



ComEd Small Business Offering Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2018 (CY2018)
(1/1/2018-12/31/2018)

Presented to
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FINAL

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1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2018 Small Business Offering (SBO). It presents a summary of the energy and demand impacts for the total program and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. CY2018 covers January 1, 2018 through December 31, 2018.

2. PROGRAM DESCRIPTION

The SBO is designed to assist qualified ComEd non-residential customers to achieve electric energy savings by educating them about energy efficiency opportunities through no-cost on-site energy assessments conducted by vetted and trained Energy Efficiency Service Providers (EESPs) and the installation of no-cost direct install measures. Further savings are available to participating customers for implementing select contractor-installed measures identified during the assessment. Incentives are available for these measures and they can cover up to 75 percent of the project costs. EESPs are the primary means of promoting the SBO and obtaining participants.

The CY2018 program offered comprehensive measures including lighting, refrigeration, HVAC and hot water, compressed air, commercial kitchen and building envelope upgrades. Nexant, Inc. (Nexant) is the implementation contractor for the SBO throughout ComEd's service territory.

The program had 6,313 participants in CY2018 and incented 95,843 measures from 7,709 projects, as shown in Table 2-1 and Figure 2-1. Lighting contributed 81 percent of participation (including exit signs) and other non-lighting measures contributed 19 percent of participation.

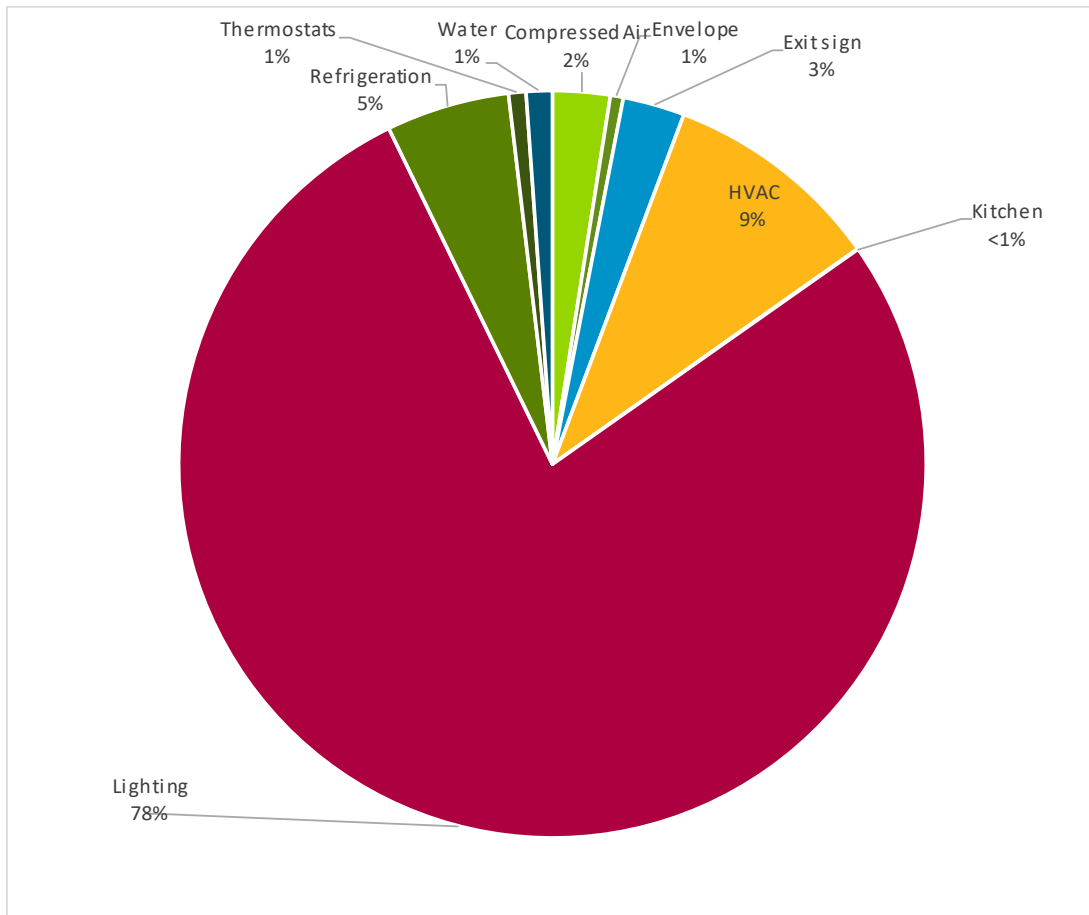
Table 2-1. CY2018 Volumetric Findings Detail

Participation	Total
Participants	6,313
Total Projects	7,709
Total Measures	95,843
Lighting Projects	6,720
Non-Lighting Projects	3,335
Mixed Projects (L + NL)	2,346
Lighting Measures	76,882
Non-Lighting Measures	18,961

Note: For purpose of this table, if a measure count is reported as for example, watts reduced or controlled, Navigant counted each row as one measure. Other measures were counted as per units.

Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. Proportion of Measures Installed by End-Use



Source: ComEd tracking data and Navigant team analysis.

3. PROGRAM SAVINGS DETAIL

Table 3-1 summarizes the incremental energy and demand savings the SBO achieved in CY2018. The gas savings comprise only those that the gas utilities are not claiming and that ComEd can claim.¹ Total CY2018 verified net savings (without gas savings) are 196,963,232 kWh and the program gross realization rate is 1.02.

¹ The final therms-to-kWh conversion counted towards ComEd incremental goal are documented in the CY2018 portfolio summary evaluation report.

Table 3-1. CY2018 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	212,617,333	NR	34,646
Program Gross Realization Rate	1.02	NA	1.00
Verified Gross Savings	216,443,112	81,277	34,647
Program Net-to-Gross Ratio (NTG)	0.91	0.91	0.91
Verified Net Savings	196,963,232	73,962	31,529
Converted from Gas*			
Ex Ante Gross Savings	10,841,604	NA	NA
Program Gross Realization Rate	0.99	NA	NA
Verified Gross Savings	10,763,493	NA	NA
Program Net-to-Gross Ratio (NTG)	0.91	NA	NA
Verified Net Savings	9,794,779	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	223,458,937	NR	34,646
Program Gross Realization Rate	1.02	NA	1.00
Verified Gross Savings	227,206,605	81,277	34,647
Program Net-to-Gross Ratio (NTG)	0.91	0.91	0.91
Verified Net Savings	206,758,011	73,962	31,529

NR = Not reported

NA = Not applicable

* Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).

Note: Note: The demand savings are equivalent to the reduction in kW of bulbs installed in 2018. The coincident Summer Peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June

Source: ComEd tracking data and Navigant team analysis.

4. CUMULATIVE PERSISTING ANNUAL SAVINGS

The measure-specific and total ex ante gross savings for the SBO and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The total electric CPAS across all measures is 196,963,232 kWh. The program achieved 9,794,779 kWh CPAS equivalent of gas savings converted to electricity that might be counted towards ComEd's goal² (Table 4-2). Adding the savings converted from gas savings to the electric savings produces a total 206,758,011 kWh of total CPAS.

The CPAS Table 4-1 accounts for changes in the T12 baseline in 2019 as required by the IL TRM (v6.0). Discussion of the T12 adjustment approach are based on guidance from the IL TRM, detailed in Section 6.2. and Table 8-8. The evaluation team estimated 45 percent of LED Fixtures and 22 percent of Linear T8 Lamps and Ballast had T12s as the baseline. We estimated a 19 percent drop in total lighting CPAS, and a 17 percent drop in the total program CPAS electric from 2018 due to the 2019 baseline shift.

² The final therms (kWh conversion) counted towards ComEd incremental goal are documented in the CY2018 portfolio summary evaluation report.

The evaluation team did not apply the adjustment for EISA baseline shift to LED omnidirectional lamps because the delta watts and lumen range for the program lamps were higher than the IL TRM deemed EISA baseline adjustment requirements.

