)	Each	336.97	0.05	336.97	100%	0.05	100%	4.5.5
Lighting	LED Exit Sign Lamp (CFL Dual Sided)	Each	108.70	0.02	108.70	100%	0.02	100%	4.5.5
Lighting	LED Exit Sign Lamp (High Rise, Incandescent)	Each	336.97	0.05	309.79	92%	0.04	85%	4.5.5
Lighting	LED Exit Sign Lamp (Incandescent)	Each	336.97	0.05	336.97	100%	0.05	100%	4.5.5

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Consumer Electronics	Advanced Power Strip - Tier 1 (IU)	Each	71.07	0.01	71.07	100%	0.01	100%	5.2.1
Consumer Electronics	Advacned Power Strip - Tier 1 (CA)	Each	71.07	0.01	108.58	153%	0.00	NA	4.8.7
HVAC	Prog. T-Stat - Gas - Furnace (IU)	Each	35.32	0.00	37.26	106%	0.00	NA	5.3.11
HVAC	Prog. T-Stat - Gas - Furnace (IU, Climate Zone 1)	Each	35.32	0.00	39.00	110%	0.00	NA	5.3.11
HVAC	Manual T-Stat - Electric - Furnace & AC (IU)	Each	1310.38	0.07	1310.38	100%	0.07	100%	5.3.16
HVAC	Manual T-Stat Nest - Gas - Furnace & AC (IU)	Each	174.76	0.07	174.76	100%	0.07	100%	5.3.16
HVAC	Manual T-Stat Nest - Gas - Furnace & AC (IU, Climate Zone 1)	Each	174.76	0.07	165.37	95%	0.07	100%	5.3.16
HVAC	Prog. T-Stat Nest - Gas - FCU (IU)	Each	155.53	0.07	155.53	100%	0.07	100%	5.3.16
HVAC	Prog. T-Stat Nest - Gas - Furnace & AC (IU)	Each	155.53	0.07	146.14	94%	0.07	100%	5.3.16
HVAC	Electric T-Stat. - Resistance (IU)	Each	793.01	0.00	837.35	106%	0.00	NA	5.3.11
HVAC	Electric T-Stat. - Heat Pump (IU)	Each	466.47	0.00	515.56	111%	0.00	NA	5.3.11
HVAC	Reprog. T-Stat - Gas - Furnace (IU)	Each	35.32	0.00	37.26	106%	0.00	NA	5.3.16
HVAC	Manual T-Stat Nest - Gas - Furnace & AC (CA)	Each	174.76	0.07	165.37	95%	0.07	100%	5.3.16
HVAC	Prog. T-Stat Nest - Gas - Furnace (CA)	Each	155.53	0.07	155.53	100%	0.07	100%	5.3.16
HVAC	Prog. T-Stat - Gas - Furnace (CA)	Each	130.01	0.00	115.84	89%	0.00	NA	4.4.18
HVAC	Program T-Stat - Electric - Heat Pump (CA)	Each	548.43	0.00	373.68	68%	0.00	NA	4.4.18
HVAC	Prog. T-Stat - Gas - FCU (CA)	Each	79.85	0.00	115.84	145%	0.00	NA	4.4.18
HVAC	Prog. T-Stat - Electric (CA)	Each	373.68	0.00	373.68	100%	0.00	NA	4.4.18
Hot Water	Electric Aerator - Bathroom (IU)	Each	31.49	0.03	33.49	106%	0.03	100%	5.4.4
Hot Water	Electric Aerator - Bathroom (IU, Cook County)	Each	31.49	0.03	32.67	104%	0.03	100%	5.4.4
Hot Water	Electric Showerhead (IU)	Each	226.80	0.03	236.84	104%	0.03	100%	5.4.5

End Use Type	Research Category	Unit	Ex Ante Gross kWh/unit savings	Ex Ante Gross Peak kW/unit savings	Verified Gross kWh/Unit Savings	kWh Savings RR	Verified Gross Peak kW/unit	Peak kW Savings RR	Source
Hot Water	Electric Showerhead (IU, Cook County)	Each	226.80	0.03	232.82	103%	0.03	100%	5.4.5
Hot Water	Electric Aerator - Kitchen (IU)	Each	52.30	0.01	55.00	105%	0.01	100%	5.4.4
Hot Water	Electric Aerator - Kitchen (IU, Cook County)	Each	52.30	0.01	53.88	103%	0.01	100%	5.4.4
Hot Water	Electric Aerator - Bathroom (CA, Cook County)	Each	128.69	0.03	126.77	99%	0.03	95%	4.3.2
Hot Water	Electric Aerator - Kitchen (CA, Cook County)	Each	156.85	0.04	153.53	98%	0.04	95%	4.3.2
Hot Water	Electric Showerhead (CA, Cook County)	Each	459.09	0.06	446.22	97%	0.05	95%	4.3.3
HVAC	Electric Pipe Insulation - Hyd. Boiler Sm <=1.25 (IU)	Ln. Ft.	49.65	0.00	50.66	102%	0.00	NA	5.4.1
HVAC	Electric Pipe Insulation - Hyd. Boiler Sm <=1.25 (CA)	Ln. Ft.	49.65	0.00	50.66	102%	0.00	NA	4.4.14
HVAC	Electric Pipe Insulation - Hyd. Boiler Med 1.26-2 (CA)	Ln. Ft.	86.50	0.00	88.26	102%	0.00	NA	4.4.14
HVAC	Electric Pipe Insulation - Hyd. Boiler Large >2 (CA)	Ln. Ft.	148.50	0.00	151.54	102%	0.00	NA	4.4.14
HVAC	Electric Pipe Insulation - DHW (CA, Small <=1.25)	Ln. Ft.	58.72	0.00	59.70	102%	0.01	NA	4.4.14
HVAC	Electric Pipe Insulation - DHW (CA, Medium 1.26-2)	Ln. Ft.	102.06	0.00	104.14	102%	0.01	NA	4.4.14
HVAC	Electric Pipe Insulation - DHW (CA, Large >2)	Ln. Ft.	175.31	0.00	178.89	102%	0.02	NA	4.4.14
Refrigeration	Vending Miser (CA)	Each	1612.94	0.00	1612.94	100%	0.00	NA	4.6.2