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

End Use Type	Research Category	EUL*	CY2018 Verified Gross Savings	NTG†	Lifetime Net Savings‡	Verified Net kWh Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	10.0	1,329,176	0.91	12,095,502	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	
Compressed Air	Compressed Air Leak Repair	2.0	561,702	0.91	1,022,298	511,149	511,149	-	-	-	-	-	-	-	
Compressed Air	Efficient Refrigerated CA Dryer	10.0	3,501	0.91	31,859	3,186	3,186	3,186	3,186	3,186	3,186	3,186	3,186	3,186	
Compressed Air	High-Efficiency Air Nozzles	15.0	485,669	0.91	6,629,382	441,959	441,959	441,959	441,959	441,959	441,959	441,959	441,959	441,959	
Compressed Air	No-Loss Condensate Drains	10.0	385,652	0.91	3,509,433	350,943	350,943	350,943	350,943	350,943	350,943	350,943	350,943	350,943	
Shell	Weather Stripping	20.0	7,438	0.91	135,372	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	
HVAC	Battery Charger	15.0	63,552	0.91	867,485	57,832	57,832	57,832	57,832	57,832	57,832	57,832	57,832	57,832	
HVAC	Cool Roof	20.0	4,481	0.91	81,554	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	
HVAC	Early Replacement for Air Cooled AC	15.0	1,125,880	0.91	10,763,660	1,024,551	1,024,551	1,024,551	1,024,551	1,024,551	564,091	564,091	564,091	564,091	
HVAC	Economizer with DCV	10.0	4,712,230	0.91	42,881,293	4,288,129	4,288,129	4,288,129	4,288,129	4,288,129	4,288,129	4,288,129	4,288,129	4,288,129	
HVAC	End of life Replacement for Air Cooled AC	15.0	3,151	0.91	43,011	2,867	2,867	2,867	2,867	2,867	2,867	2,867	2,867	2,867	
HVAC	Restroom Exhaust Fan Occupancy Sensor	8.0	497,110	0.91	3,618,961	452,370	452,370	452,370	452,370	452,370	452,370	452,370	452,370	-	
HVAC	Smart Strip - Tier 1	7.0	551,674	0.91	3,514,163	502,023	502,023	502,023	502,023	502,023	502,023	502,023	-	-	
HVAC	Variable Speed Drive on HVAC	15.0	316,976	0.91	4,326,722	288,448	288,448	288,448	288,448	288,448	288,448	288,448	288,448	288,448	
Food Service Equipment	Kitchen Fan with DCV	15.0	114,218	0.91	1,559,076	103,938	103,938	103,938	103,938	103,938	103,938	103,938	103,938	103,938	
Lighting	Induction and MH Fixtures	12.2	65,827	0.91	729,014	59,903	59,903	59,903	59,903	59,903	59,903	59,903	59,903	59,903	
Lighting	LED Channel Sign	15.0	4,106	0.91	56,047	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	
Lighting	LED Exit Signs	16.0	264,328	0.91	3,848,616	240,538	240,538	240,538	240,538	240,538	240,538	240,538	240,538	240,538	
Lighting	LED Lamps and Fixtures (with adjusted T12 baseline)	12.2	181,101,320	0.91	1,645,980,678	164,802,201	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	
Lighting	Lighting Controls	8.0	9,611,359	0.91	69,970,694	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	
Lighting	Linear T8 and T5 Lamps and Ballast (with adjusted T12 baseline)	15.0	85,295	0.91	1,017,413	77,618	67,128	67,128	67,128	67,128	67,128	67,128	67,128	67,128	
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	12.0	6,184,674	0.91	67,536,640	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	8.0	339,868	0.91	2,474,239	309,280	309,280	309,280	309,280	309,280	309,280	309,280	309,280	-	
Refrigeration	Beverage, Snack and Cooler Machine Controls	5.0	311,177	0.91	1,415,855	283,171	283,171	283,171	283,171	283,171	-	-	-	-	
Refrigeration	EC Motor for Cooler or Freezer	15.0	7,526,564	0.91	102,737,599	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	12.0	8,728	0.91	95,310	7,942	7,942	7,942	7,942	7,942	7,942	7,942	7,942	7,942	
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	16.0	33,944	0.91	494,225	30,889	30,889	30,889	30,889	30,889	30,889	30,889	30,889	30,889	
Refrigeration	Night Covers	5.0	90,388	0.91	411,265	82,253	82,253	82,253	82,253	82,253	-	-	-	-	
Refrigeration	Strip Curtains for Cooler or Freezer	4.0	459,516	0.91	1,672,638	418,160	418,160	418,160	418,160	-	-	-	-	-	
Thermostats	Thermostat	4.0	49,494	0.91	180,158	45,040	45,040	45,040	45,040	-	-	-	-	-	
Water	Bathroom and Kitchen Faucet Aerators	9.0	89,795	0.91	735,421	81,713	81,713	81,713	81,713	81,713	81,713	81,713	81,713	81,713	
Water	High Efficiency Pre-Rinse Spray Valve	5.0	13,852	0.91	63,027	12,605	12,605	12,605	12,605	12,605	-	-	-	-	
Water	Showerhead - Low Flow	10.0	40,467	0.91	368,250	36,825	36,825	36,825	36,825	36,825	36,825	36,825	36,825	36,825	
CY2018 Program Total Electric CPAS			216,443,112		1,990,866,858	196,963,232	164,398,619	163,887,470	163,887,470	163,887,470	163,424,271	162,585,781	162,585,781	162,083,758	152,575,771
CY2018 Program Expiring Electric Savings§							32,564,613	33,075,762	33,075,762	33,538,961	34,377,451	34,377,451	34,879,474	44,387,461	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	1,209,550	-	-	-	-	-	-	-	-	-	-	-
Compressed Air	Compressed Air Leak Repair	-	-	-	-	-	-	-	-	-	-	-	-
Compressed Air	Efficient Refrigerated CA Dryer	3,186	-	-	-	-	-	-	-	-	-	-	-
Compressed Air	High-Efficiency Air Nozzles	441,959	441,959	441,959	441,959	441,959	441,959	-	-	-	-	-	-
Compressed Air	No-Loss Condensate Drains	350,943	-	-	-	-	-	-	-	-	-	-	-
Shell	Weather Stripping	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	6,769	-
HVAC	Battery Charger	57,832	57,832	57,832	57,832	57,832	57,832	-	-	-	-	-	-
HVAC	Cool Roof	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	-
HVAC	Early Replacement for Air Cooled AC	564,091	564,091	564,091	564,091	564,091	564,091	-	-	-	-	-	-
HVAC	Economizer with DCV	4,288,129	-	-	-	-	-	-	-	-	-	-	-
HVAC	End of life Replacement for Air Cooled AC	2,867	2,867	2,867	2,867	2,867	2,867	-	-	-	-	-	-
HVAC	Restroom Exhaust Fan Occupancy Sensor	-	-	-	-	-	-	-	-	-	-	-	-
HVAC	Smart Strip - Tier 1	-	-	-	-	-	-	-	-	-	-	-	-
HVAC	Variable Speed Drive on HVAC	288,448	288,448	288,448	288,448	288,448	288,448	-	-	-	-	-	-
Food Service Equipment	Kitchen Fan with DCV	103,938	103,938	103,938	103,938	103,938	103,938	-	-	-	-	-	-
Lighting	Induction and MH Fixtures	59,903	59,903	59,903	10,183	-	-	-	-	-	-	-	-
Lighting	LED Channel Sign	3,736	3,736	3,736	-	3,736	3,736	-	-	-	-	-	-
Lighting	LED Exit Signs	240,538	240,538	240,538	240,538	240,538	240,538	240,538	-	-	-	-	-
Lighting	LED Lamps and Fixtures (with adjusted T12 baseline)	132,248,078	132,248,078	132,248,078	26,449,616	-	-	-	-	-	-	-	-
Lighting	Lighting Controls	-	-	-	-	-	-	-	-	-	-	-	-
Lighting	Linear T8 and T5 Lamps and Ballast (with adjusted T12 baseline)	67,128	67,128	67,128	67,128	67,128	67,128	-	-	-	-	-	-
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	5,628,053	5,628,053	5,628,053	-	-	-	-	-	-	-	-	-
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	Beverage, Snack and Cooler Machine Controls	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	EC Motor for Cooler or Freezer	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	-	-	-	-	-	-
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	7,942	7,942	7,942	-	-	-	-	-	-	-	-	-
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	30,889	30,889	30,889	30,889	30,889	30,889	30,889	-	-	-	-	-
Refrigeration	Night Covers	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	Strip Curtains for Cooler or Freezer	-	-	-	-	-	-	-	-	-	-	-	-
Thermostats	Thermostat	-	-	-	-	-	-	-	-	-	-	-	-
Water	Bathroom and Kitchen Faucet Aerators	-	-	-	-	-	-	-	-	-	-	-	-
Water	High Efficiency Pre-Rinse Spray Valve	-	-	-	-	-	-	-	-	-	-	-	-
Water	Showerhead - Low Flow	36,825	-	-	-	-	-	-	-	-	-	-	-
CY2018 Program Total Electric CPAS		152,494,058	146,605,424	146,605,424	35,121,246	8,661,447	8,661,447	282,274	10,846	10,846	10,846	10,846	-
CY2018 Program Expiring Electric Savings§		44,469,174	50,357,808	50,357,808	161,841,985	188,301,785	188,301,785	196,680,958	196,952,386	196,952,386	196,952,386	196,952,386	196,963,232

Note: The green highlighted cell shows program total first year electric savings.

* The EUL values for LED lamps and fixtures, and Induction Lightings represent average values, weighted by electric energy savings, of all measures in the identified research category

† A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

§ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

Source: Navigant analysis

Table 4-2. Cumulative Persisting Annual Savings (CPAS) – Gas

End Use Type	Research Category	EUL	CY2018 Verified Gross Savings (Therms)	NTG*	Lifetime Net Savings†	Verified Net Therms Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Shell	Weather Stripping	20.0	26,676	0.91	485,503	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	
HVAC	Economizer with DCV	10.0	228,695	0.91	2,081,125	208,112	208,112	208,112	208,112	208,112	208,112	208,112	208,112	208,112	
Food Service Equipment	Kitchen Fan with DCV	15.0	105,515	0.91	1,440,284	96,019	96,019	96,019	96,019	96,019	96,019	96,019	96,019	96,019	
Thermostats	Thermostat	4.0	6,343	0.91	23,089	5,772	5,772	5,772	5,772	-	-	-	-	-	
CY2018 Program Total Gas CPAS (Therms)			367,229		4,030,000	334,179	334,179	334,179	334,179	328,407	328,407	328,407	328,407	328,407	
CY2018 Program Total Gas CPAS (kWh Equivalent)‡			10,763,493.05		118,119,305	9,794,779	9,794,779	9,794,779	9,794,779	9,625,595	9,625,595	9,625,595	9,625,595	9,625,595	
CY2018 Program Expiring Gas Savings (Therms)§										5,772	5,772	5,772	5,772	5,772	
CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§										169,184	169,184	169,184	169,184	169,184	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Shell	Weather Stripping	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	24,275	-
HVAC	Economizer with DCV	208,112	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Kitchen Fan with DCV	96,019	96,019	96,019	96,019	96,019	96,019	-	-	-	-	-	-
Thermostats	Thermostat	-	-	-	-	-	-	-	-	-	-	-	-
CY2018 Program Total Gas CPAS (Therms)		328,407	120,294	120,294	120,294	120,294	120,294	24,275	24,275	24,275	24,275	24,275	-
CY2018 Program Total Gas CPAS (kWh Equivalent)‡		9,625,595	3,525,819	3,525,819	3,525,819	3,525,819	3,525,819	711,505	711,505	711,505	711,505	711,505	-
CY2018 Program Expiring Gas Savings (Therms)§		5,772	213,885	213,885	213,885	213,885	213,885	309,904	309,904	309,904	309,904	309,904	334,179
CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§		169,184	6,268,960	6,268,960	6,268,960	6,268,960	6,268,960	9,083,274	9,083,274	9,083,274	9,083,274	9,083,274	9,794,779

Note: The green highlighted cell shows program total first year gas savings in kWh equivalents.

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

‡ kWh equivalent savings are calculated by multiplying therm savings by 29.31.

§ Expiring savings (therm) are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

‡§ Expiring savings (kWh Equivalent) are calculated by multiplying expiring savings (therm) by 29.31.

Source: Navigant analysis

Table 4-3. Cumulative Persisting Annual Savings (CPAS) – Total

Research Category	EUL*	CY2018 Verified Gross Savings	NTG†	Lifetime Net Savings‡	Verified Net kWh Savings (Including Those Converted from Gas Savings)									
					2018	2019	2020	2021	2022	2023	2024	2025	2026	
Air Compressors with Integrated VSD LTE 40 HP	10.0	1,329,176	0.91	15,653,026	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550	1,209,550
Compressed Air Leak Repair	2.0	561,702	0.91	1,022,298	511,149	511,149	-	-	-	-	-	-	-	-
Efficient Refrigerated CA Dryer	10.0	3,501	0.91	31,859	3,186	3,186	3,186	3,186	3,186	3,186	3,186	3,186	3,186	3,186
High-Efficiency Air Nozzles	15.0	485,669	0.91	6,629,382	441,959	441,959	441,959	441,959	441,959	441,959	441,959	441,959	441,959	441,959
No-Loss Condensate Drains	10.0	385,652	0.91	3,509,433	350,943	350,943	350,943	350,943	350,943	350,943	350,943	350,943	350,943	350,943
Weather Stripping	20.0	789,312	0.91	10,807,946	718,274	718,274	718,274	718,274	718,274	718,274	718,274	718,274	718,274	718,274
Battery Charger	15.0	63,552	0.91	867,485	57,832	57,832	57,832	57,832	57,832	57,832	57,832	57,832	57,832	57,832
Cool Roof	20.0	4,481	0.91	81,554	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078
Early Replacement for Air Cooled AC	15.0	1,125,880	0.91	10,763,660	1,024,551	1,024,551	1,024,551	1,024,551	1,024,551	564,091	564,091	564,091	564,091	564,091
Economizer with DCV	10.0	11,415,280	0.91	103,879,052	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905	10,387,905
End of life Replacement for Air Cooled AC	15.0	3,151	0.91	43,011	2,867	2,867	2,867	2,867	2,867	2,867	2,867	2,867	2,867	2,867
Restroom Exhaust Fan Occupancy Sensor	8.0	497,110	0.91	3,618,961	452,370	452,370	452,370	452,370	452,370	452,370	452,370	452,370	452,370	-
Smart Strip - Tier 1	7.0	551,674	0.91	3,514,163	502,023	502,023	502,023	502,023	502,023	502,023	502,023	502,023	-	-
Variable Speed Drive on HVAC	15.0	316,976	0.91	4,326,722	288,448	288,448	288,448	288,448	288,448	288,448	288,448	288,448	288,448	288,448
Kitchen Fan with DCV	15.0	3,206,871	0.91	43,773,788	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253
Induction and MH Fixtures	12.2	65,827	0.91	729,014	59,903	59,903	59,903	59,903	59,903	59,903	59,903	59,903	59,903	59,903
LED Channel Sign	15.0	4,106	0.91	56,047	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736	3,736
LED Exit Signs	16.0	264,328	0.91	3,848,616	240,538	240,538	240,538	240,538	240,538	240,538	240,538	240,538	240,538	240,538
LED Lamps and Fixtures (with adjusted T12 baseline)	12.2	181,101,320	0.91	1,645,980,678	164,802,201	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078	132,248,078
Lighting Controls	8.0	9,611,359	0.91	69,970,694	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	8,746,337	-
Linear T8 and T5 Lamps and Ballast (with adjusted T12 baseline)	15.0	85,295	0.91	1,017,413	77,618	67,128	67,128	67,128	67,128	67,128	67,128	67,128	67,128	67,128
Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	12.0	6,184,674	0.91	67,536,640	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053	5,628,053
Auto Closer for Walk-in Cooler or Freezer	8.0	339,868	0.91	2,474,239	309,280	309,280	309,280	309,280	309,280	309,280	309,280	309,280	309,280	-
Beverage, Snack and Cooler Machine Controls	5.0	311,177	0.91	1,415,855	283,171	283,171	283,171	283,171	283,171	-	-	-	-	-
EC Motor for Cooler or Freezer	15.0	7,526,564	0.91	102,737,599	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173
ENERGY STAR Solid or Glass Door Refrigerator or Freezer	12.0	8,728	0.91	95,310	7,942	7,942	7,942	7,942	7,942	7,942	7,942	7,942	7,942	7,942
Evaporator Fan Controls for walk-in or reach-in coolers	16.0	33,944	0.91	494,225	30,889	30,889	30,889	30,889	30,889	30,889	30,889	30,889	30,889	30,889
Night Covers	5.0	90,388	0.91	411,265	82,253	82,253	82,253	82,253	82,253	-	-	-	-	-
Strip Curtains for Cooler or Freezer	4.0	459,516	0.91	1,672,638	418,160	418,160	418,160	418,160	-	-	-	-	-	-
Thermostat	4.0	235,410	0.91	856,893	214,223	214,223	214,223	214,223	-	-	-	-	-	-
Bathroom and Kitchen Faucet Aerators	9.0	89,795	0.91	735,421	81,713	81,713	81,713	81,713	81,713	81,713	81,713	81,713	81,713	81,713
High Efficiency Pre-Rinse Spray Valve	5.0	13,852	0.91	63,027	12,605	12,605	12,605	12,605	12,605	-	-	-	-	-
Showerhead - Low Flow	10.0	40,467	0.91	368,250	36,825	36,825	36,825	36,825	36,825	36,825	36,825	36,825	36,825	36,825
total CPAS		227,206,605		2,108,986,163	206,758,011	174,193,397	173,682,249	173,682,249	173,049,866	172,211,376	172,211,376	171,709,353	162,201,366	
Expiring Savings\$						32,564,613	33,075,762	33,075,762	33,708,145	34,546,634	34,546,634	35,048,658	44,556,644	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	1,209,550	-	-	-	-	-	711,505	711,505	711,505	711,505	711,505	-
Compressed Air	Compressed Air Leak Repair	-	-	-	-	-	-	-	-	-	-	-	-
Compressed Air	Efficient Refrigerated CA Dryer	3,186	-	-	-	-	-	-	-	-	-	-	-
Compressed Air	High-Efficiency Air Nozzles	441,959	441,959	441,959	441,959	441,959	441,959	-	-	-	-	-	-
Compressed Air	No-Loss Condensate Drains	350,943	-	-	-	-	-	-	-	-	-	-	-
Shell	Weather Stripping	718,274	718,274	718,274	718,274	718,274	718,274	6,769	6,769	6,769	6,769	6,769	-
HVAC	Battery Charger	57,832	57,832	57,832	57,832	57,832	57,832	-	-	-	-	-	-
HVAC	Cool Roof	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	4,078	-
HVAC	Early Replacement for Air Cooled AC	564,091	564,091	564,091	564,091	564,091	564,091	-	-	-	-	-	-
HVAC	Economizer with DCV	10,387,905	-	-	-	-	-	-	-	-	-	-	-
HVAC	End of life Replacement for Air Cooled AC	2,867	2,867	2,867	2,867	2,867	2,867	-	-	-	-	-	-
HVAC	Restroom Exhaust Fan Occupancy Sensor	-	-	-	-	-	-	-	-	-	-	-	-
HVAC	Smart Strip - Tier 1	-	-	-	-	-	-	-	-	-	-	-	-
HVAC	Variable Speed Drive on HVAC	288,448	288,448	288,448	288,448	288,448	288,448	-	-	-	-	-	-
Food Service Equip	Kitchen Fan with DCV	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	2,918,253	-	-	-	-	-	-
Lighting	Induction and MH Fixtures	59,903	59,903	59,903	10,183	-	-	-	-	-	-	-	-
Lighting	LED Channel Sign	3,736	3,736	3,736	3,736	3,736	3,736	-	-	-	-	-	-
Lighting	LED Exit Signs	240,538	240,538	240,538	240,538	240,538	240,538	240,538	-	-	-	-	-
Lighting	LED Lamps and Fixtures (with adjusted T12 baseline)	132,248,078	132,248,078	132,248,078	26,449,616	-	-	-	-	-	-	-	-
Lighting	Lighting Controls	-	-	-	-	-	-	-	-	-	-	-	-
Lighting	Linear T8 and T5 Lamps and Ballast (with adjusted T12 baseline)	67,128	67,128	67,128	67,128	67,128	67,128	-	-	-	-	-	-
Refrigeration	Ani-Sweat Heater Controls for Glass Door Cooler or Refrigerator	5,628,053	5,628,053	5,628,053	-	-	-	-	-	-	-	-	-
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	Beverage, Snack and Cooler Machine Controls	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	EC Motor for Cooler or Freezer	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	6,849,173	-	-	-	-	-	-
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	7,942	7,942	7,942	-	-	-	-	-	-	-	-	-
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	30,889	30,889	30,889	30,889	30,889	30,889	30,889	-	-	-	-	-
Refrigeration	Night Covers	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	Strip Curtains for Cooler or Freezer	-	-	-	-	-	-	-	-	-	-	-	-
Thermostats	Thermostat	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	Bathroom and Kitchen Faucet Aerators	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	High Efficiency Pre-Rinse Spray Valve	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	Showerhead - Low Flow	36,825	-	-	-	-	-	-	-	-	-	-	-
CY2018 Program Total CPAS		162,119,653	150,131,243	150,131,243	38,647,066	12,187,266	12,187,266	993,779	722,351	722,351	722,351	722,351	-
CY2018 Program Expiring Savings§		44,638,358	56,626,767	56,626,767	168,110,945	194,570,744	194,570,744	205,764,232	206,035,659	206,035,659	206,035,659	206,035,659	206,758,011

Note: The green highlighted cell shows program total first year electric savings (including direct electric savings and those converted from gas).

* The EUL values for LED lamps and fixtures, and Induction Lightings represent average values, weighted by electric energy savings, of all measures in the identified research category.