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)
Lighting	LED IU Interior Incandescent	Lamp	60,075	10.0	No	2,039,036	263.60	NA	0	-42,691	0.84	0.84	0.85	1,712,790	221.42	NA	0	-36,287
Lighting	LED Exterior HID	Lamp	2,694	11.6	No	1,754,072	0.00	NA	0	0	0.95	0.95	0.85	1,666,369	0.00	NA	0	0
Lighting	LED CA Interior T8‡	Lamp	13,751	8.6	No	1,726,939	271.17	NA	0	-35,284	0.95	0.95	0.85	1,640,592	257.61	NA	0	-29,992
Lighting	LED IU Specialty	Lamp	50,514	10.0	No	1,524,792	234.95	NA	0	-32,849	0.84	0.84	0.85	1,280,825	197.36	NA	0	-27,922
Lighting	LED Exit Sign	Lamp	6,353	5.0	No	1,411,677	210.13	NA	0	-28,682	0.95	0.95	0.85	1,341,093	199.62	NA	0	-24,380
Lighting	LED 24/7 Garage HID	Lamp	1,286	5.7	No	1,243,489	141.85	NA	0	0	0.95	0.95	0.85	1,181,315	134.76	NA	0	0
Lighting	LED CA Interior Incandescent	Lamp	5,528	8.4	No	1,090,976	172.77	NA	0	-23,560	0.95	0.95	0.85	1,036,427	164.13	NA	0	-20,026
Lighting	LED 24/7 Garage T8	Lamp	4,197	5.7	No	879,644	100.35	NA	0	0	0.95	0.95	0.85	835,662	95.33	NA	0	0
Consumer Electronics	Advanced Power Strip - Tier 1	Each	10,376	7.0	No	741,285	81.93	NA	0	0	0.95	0.95	0.95	704,221	77.83	NA	0	0
Lighting	LED CA Interior T12‡	Lamp	3,698	8.8	No	703,772	122.26	NA	0	-14,286	0.95	0.95	0.85	668,584	116.15	NA	0	-12,143
Lighting	LED CA Interior Specialty	Lamp	2,440	8.4	No	571,601	88.02	NA	0	-11,928	0.95	0.95	0.85	543,021	83.62	NA	0	-10,139
Lighting	LED 24/7 Garage T12	Lamp	1,399	5.7	No	420,989	48.03	NA	0	0	0.95	0.95	0.85	399,939	45.62	NA	0	0
Lighting	LED CA Interior CFL	Lamp	16,741	8.4	No	414,502	64.78	NA	0	-9,140	0.95	0.95	0.85	393,777	61.54	NA	0	-7,769
HVAC	Advanced Thermostat	Each	1,060	11.0	No	182,561	73.76	NA	0	0	NA	NA	NA	182,561	73.76	NA	0	0
HVAC	IU Programmable Thermostat	Each	2,570	8.0	No	165,091	0.00	NA	0	0	0.90	0.90	0.85	148,582	0.00	NA	0	0
Hot Water	Low Flow Showerhead	Each	7,282	10.0	No	85,288	11.37	NA	0	0	1.00	1.00	0.85	85,288	11.37	NA	0	0
Lighting	LED CA Exterior Incandescent	Lamp	572	11.6	No	70,705	0.00	NA	0	0	0.95	0.95	0.85	67,170	0.00	NA	0	0
Lighting	LED CA Exterior Specialty	Lamp	275	11.6	No	68,965	0.00	NA	0	0	0.95	0.95	0.85	65,517	0.00	NA	0	0
HVAC	CA Pipe Insulation	Ln. Ft.	567	15.0	No	50,756	4.63	NA	0	0	0.95	0.95	0.85	48,218	4.40	NA	0	0
Lighting	LED CA Exterior CFL	Lamp	2,720	11.6	No	44,023	0.00	NA	0	0	0.95	0.95	0.85	41,822	0.00	NA	0	0
Lighting	LED IU Exterior Incandescent	Lamp	399	6.1	No	32,377	3.57	NA	0	0	0.84	0.84	0.85	27,196	3.00	NA	0	0
Refrigeration	CA Vending Miser	Each	13	5.0	No	20,968	0.00	NA	0	0	0.95	0.95	0.85	19,920	0.00	NA	0	0
Hot Water	Low Flow Faucet Aerator	Each	9,563	10.0	No	15,679	8.97	NA	0	0	1.00	1.00	0.85	15,679	8.97	NA	0	0
Lighting	LED Garage T12	Lamp	82	14.7	No	9,119	2.47	NA	0	0	0.95	0.95	0.85	8,663	2.34	NA	0	0
Lighting	LED Garage CFL	Lamp	455	14.1	No	5,800	1.51	NA	0	0	0.95	0.95	0.85	5,510	1.43	NA	0	0
HVAC	CA Programmable Thermostat	Each	24	8.0	No	3,296	0.00	NA	0	0	0.95	0.95	0.85	3,131	0.00	NA	0	0
Lighting	LED Garage Incandescent	Lamp	29	14.1	No	2,722	0.71	NA	0	0	0.95	0.95	0.85	2,586	0.67	NA	0	0
Lighting	LED IU Exterior Specialty	Lamp	11	6.1	No	923	0.10	NA	0	0	0.84	0.84	0.85	776	0.09	NA	0	0
HVAC	IU Reprogram Thermostat	Each	16	2.0	No	596	0.00	NA	0	0	0.90	0.90	0.85	537	0.00	NA	0	0
Lighting	Occupancy Sensor	Each	5	8.0	No	595	0.51	NA	0	0	0.95	0.95	0.85	565	0.48	NA	0	0
	Total			8.4		15,282,242	1,907	0	0	-198,420	NA	NA	NA	14,128,338	1,762	0	0	-168,657

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis excludes secondary energy savings from water reduction measures. Table 9-1 represents the kWh savings from Table 5-1 minus those shown in Table 5-4)

* 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.

** The electric heating penalty is included in the verified savings. Hence the columns for electric heating penalty in above table is made zero to avoid double counting
† 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 tables (Table 4-1).