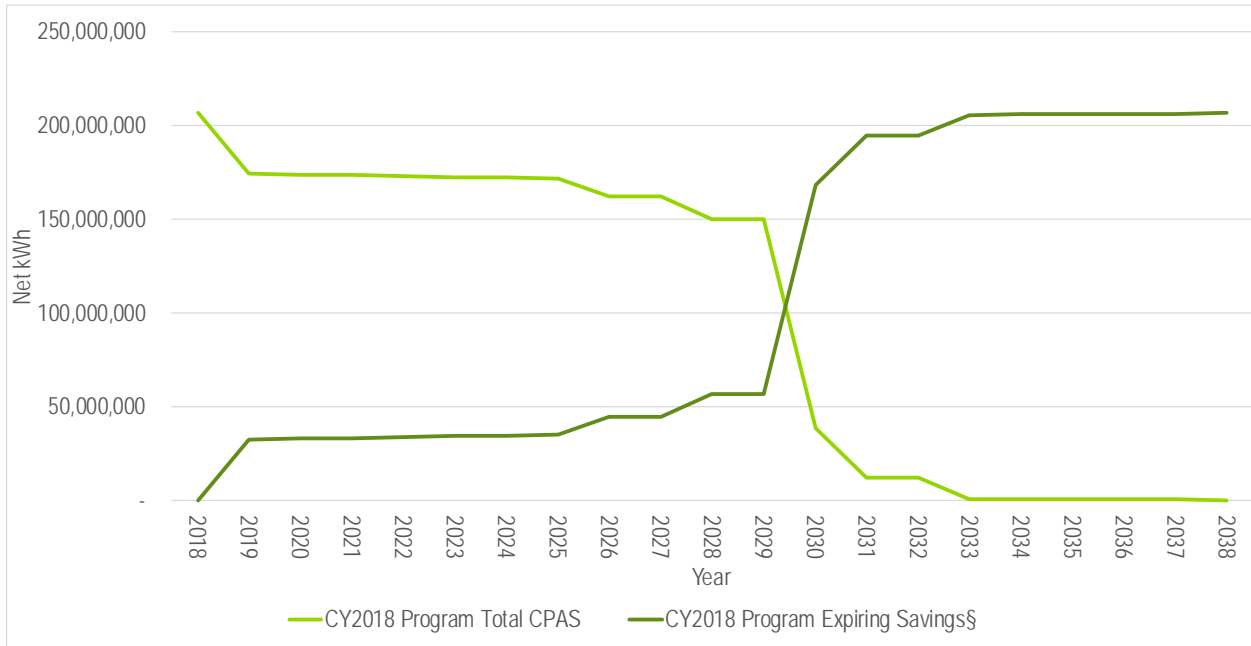
† A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

§ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

Source: Navigant analysis

Figure 4-1. Cumulative Persisting Annual Savings



‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.
 Source: Navigant analysis

5. PROGRAM SAVINGS BY MEASURE

The CY2018 SBO included 33 measures as shown in the following tables. Lighting contributed 88 percent of net savings (84 percent from LED lamps and fixtures), and the remaining 12 percent from other non-lighting measures.

Table 5-1. CY2018 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)	Effective Useful Life
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	1,329,180	1.00	1,329,176	0.91	1,209,550	10.0
Compressed Air	Compressed Air Leak Repair	751,529	0.75	561,702	0.91	511,149	2.0
Compressed Air	Efficient Refrigerated CA Dryer	3,502	1.00	3,501	0.91	3,185	10.0
Compressed Air	High-Efficiency Air Nozzles	485,672	1.00	485,669	0.91	441,959	15.0
Compressed Air	No-Loss Condensate Drains	385,651	1.00	385,652	0.91	350,943	10.0
Shell	Weather Stripping	7,441	1.00	7,438	0.91	6,768	20.0
HVAC	Battery Charger	63,552	1.00	63,552	0.91	57,832	15.0
HVAC	Cool Roof	4,500	1.00	4,481	0.91	4,078	20.0
HVAC	Early Replacement for Air Cooled AC	1,125,864	1.00	1,125,880	0.91	1,024,551	15.0
HVAC	Economizer with DCV	4,712,199	1.00	4,712,230	0.91	4,288,129	10.0
HVAC	End of life Replacement for Air Cooled AC	3,151	1.00	3,151	0.91	2,867	15.0
HVAC	Restroom Exhaust Fan Occupancy Sensor	497,259	1.00	497,110	0.91	452,370	8.0
HVAC	Smart Strip - Tier 1	543,985	1.01	551,674	0.91	502,023	7.0
HVAC	Variable Speed Drive on HVAC	699,192	0.45	316,976	0.91	288,448	15.0
Food Service Equipment	Kitchen Fan with DCV	111,338	1.03	114,218	0.91	103,938	15.0
Lighting	Induction and MH Fixtures	65,827	1.00	65,827	0.91	59,903	12.2
Lighting	LED Channel Sign	4,106	1.00	4,106	0.91	3,737	15.0
Lighting	LED Exit Signs	264,239	1.00	264,328	0.91	240,539	16.0
Lighting	LED Lamps and Fixtures	176,740,555	1.02	181,101,320	0.91	164,802,201	12.2
Lighting	Lighting Controls	9,595,370	1.00	9,611,359	0.91	8,746,337	8.0
Lighting	Linear T8 and T5 Lamps and Ballast	85,306	1.00	85,295	0.91	77,618	15.0
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	6,184,639	1.00	6,184,674	0.91	5,628,053	12.0
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	339,868	1.00	339,868	0.91	309,280	8.0
Refrigeration	Beverage, Snack and Cooler Machine Controls	311,177	1.00	311,177	0.91	283,171	5.0
Refrigeration	EC Motor for Cooler or Freezer	7,505,153	1.00	7,526,564	0.91	6,849,173	15.0
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	10,160	0.86	8,728	0.91	7,942	12.0
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	29,079	1.17	33,944	0.91	30,889	16.0
Refrigeration	Night Covers	90,388	1.00	90,388	0.91	82,253	5.0
Refrigeration	Strip Curtains for Cooler or Freezer	457,329	1.00	459,516	0.91	418,159	4.0
Thermostats	Thermostat	63,149	0.78	49,494	0.91	45,039	4.0
Water	Bathroom and Kitchen Faucet Aerators	92,717	0.97	89,795	0.91	81,713	9.0
Water	High Efficiency Pre-Rinse Spray Valve	13,852	1.00	13,852	0.91	12,605	5.0
Water	Showerhead - Low Flow	40,404	1.00	40,467	0.91	36,825	10.0
Total		212,617,333	1.02	216,443,112	0.91	196,963,232	NA

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.
Source: ComEd tracking data and Navigant team analysis.

Table 5-2. CY2018 Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Demand Reduction (kW)	Verified Gross Realization Rate*	Verified Gross Demand Reduction (kW)	NTG†	Verified Net Demand Reduction (kW)
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	NR	NA	336.3	0.91	306.1
Compressed Air	Compressed Air Leak Repair	NR	NA	2,001.7	0.91	1,821.6
Compressed Air	Efficient Refrigerated CA Dryer	NR	NA	0.9	0.91	0.8
Compressed Air	High-Efficiency Air Nozzles	NR	NA	122.9	0.91	111.8
Compressed Air	No-Loss Condensate Drains	NR	NA	97.6	0.91	88.8
Shell	Weather Stripping	NR	NA	0.9	0.91	0.8
HVAC	Battery Charger	NR	NA	-	0.91	0.0
HVAC	Cool Roof	NR	NA	-	0.91	0.0
HVAC	Early Replacement for Air Cooled AC	NR	NA	1,169.3	0.91	1,064.1
HVAC	Economizer with DCV	NR	NA	5,035.5	0.91	4,582.3
HVAC	End of life Replacement for Air Cooled AC	NR	NA	3.3	0.91	3.0
HVAC	Restroom Exhaust Fan Occupancy Sensor	NR	NA	110.0	0.91	100.1
HVAC	Smart Strip - Tier 1	NR	NA	3,283.8	0.91	2,988.2
HVAC	Variable Speed Drive on HVAC	NR	NA	258.4	0.91	235.2
Food Service Equipment	Kitchen Fan with DCV	NR	NA	15.6	0.91	14.2
Lighting	Induction and MH Fixtures	NR	NA	33.9	0.91	30.9
Lighting	LED Channel Sign	NR	NA	0.8	0.91	0.8
Lighting	LED Exit Signs	NR	NA	114.3	0.91	104.0
Lighting	LED Lamps and Fixtures	NR	NA	50,099.9	0.91	45,590.9
Lighting	Lighting Controls	NR	NA	13,246.3	0.91	12,054.2
Lighting	Linear T8 and T5 Lamps and Ballast	NR	NA	20.1	0.91	18.2
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	NR	NA	706.0	0.91	642.5
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	NR	NA	48.4	0.91	44.0
Refrigeration	Beverage, Snack and Cooler Machine Controls	NR	NA	95.4	0.91	86.8
Refrigeration	EC Motor for Cooler or Freezer	NR	NA	868.1	0.91	789.9
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	NR	NA	1.0	0.91	0.9
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	NR	NA	3.9	0.91	3.5
Refrigeration	Night Covers	NR	NA	-	0.91	0.0
Refrigeration	Strip Curtains for Cooler or Freezer	NR	NA	52.4	0.91	47.7
Thermostats	Thermostat	NR	NA	9.6	0.91	8.7
Water	Bathroom and Kitchen Faucet Aerators	NR	NA	3,316.0	0.91	3,017.6
Water	High Efficiency Pre-Rinse Spray Valve	NR	NA	44.4	0.91	40.4
Water	Showerhead - Low Flow	NR	NA	180.1	0.91	163.9
	Total	NR	NA	81,277	0.91	73,962

NR = Not reported

NA = Not applicable

* The realization rates are not applicable ex ante savings were not reported.

† A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Source: ComEd tracking data and Navigant team analysis.

Table 5-3. CY2018 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)
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	319.51	1.00	319.5	0.91	290.8
Compressed Air	Compressed Air Leak Repair	1,901.65	1.00	1,901.7	0.91	1,730.5
Compressed Air	Efficient Refrigerated CA Dryer	0.84	1.00	0.8	0.91	0.8
Compressed Air	High-Efficiency Air Nozzles	116.75	1.00	116.8	0.91	106.2
Compressed Air	No-Loss Condensate Drains	92.70	1.00	92.7	0.91	84.4
Shell	Weather Stripping	0.00	1.00	-	0.91	0.0
HVAC	Battery Charger	0.00	1.00	0.5	0.91	0.5
HVAC	Cool Roof	6.75	1.00	6.8	0.91	6.1
HVAC	Early Replacement for Air Cooled AC	558.78	1.00	558.9	0.91	508.6
HVAC	Economizer with DCV	0.00	1.00	-	0.91	0.0
HVAC	End of life Replacement for Air Cooled AC	1.57	1.00	1.6	0.91	1.4
HVAC	Restroom Exhaust Fan Occupancy Sensor	66.75	1.01	67.1	0.91	61.1
HVAC	Smart Strip - Tier 1	0.83	-	-	0.91	0.0
HVAC	Variable Speed Drive on HVAC	208.81	1.00	209.1	0.91	190.3
Food Service Equipment	Kitchen Fan with DCV	16.12	0.97	15.6	0.91	14.2
Lighting	Induction and MH Fixtures	20.98	1.00	21.0	0.91	19.1
Lighting	LED Channel Sign	0.44	-	-	0.91	0.0
Lighting	LED Exit Signs	70.31	1.01	71.0	0.91	64.6
Lighting	LED Lamps and Fixtures	24,649.74	1.00	24,674.7	0.91	22,454.0
Lighting	Lighting Controls	5,603.20	1.00	5,577.3	0.91	5,075.3
Lighting	Linear T8 and T5 Lamps and Ballast	15.68	1.00	15.7	0.91	14.3
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	0.00	1.00	-	0.91	0.0
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	49.04	0.99	48.4	0.91	44.0
Refrigeration	Beverage, Snack and Cooler Machine Controls	0.00	1.00	-	0.91	0.0
Refrigeration	EC Motor for Cooler or Freezer	865.67	1.00	868.1	0.91	789.9
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	1.09	0.86	0.9	0.91	0.9
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	3.34	1.16	3.9	0.91	3.5
Refrigeration	Night Covers	0.00	1.00	-	0.91	0.0
Refrigeration	Strip Curtains for Cooler or Freezer	52.19	1.00	52.4	0.91	47.7
Thermostats	Thermostat	0.00	1.00	-	0.91	0.0
Water	Bathroom and Kitchen Faucet Aerators	18.35	0.98	18.1	0.91	16.5
Water	High Efficiency Pre-Rinse Spray Valve	0.00	1.00	-	0.91	0.0
Water	Showerhead - Low Flow	5.00	1.00	5.0	0.91	4.6
	Total	34,646	1.00	34,647	0.91	31,529

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Source: ComEd tracking data and Navigant team analysis.

Table 5-4. CY2018 Energy Savings by Measure – Gas

End Use Type	Research Category	Ex Ante Gross Savings	Verified Gross Realization Rate	Verified Gross Savings	NTG*	Verified Net Savings	Effective Useful Life
Shell	Weather Stripping	26,676	1.00	26,676	0.91	24,275	20.0
HVAC	Economizer with DCV	227,603	1.00	228,695	0.91	208,112	10.0
Food Service Equipment	Kitchen Fan with DCV	105,515	1.00	105,515	0.91	96,019	15.0
Thermostats	Thermostat	6,343	1.00	6,343	0.91	5,772	4.0
Lighting	Lighting	3,757	-	0	0.91	0	NA
	Total Therms	369,894	0.99	367,229	0.91	334,179	NA
	Total kWh Converted From Therms†	10,841,604	0.99	10,763,493	0.91	9,794,779	

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

† Gas savings converted to kWh by multiplying therms by 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).

Source: ComEd tracking data and Navigant team analysis.

Table 5-5. CY2018 Energy Savings by Measure – Total Combining Electricity and Gas

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	1,329,180	1.00	1,329,176	0.91	1,209,550
Compressed Air	Compressed Air Leak Repair	751,529	0.75	561,702	0.91	511,149
Compressed Air	Efficient Refrigerated CA Dryer	3,502	1.00	3,501	0.91	3,186
Compressed Air	High-Efficiency Air Nozzles	485,672	1.00	485,669	0.91	441,959
Compressed Air	No-Loss Condensate Drains	385,651	1.00	385,652	0.91	350,943
Shell	Weather Stripping	789,315	1.00	789,312	0.91	718,274
HVAC	Battery Charger	63,552	1.00	63,552	0.91	57,832
HVAC	Cool Roof	4,500	1.00	4,481	0.91	4,078
HVAC	Early Replacement for Air Cooled AC	1,125,864	1.00	1,125,880	0.91	1,024,551
HVAC	Economizer with DCV	11,383,243	1.00	11,415,280	0.91	10,387,905
HVAC	End of life Replacement for Air Cooled AC	3,151	1.00	3,151	0.91	2,867
HVAC	Restroom Exhaust Fan Occupancy Sensor	497,259	1.00	497,110	0.91	452,370
HVAC	Smart Strip - Tier 1	543,985	1.01	551,674	0.91	502,023
HVAC	Variable Speed Drive on HVAC	699,192	0.45	316,976	0.91	288,448
Food Service Equipment	Kitchen Fan with DCV	3,203,991	1.00	3,206,871	0.91	2,918,253
Lighting	Induction and MH Fixtures	65,827	1.00	65,827	0.91	59,903
Lighting	LED Channel Sign	4,106	1.00	4,106	0.91	3,736
Lighting	LED Exit Signs	264,239	1.00	264,328	0.91	240,538
Lighting	LED Lamps and Fixtures	176,740,553	1.02	181,101,320	0.91	164,802,201
Lighting	Lighting Controls	9,595,370	1.00	9,611,359	0.91	8,746,337
Lighting	Linear T8 and T5 Lamps and Ballast	85,307	1.00	85,295	0.91	77,618
Lighting	Other Lighting (claiming gas savings)	110,118	-	0	0.91	0
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	6,184,639	1.00	6,184,674	0.91	5,628,053
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	339,868	1.00	339,868	0.91	309,280
Refrigeration	Beverage, Snack and Cooler Machine Controls	311,177	1.00	311,177	0.91	283,171
Refrigeration	EC Motor for Cooler or Freezer	7,505,154	1.00	7,526,564	0.91	6,849,173
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	10,161	0.86	8,728	0.91	7,942
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	29,079	1.17	33,944	0.91	30,889
Refrigeration	Night Covers	90,388	1.00	90,388	0.91	82,253
Refrigeration	Strip Curtains for Cooler or Freezer	457,329	1.00	459,516	0.91	418,160
Thermostats	Thermostat	249,065	0.95	235,410	0.91	214,223
Water	Bathroom and Kitchen Faucet Aerators	92,717	0.97	89,795	0.91	81,713
Water	High Efficiency Pre-Rinse Spray Valve	13,852	1.00	13,852	0.91	12,605
Water	Showerhead - Low Flow	40,404	1.00	40,467	0.91	36,825
	Total†	223,458,937	1.02	227,206,605	0.91	206,758,011

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

† The total includes the electric equivalent of the total therms.

Source: ComEd tracking data and Navigant team analysis.

6. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

6.1 Impact Parameter Estimates

The evaluation team calculated verified gross and net savings (energy and coincident peak demand) resulting from the CY2018 SBO using algorithms as defined by the Illinois Technical Reference Manual (TRM) version 6.0 or ComEd CY2018 Workpapers. Table 6-1 presents the key parameters and the references used in the verified gross and net savings calculations, and indicate which were examined through CY2018 evaluation research and which were deemed.

Table 6-1. Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source
Quantity	Varies	Varies	Evaluated	Program tracking database, CY2018 on-site verification
NTG	Varies	0.91	Deemed	IL SAG Consensus*
Deemed Lighting Measure Savings Parameters: Hours of Use (HOU), Coincidence Factor, Interactive Effects	Varies	NA	Deemed	IL TRM v6.0†
Lighting Measure ΔWatts (deemed by IL TRM)	Varies	Watts	Deemed	IL TRM v6.0
Lighting Measure ΔWatts (not deemed by IL TRM), Photocells, Time Clock, Daylighting Controls	Varies	Watts	Evaluated	Program Measure Workbook and Evaluation M&V
Deemed HVAC, Food Service/Other, and Refrigeration Measures, principally: Electric Air-Cooled Chillers, Air Conditioners, PTAC/PTHP, HVAC s, Air Compressors, EC Motors, Anti-Sweat Heater Controls, Refrigerated Case Lighting, DCV	Varies	kWh	Deemed	IL TRM v6.0
Non-Deemed Non-Lighting Measures with TRM Adjustment principally: Compressed Air Measures, Weather Stripping, Cool Roof,	Varies	kWh	Evaluated	Program Measure Workbook and Evaluation M&V
Verified Realization Rate on Ex Ante Gross Savings	Varies	NA	Evaluated	CY2018 Evaluation
Verified Realization Rate on Ex Ante Gross Savings	Varies	NA	Evaluated	CY2018 Evaluation
Effective Useful Life (EUL)	Varies	Years	Mixture	IL TRM v7.0 and Evaluation memo dated May 14, 2018

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

† State of Illinois Technical Reference Manual version 6.0 from <http://www.ilsag.info/technical-reference-manual.html>.

Source: ComEd tracking data and Navigant team analysis.

6.2 T12 Baseline Adjustment

ComEd provided supplemental tracking data that enabled the evaluation team to assess potential T12 baseline lighting measures. The evaluation team found that 45 percent of the savings from affected LED measures involved T12 baselines, and 22 percent of New T8/T5 Fluorescent Fixtures involved T12 baselines. The affected measures were identified as:

- Indoor and Outdoor LED Fixtures
- Indoor and Outdoor TLED (Type C)
- New T8/T5 Fixtures with Electronic Ballasts
- New T8/T5 Fluorescent Fixtures with Electronic Ballasts

The evaluation team developed T12 adjustment factors based on guidance provided in the IL TRM (v6.0):

- For fluorescent measures, the evaluation team estimated the adjustment factor to be 39 percent using an average of the savings adjustment factors in the IL TRM (v6.0).³

³ 39 percent reflects an average of the four lamp quantities and the 34W and 40W T12 lamps with EE magnetic ballasts. IL TRM v6.0, p. 362, C-1: T12 Baseline Adjustment.

- For LED measures, the IL TRM approach was modified to account for LED fixture installation instead of high-performance T8 fixtures. The evaluation team estimated the modified adjustment factor to be 56 percent.⁴

The evaluation team applied the savings adjustment factors to portions of savings from the four measure types identified above. This approach assumes that the sampled T12 content is representative of the population. We then adjusted the CPAS, which showed a 19 percent lighting CPAS drop from 2018 to 2019. For more details on these adjustments, see Table 8-8. Navigant will work with ComEd and the implementation contractor to improve on the T12 baseline data collection in CY2019.

6.3 Other Impact Findings and Recommendations

The evaluation team has developed several recommendations based on findings from the CY2018 evaluation, as follows:

6.3.1 Verified Gross Impacts and Realization Rate

Finding 1. Lighting contributed 88 percent of the verified gross savings (84 percent from LED lamps and fixtures), followed by refrigeration with 6 percent, and the remaining 6 percent spread among the other end-uses. The overall program gross realization rate was 102 percent.

Finding 2. The CY2018 program included 6,248,782 kWh savings from 100 projects that were rolled over from the previous year (PY9). The savings from these projects were based on prior year's version of the TRM (v5.0), which was since updated in v6.0 for CY2018. Changes in hours of use for warehouse building type, among other updates, resulted in verified savings of 6,288,822 kWh, which is a 101 percent gross realization rate.

Recommendation 1. Navigant recommends that savings calculations for rollover projects should use the most current and applicable TRM version. Hence, TRM (v7.0) should be used if there are 2018 rollover projects in CY2019.

6.3.2 Tracking Data

Finding 3. The IL TRM requires a baseline shift for all measures that replace T12 fluorescent lighting.⁵ Currently, ComEd does not adequately track the baseline equipment type for the retrofit or replacement of indoor LED lamps and fixtures, high or low bay LEDs, and other new T5/T8 fixtures in the eTrack system for the SBO. ComEd and the evaluation team need to be able to identify these measures to accurately calculate CPAS.

Recommendation 2. The evaluation team recommends that ComEd identifies projects with energy savings resulting from T12 replacement in the tracking data. The program implementer tracks the data, which should be migrated into ComEd's eTrack system.

Recommendation 3. The program should consider tracking details of the savings drop that may result from baseline shift from T12s or EISA compliance for omni directional LED lamps.

Finding 4. In measures involving Electronically Controlled (EC) Motor for Walk-in Cooler or Freezer; Strip Curtains for Cooler, and Strip Curtains for Freezer, we found several projects have a realization rate for kWh savings and peak demand that are not 100 percent. However,

⁴ IL-TRM_Effective_010119_v7.0_Vol_2_C&I 091318_Final (Page 421, C-1: T12 Baseline Adjustment)⁵ "There will be a baseline shift applied to all measures installed before 2019." IL TRM v6.0, p. 351.

⁵ "There will be a baseline shift applied to all measures installed before 2019." IL TRM v6.0, p. 351.

there are other projects with the same building type or savings inputs that have a realization rate of 100 percent based on the equations in the TRM.

Recommendation 4. ComEd should review the tracking data to ensure the correct use of the TRM calculations to determine kWh and peak demand savings for EC Motors and Strip Curtains for cooler and freezers.

6.3.3 Measure-Related Findings

Finding 5. Several of the discrepancies found or savings realization rate adjustments were related to the rollover projects from PY9, which had not been adjusted to use the TRM (v6.0) or benefited from the implementation of the recommendations provided in the PY9 SBES evaluation report. The evaluation team confirmed from the program workpapers that in CY2019, the program is using TRM shift hours for compressed air systems savings rather than lighting operating hours.

Finding 6. Auto Closer for Walk-in Cooler measures were assigned an ex ante peak demand savings of 0.309 kW, which is the peak demand saving value associated with the Auto Closer for Walk-in Freezer measure. Similarly, several projects for Auto Closer for Walk-in Freezer were given an ex ante peak demand savings of 0.137 kW, which is the peak demand saving value associated with the Auto Closer for Walk-in Cooler measure. The implementer made an error in switching the peak demand savings between these two measures.

Recommendation 5: ComEd should update the program tracking system to ensure the correct peak demand savings for Auto Closer for Walk-in Cooler and Freezers are recorded.

Finding 7. The ex ante savings for Variable Speed Drive on HVAC Fan or Pump LTE 5 HP used the incorrect Energy Savings Factor (ESF). The 2018 program Workbook⁶ uses an ESF value of 0.126, which corresponds to application type Cooling Water. The Small Business Offering (“SBO”) Workpaper uses the average ESF of Hot Water Pump, Chilled Water Pump, and Cooling Water, which is 0.320. The SBO Workbook incorrectly calculated the average – the “average” formula does not reference the correct cells in Excel.

Recommendation 6. Navigant has confirmed that the ESF values have changed for CY2019 per the TRM errata corrections, and expects that the CY2019 tracking database will reflect these changes.

Finding 8. The ex ante savings for Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP changes based on building type. The TRM v6.0 and Workpaper’s equation for energy savings is not dependent on building type.

Recommendation 7. Navigant recommends using the energy savings equation from the TRM and Workpaper.

Finding 9. All of the projects for LED Refrigerated Display Case Lighting show a realization rate of 122 percent. The SBO 2018 Measure Workbook shows a “WattsBASE” of 15.2 and a “WattsEE” of 7.6. The tracking data appear to use a “WattsBASE” of 16.95 and a “WattsEE” of 7.65.

Recommendation 8. Navigant recommends using the “WattsBASE” and “WattsEE” values from the SBO 2019 Measure Workbook going forward.

Finding 10. Economizer with DCV used the incorrect mapping of building type for therms savings for the Warehouse building type. The ex ante savings use the Savings Factor associated with Manufacturing for Warehouse.

⁶ SBO 2018 Measure Workbook_kWh&Therm_06192018_Nexant.xlsx

Recommendation 9. Navigant recommends using the appropriate building type mapping and savings factors in the TRM for economizer with DCVs.

7. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

7.1 Verified Gross Program Savings Analysis Approach

Navigant determined the verified gross savings for each program measure by:

1. Reviewing the savings algorithm inputs in the measure workbook for agreement with the TRM or secondary research.
2. Validating that the savings algorithm was applied correctly.
3. Cross-checking per-unit savings values in the tracking data with the verified values in the measure workbook or in Navigant's calculations if the workbook did not agree with the TRM.
4. Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

Navigant downloaded the final tracking data and measure workbook for the CY2018 impact evaluation from the ComEd Evaluation ShareFile site. We relied on the following documents to verify the per-unit savings for each program measure:

- Final PY9 tracking database file: "SBES_CY2018_Paid_EOY_Data_Rev1_20190125".
- Measure workbook of default savings: "SBO 2018 Measure Workbook_kWh&Therm_06192018_Nexant".
- ComEd SBO Workpapers "SBO Measure Workpaper_v5.0_06072018.docx".
- Illinois Technical Reference Manual (TRM v6.0) for deemed input parameters or secondary evaluation research to verify any custom inputs used in the ex ante calculations.

The ex ante kWh savings for directional, decorative, and hardwired LEDs were split 50 percent due to the SBO overlap with the Instant Discounts Program. The measures also had relatively similar incentive levels across the two programs: Navigant reduced the verified deemed kWh savings and peak demand savings for these measures by 50 percent to be consistent with the claimed kWh savings due to the overlap. The peak demand savings were adjusted 50 percent less, in cases where the overlap adjustment was not applied to ex ante demand savings.

Navigant discussed with ComEd and the implementation team how to handle rollover projects from PY9 to CY2018. Navigant directed that the rollover projects should have savings calculations using the TRM (6.0) which is applicable for CY2018 because that is the year the projects completed. Based on updates in TRM (v6.0) from (v5.0), the savings for the rollover projects were impacted. For instance, hours of use for the warehouse building type changed from 5,087 hours to 5,242 hours. This contributed to increased gross realization rate for the rollover projects, as shown in Table 8-2.

7.2 Verified Net Program Savings Analysis Approach

Navigant 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 CY2018, the NTG ratio estimates used to calculate the net verified savings were based on past evaluation research and defined by a consensus process through SAG, as documented in a spreadsheet.⁷

⁷ Source: ComEd tracking data and Navigant team analysis. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

8. APPENDIX 2. IMPACT ANALYSIS DETAIL

8.1 Program Savings by Channel and Project Type

Table 8-1 presents program net savings by program channel. The traditional (Basic) small business offers contributed 97 percent of the net savings, followed by two percent from AC Replacement promotions.

Table 8-1 Program Savings by Project Type

Project Type	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net kWh Savings	Verified Net Peak Demand Reduction (kW)
AC Replacement	4,905,353	0.99	4,846,160	721	0.91	4,410,006	656
Basic SBES	206,686,589	1.02	210,560,685	33,731	0.91	191,610,223	30,695
RTU Promotion	32,275	1.00	32,275	5	0.91	29,370	4
Summer Campaign	993,116	1.01	1,003,992	191	0.91	913,633	174
Total	212,617,333	1.02	216,443,112	34,647	0.91	196,963,232	31,529

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Source: ComEd tracking data and Navigant team analysis.

In Table 8-2 we show the verified savings from the rollover measures from PY9. The verified gross realization rate was 101 percent.

Table 8-2 Rollover Project Savings from PY9 Counted Towards CY2018

Project Type	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net kWh Savings	Verified Net Peak Demand Reduction (kW)
Weather Stripping	636	1.00	636	0.0	0.91	579	0.0
HVAC	241,556	0.90	218,010	12.9	0.91	198,389	11.7
Lighting	5,850,647	1.01	5,896,506	804.8	0.91	5,365,821	732.4
Kitchen Fan_DCV	26,916	1.11	29,796	4.1	0.91	27,114	3.7
Refrigeration	113,178	1.25	141,617	7.0	0.91	128,871	6.3
Thermostat	14,841	0.09	1,340	0.0	0.91	1,219	0.0
Water Efficiency (Faucet Aerators)	1,008	0.91	917	2.0	0.91	834	1.8
Total	6,248,782	1.01	6,288,822	830.7	0.91	5,722,828	755.9

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Source: ComEd tracking data and Navigant team analysis.

Table 8-3 shows the program savings breakdown by direct install versus the prescriptive paths. Direct install measures included showerheads, bathroom and kitchen faucet aerators, smart strips, high efficiency nozzles, snack machines and pre-spray valves. The direct install projects contributed less than one percent of the net savings.

Table 8-3 Program Savings by Direct Install and Prescriptive Install

Project Type	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net kWh Savings	Verified Net Peak Demand Reduction (kW)
Direct Install	1,487,807	0.99	1,492,635	140	0.91	1,358,298	127
Prescriptive	211,129,526	1.02	214,950,477	34,508	0.91	195,604,934	31,402
Total	212,617,333	1.02	216,443,112	34,647	0.91	196,963,232	31,529

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Source: ComEd tracking data and Navigant team analysis.

8.2 Measure Level Details

The following section analyses the differences between the ex ante and verified savings estimates for some measures that had Navigant adjusted savings. The findings and recommendations were presented in Section 6.

8.2.1 Lighting

Lighting measures have an overall savings realization rate of 102 percent. Rollover projects from PY9 from warehouse building had their savings adjusted upward due to changes in hours of operation in CY2018.

Table 8-4 Lighting Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
3-Foot T8 Lamp and Ballast	Lamp	3	1.00	116	1.00	0.0	15.0
4-Foot T8 Lamp and Ballast	Lamp	8	1.03	531	1.00	0.1	15.0
400WMH to 6L 4F T8 Fixture with Fixture Mounted Occupancy Sensor	Each	57	1.00	59,903	1.00	19.1	12.2
8-Foot T12 Lamp to Two 4-Foot T8 Lamps and Ballast	Lamp	4	1.03	258	1.00	0.1	15.0
Advanced Lighting Controls	Watt Controlled	6,523	1.00	9,634	1.00	3.7	8.0
Daylighting Controls	Watt Controlled	2,414	1.01	1,453	1.00	0.4	8.0
Dimming Technology	Watt Controlled	68,739	1.00	87,017	1.02	16.0	8.0
Fixture-Mounted Occupancy Sensor	Each	19,899	1.00	3,467,306	1.00	2,141.2	8.0
LED Decorative	Each	3,174	1.01	120,020	0.99	28.2	12.2
LED Directional MR	Each	849	1.00	66,310	1.00	14.6	12.2
LED Directional PAR 17	Each	23	1.00	2,112	1.00	0.4	12.2
LED Directional PAR 20	Each	763	1.00	57,871	1.00	11.3	12.2
LED Directional PAR 30	Each	3,404	1.00	272,161	1.00	57.2	12.2
LED Directional PAR 38	Each	2,839	0.95	291,932	0.95	66.0	12.2
LED Directional R/BR	Each	5,149	1.00	348,448	1.00	78.6	12.2
LED Fixtures	Watt Reduced	24,889,593	1.00	96,805,486	1.00	19,175.5	12.2
LED Omnidirectional	Each	13,449	1.00	1,560,821	1.00	372.2	12.2
LED Refrigerated Display Case Lighting	Lamp	4,077	1.22	1,549,472	1.21	184.3	12.2
New T8/T5 Fixtures with Electronic Ballasts	Watt Reduced	18,076	1.00	76,758	1.00	14.1	15.0
Occupancy Sensors Plus Daylighting Controls	Watt Controlled	28,990	1.00	47,346	1.00	7.7	8.0
Occupancy Sensors with Dimming Technology	Watt Controlled	81,128	1.00	125,838	1.00	19.9	8.0
Outdoor: LED Channel Sign LTE 2 Feet	Letter	25	1.00	3,736	0.00	0.0	15.0
Outdoor: LED Fixtures	Watt Reduced	12,206,907	1.07	54,463,924	1.00	0.0	15.0
Outdoor: Occupancy Sensors Plus Daylighting Controls	Watt Controlled	95	1.00	154	1.00	0.0	8.0
Outdoor: Photocell with Time Clock	Watt Controlled	69,988	1.12	92,777	1.00	0.0	8.0
Outdoor: Photocells	Watt Controlled	699,240	1.00	178,166	1.00	0.0	8.0
Outdoor: Time Clocks for Lighting	Watt Controlled	19,593	1.16	20,980	1.00	0.0	8.0
Outdoor: TLED (Type C)	Watt Reduced	6,430	1.24	28,688	1.00	0.0	15.0
Remote-Mounted Occupancy Sensor	Each	11,039	1.00	4,670,663	1.00	2,855.8	8.0
TLED (Type C)	Watt Reduced	2,384,641	1.00	9,234,957	1.00	1,837.2	15.0
Wall Mounted Occupancy Sensor	Each	132	1.00	45,001	0.63	30.6	8.0

Source: ComEd tracking data and Navigant team analysis.

Rollover projects from PY9, the building type “Warehouse” - (ex: SBES9_46427) were adjusted from 5,087 (TRM v5.0) to the TRM (v6.0), which is 5,242 hours.

A portion of projects for some measures (Outdoor: LED Fixtures, Outdoor: Photocell with Time Clock, Outdoor: Time Clocks for Lighting, Outdoor: TLED (Type C), and ENERGY STAR Solid or Glass Door Refrigerator) have a realization rate that is not 100 percent. There are projects within each of these measures that have a realization rate of 100 percent.

8.2.2 Refrigeration

Refrigeration measures have an overall savings realization rate of 100 percent.

Table 8-5 Refrigeration Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	Linear Foot	10,354	100%	5,628,053	100%	0.0	12
Auto Closer for Walk-in Cooler	Each	265	100%	227,404	98%	33.0	8
Auto Closer for Walk-in Freezer	Each	39	100%	81,875	101%	11.0	8
Direct Install: Beverage Machine Controls	Each	107	100%	157,052	100%	0.0	5
Direct Install: Reach-in (Novelty) Cooler Controls	Each	114	100%	125,495	100%	0.0	5
Direct Install: Snack Machine Controls	Each	2	100%	624	100%	0.0	5
EC Motor for Reach-in Cooler or Freezer	Motor	126	100%	195,209	100%	22.3	15
EC Motor for Walk-in Cooler or Freezer	Motor	235	102%	364,080	102%	41.6	15
EC Motor with Evaporator Fan Controls for Walk-in Cooler and Freezer	Motor	3,129	100%	6,289,885	100%	726.1	15
ENERGY STAR Solid Door Freezer	Each	6	100%	4,747	100%	0.5	12
ENERGY STAR Solid or Glass Door Refrigerator	Each	6	71%	3,196	72%	0.4	12
Evaporator Fan Controls for walk-in coolers	Motor	20	117%	30,889	116%	3.5	16
Night Covers-Vertical Open; Remote Condensing; Medium Temperature - 35° F to 55°	Linear Foot	472	100%	82,253	100%	0.0	5
Strip Curtains for Cooler	Door	571	102%	205,701	102%	23.5	6
Strip Curtains for Freezer	Door	163	99%	212,459	99%	24.2	6

Source: ComEd tracking data and Navigant team analysis.

LED Refrigerated Display Case Lighting - All of the projects show a realization rate of 122 percent. The SBO 2018 Measure Workbook shows a “WattsBASE” of 15.2 and a “WattsEE” of 7.6. The Wave 1 Data showed a “WattsBASE” of 16.95 and a “WattsEE” of 7.65. Navigant recommends using the “WattsBASE” and “WattsEE” values from the SBO 2018 Measure Workbook.

Several projects for Auto Closer for Walk-in Cooler have an ex ante peak demand savings of 0.309 kW, which is actually the peak demand saving value associated with the Auto Closer for Walk-in Freezer measure. Similarly, several projects for Auto Closer for Walk-in Freezer have an ex ante peak demand savings of 0.137 kW, which is the peak demand saving value associated with the Auto Closer for Walk-in Cooler measure. The implementer made an error in switching the peak demand savings between these two measures.

For the EC Motor for Walk-in Cooler or Freezer; Strip Curtains for Cooler, Strip Curtains for Freezer we found several projects have a realization rate for kWh savings and peak demand that are not 100 percent. However, there are other projects with the same building type or savings inputs that have a realization rate of 100 percent based on the equations in the TRM.

8.2.3 HVAC

HVAC measures have an overall savings realization rate of 96 percent.

Table 8-6 HVAC Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Cool Roof	Square Foot	15,000	1.00	4,078	1.00	6.1	20
Direct Install: Smart Strip	Each	5,081	1.01	502,023	0.00	0.0	7
Early Replacement for Air Cooled AC (GT 5 ton and LTE 10 ton)	Ton	3,699	1.00	629,783	1.00	314.5	15
Early Replacement for Air Cooled AC (GT10 ton and LTE 20 ton)	Ton	1,504	1.00	219,697	1.00	106.2	15
Early Replacement for Air Cooled AC (LTE 5 ton)	Ton	1,168	1.00	175,071	1.00	87.9	15
Economizer with DCV	Ton	12,977	0.99	10,959,173	1.00	0.0	15
End of Life Replacement for Air Cooled AC (GT 10 ton to LTE 20 ton)	Ton	25	1.00	1,247	1.00	0.6	15
End of Life Replacement for Air Cooled AC (GT 5 ton and LTE 10 ton)	Ton	6	1.00	444	1.00	0.2	15
End of Life Replacement for Air Cooled AC (LTE 5 ton)	Ton	12	1.00	1,176	1.00	0.6	15
High Frequency Battery Charger	Each	9	1.00	57,832	1.00	0.5	15
Restroom Exhaust Fan Occupancy Sensor	Fan	2,885	1.00	452,370	1.01	61.1	8
Variable Speed Drive on HVAC Fan or Pump LTE 5 HP	Horsepower	1,155	0.42	226,181	1.00	166.1	15
Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP	Horsepower	24	0.92	30,641	0.98	2.1	15

Source: ComEd tracking data and Navigant team analysis.

Variable Speed Drive on HVAC Fan or Pump LTE 5 HP - The ex ante savings uses the incorrect Energy Savings Factor (ESF). The SBO Workbook uses ESF value of 0.126, which corresponds to application type “Cooling Water”. The SBO Workpaper uses the average ESF of Hot Water Pump, Chilled Water Pump, and Cooling Water, which is 0.320. The SBO Workbook incorrectly calculates the average – the “average” formula does not reference? to the correct cells in Excel.

Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP - The ex ante savings changes based on building type in TRM v5.0?. The TRM v6.0 and Workpaper’s equation for energy savings is not dependent on building type.

Economizer with DCV -The ex ante therms savings use the incorrect mapping of building type for Warehouse. The ex ante savings use the Savings Factor associated with Manufacturing for Warehouse.

8.2.4 Compressed Air

Compressed air measures have an overall savings realization rate of 94 percent.

Table 8-7 Compressed Air Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Air Compressors with Integrated VSD LTE 40 HP	Horsepower	2,020	1.00	1,209,550	1.00	290.8	13
Compressed Air Leak Repair	Horsepower	3,947	0.75	511,149	1.00	1,730.5	2
Direct Install: High-Efficiency Air Nozzles	Each	1,760	1.00	441,959	1.00	106.2	15
Efficient Refrigerated CA Dryer	CFM	1,015	1.00	3,186	1.00	0.8	13
No-Loss Condensate Drains	Each	304	1.00	350,943	1.00	84.4	10

Source: ComEd tracking data and Navigant team analysis.

Incorrect Hours of Use - The ex ante savings for Compressed Air Leak Repair uses an incorrect hour of use. The kWh savings for this measure does not vary based on building type. The SBO Measure Workbook calculates savings using the “screw-based bulb annual operating hours.”

8.2.5 T12 Adjustment Factor Details

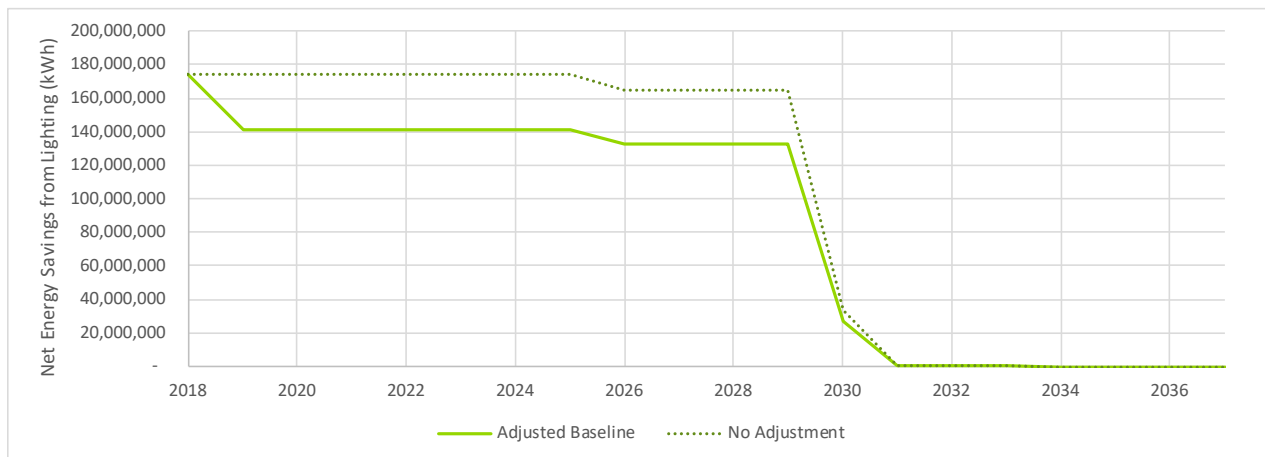
In Table 8-8 and Figure 8-1, the evaluation team presents the results from analysis of supplemental tracking data that contained additional details about the baseline and installed equipment. This analysis was used to develop the T12 portion factors that were applied in tandem with the savings adjustment factors discussed in Section 6.2.. For measures that did not have the additional data available, the evaluation team applied T12 portion factors for similar lighting. We estimated a reduction of 32,564,613 net kWh resulting from the T12 baseline adjustment, which is a 19 percent drop in total lighting CPAS, and a 17 percent drop in the total program CPAS electric from 2018 to 2019 baseline shift.

Table 8-8. T12 Adjustment Factor Details (kWh Gross -Electric only)

Measure Name	Sample			Population			
	Verified Energy Savings From All Baselines (kWh)	Verified Energy Savings, T12 Baselines (kWh)	T12 Portion of Sample	Verified Energy Savings From All Baselines (kWh)	Verified Energy Savings, T12 Baselines (kWh)	Savings Adjustment Factor	Verified Second Year Energy Savings (kWh)
LED Lamps and Fixtures	155,575,264	69,844,283	45%	181,101,320	81,304,003	56%	145,327,559
Linear T8 and T5 Lamps and Ballast	72,530	16,070	22%	85,295	18,898	39%	73,767
Total	155,647,795	69,860,353	45%	181,186,615	81,322,901	56%	145,401,326

Source: ComEd tracking data and Navigant team analysis.

Figure 8-1. Comparison of T12 Adjusted Baseline and CPAS Degradation



Source: ComEd tracking data and Navigant team analysis.

9. APPENDIX 3. TOTAL RESOURCE COST DETAIL

Table 9-1, below, shows the Total Resource Cost (TRC) table. It includes only the 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 evaluation later.

Table 9-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	Effective Useful Life	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Savings Therms	Gross Heating Penalty (kWh)	Gross Heating Penalty (Therms)	NTG Ratio (kWh)	NTG Ratio (kW)	NTG Ratio (Therms)	Verified Net Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Savings Therms	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Compressed Air	Air Compressors with Integrated VSD LTE 40 HP	Horsepower	2,020	10.0	1,329,176	319.5	-	NA	-	0.91	0.91	0.91	1,209,550	290.8	-	NA	-
Compressed Air	Compressed Air Leak Repair	Horsepower	3,947	2.0	561,702	1,901.7	-	NA	-	0.91	0.91	0.91	511,149	1,730.5	-	NA	-
Compressed Air	Efficient Refrigerated CA Dryer	CFM	1,015	10.0	3,501	0.8	-	NA	-	0.91	0.91	0.91	3,186	0.8	-	NA	-
Compressed Air	High-Efficiency Air Nozzles	Each	1,760	15.0	485,669	116.8	-	NA	-	0.91	0.91	0.91	441,959	106.2	-	NA	-
Compressed Air	No-Loss Condensate Drains	Each	304	10.0	385,652	92.7	-	NA	-	0.91	0.91	0.91	350,943	84.4	-	NA	-
Shell	Weather Stripping	Door	538	20.0	7,438	-	26,676	NA	-	0.91	0.91	0.91	6,769	-	24,275	NA	-
HVAC	Battery Charger	Each	9	15.0	63,552	0.5	-	NA	-	0.91	0.91	0.91	57,832	0.5	-	NA	-
HVAC	Cool Roof	Square Foot	15,000	20.0	4,481	6.8	-	NA	-	0.91	0.91	0.91	4,078	6.1	-	NA	-
HVAC	Early Replacement for Air Cooled AC	Ton	6,370	15.0	1,125,880	558.9	-	NA	-	0.91	0.91	0.91	1,024,551	508.6	-	NA	-
HVAC	Economizer with DCV	Ton	12,977	10.0	4,712,230	-	228,695	NA	-	0.91	0.91	0.91	4,288,129	-	208,112	NA	-
HVAC	End of Life Replacement for Air Cooled AC	Ton	44	15.0	3,151	1.6	-	NA	-	0.91	0.91	0.91	2,867	1.4	-	NA	-
HVAC	Restroom Exhaust Fan Occupancy Sensor	Fan	2,885	8.0	497,110	67.1	-	NA	-	0.91	0.91	0.91	452,370	61.1	-	NA	-
HVAC	Smart Strip - Tier 1	Each	5,081	7.0	551,674	-	-	NA	-	0.91	0.91	0.91	502,023	-	-	NA	-
HVAC	Variable Speed Drive on HVAC	Horsepower	1,333	15.0	316,976	209.1	-	NA	-	0.91	0.91	0.91	288,448	190.2	-	NA	-
Food Service Equipment	Kitchen Fan with DCV	Each	23	15.0	114,218	15.6	105,515	NA	-	0.91	0.91	0.91	103,938	14.2	96,019	NA	-
Lighting	Induction and MH Fixtures	Each	57	12.2	65,827	21.0	-	NA	(430)	0.91	0.91	0.91	59,903	19.1	-	NA	(391)
Lighting	LED Channel Sign	Letter	25	15.0	4,106	-	-	NA	(4,106)	0.91	0.91	0.91	3,736	-	-	NA	(3,737)
Lighting	LED Exit Signs	Sign	2,565	16.0	264,328	71.0	-	NA	(3,785)	0.91	0.91	0.91	240,538	64.6	-	NA	(3,444)
Lighting	LED Lamps and Fixtures*	Watt Reduced	39,521,298	12.2	181,101,320	24,674.7	-	NA	(1,732,981)	0.91	0.91	0.91	164,802,201	22,454.0	-	NA	(1,577,013)
Lighting	Lighting Controls	Watt Controlled	1,007,781	8.0	9,611,359	5,577.3	-	NA	(452,970)	0.91	0.91	0.91	8,746,337	5,075.3	-	NA	(412,203)
Lighting	Linear T8 and T5 Lamps and Ballast*	Lamp	18,091	15.0	85,295	15.7	-	NA	(1,064)	0.91	0.91	0.91	77,618	14.3	-	NA	(968)
Refrigeration	Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	Linear Foot	10,354	12.0	6,184,674	-	-	NA	-	0.91	0.91	0.91	5,628,053	-	-	NA	-
Refrigeration	Auto Closer for Walk-in Cooler or Freezer	Each	304	8.0	339,868	48.4	-	NA	-	0.91	0.91	0.91	309,280	44.0	-	NA	-
Refrigeration	Beverage, Snack and Cooler Machine Controls	Each	223	5.0	311,177	-	-	NA	-	0.91	0.91	0.91	283,171	-	-	NA	-
Refrigeration	EC Motor for Cooler or Freezer	Motor	3,490	15.0	7,526,564	868.1	-	NA	-	0.91	0.91	0.91	6,849,173	789.9	-	NA	-
Refrigeration	ENERGY STAR Solid or Glass Door Refrigerator or Freezer	Each	12	12.0	8,728	0.9	-	NA	-	0.91	0.91	0.91	7,942	0.8	-	NA	-
Refrigeration	Evaporator Fan Controls for walk-in or reach-in coolers	Motor	20	16.0	33,944	3.9	-	NA	-	0.91	0.91	0.91	30,889	3.5	-	NA	-
Refrigeration	Night Covers	Linear Foot	472	5.0	90,388	-	-	NA	-	0.91	0.91	0.91	82,253	-	-	NA	-
Refrigeration	Strip Curtains for Cooler or Freezer	Door	734	4.0	459,516	52.4	-	NA	-	0.91	0.91	0.91	418,160	47.7	-	NA	-
Thermostats	Thermostat	Each	720	4.0	49,494	-	6,343	NA	-	0.91	0.91	0.91	45,040	-	5,772	NA	-
Water	Bathroom and Kitchen Faucet Aerators	Each	959	9.0	89,795	18.1	-	NA	-	0.91	0.91	0.91	81,713	16.4	-	NA	-
Water	High Efficiency Pre-Rinse Spray Valve	Each	5	5.0	13,852	-	-	NA	-	0.91	0.91	0.91	12,605	-	-	NA	-
Water	Showerhead - Low Flow	Each	118	10.0	40,467	5.01	-	NA	-	0.91	0.91	0.91	36,825	4.6	-	NA	-

* There is a baseline shift in 2019 for all lighting measures that use T12 as the baseline fixture type. For additional information on this adjustment, see Section 6.2.

Source: ComEd tracking data and Navigant team analysis.