NAVIGANT

ComEd Income Eligible Retrofits Multi-Family Program Impact Evaluation Report

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

Presented to
ComEd

FINAL

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2018 Income Eligible Retrofits Multi-Family Program. 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 Income Eligible Retrofits Multi-Family (IER-MF) Program offers direct installation of energy efficiency measures and replacement of inefficient equipment as well as educational information to further save money on energy bills. Eligible measures include LEDs and energy efficient lighting retrofits, programmable thermostats, advanced power strips, water efficiency devices, weatherization measures, pipe insulation, and heating, cooling and refrigeration equipment.

The IER-MF Program is jointly administered by ComEd, Peoples Gas (PGL) and North Shore Gas (NSG) companies, and Nicor Gas. The program is implemented by Resource Innovations (RI) and leverages the Illinois Home Weatherization Assistance Program (IHWAP). The program provides retrofits in both common areas (CA) and tenant spaces and serves as a "one stop shop" for multi-family building owners and managers whose buildings are targeted to income eligible residents.

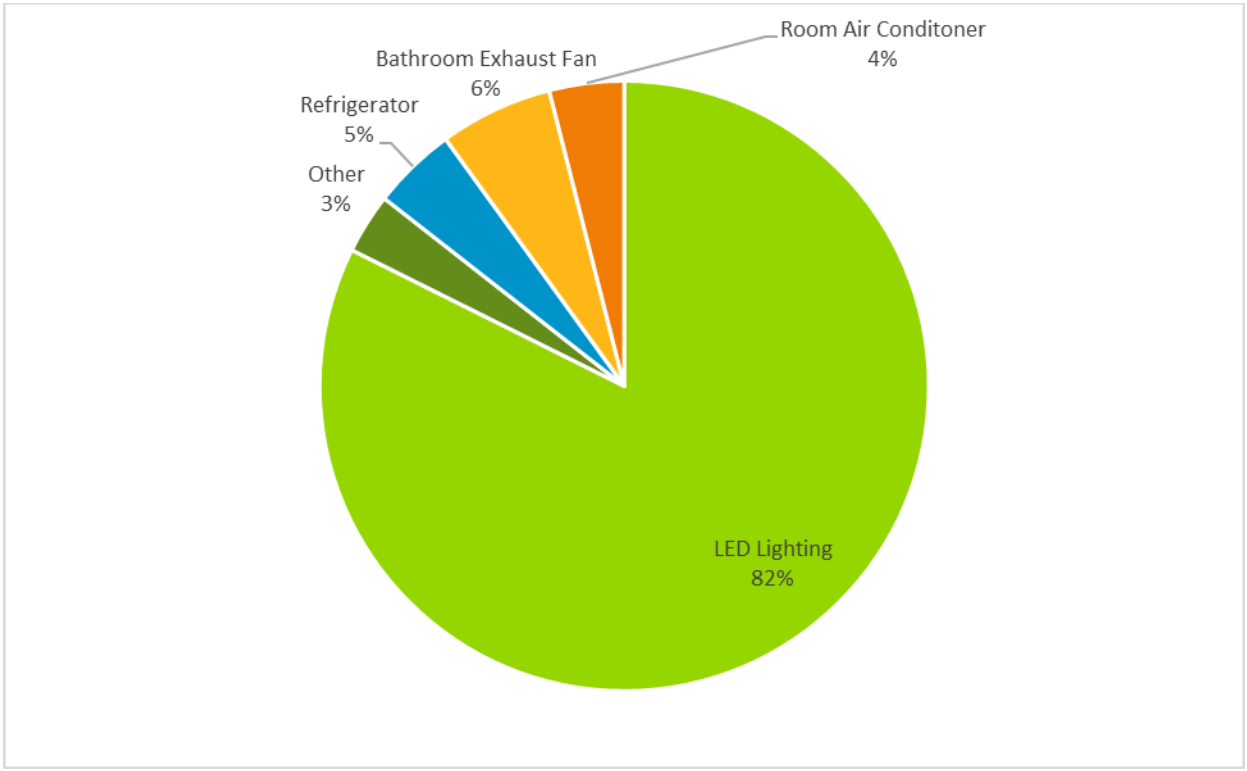
The program had 79 participants in CY2018 and distributed 5,820 measures, as shown in the following table and graph. LED bulbs comprised of 82% of the measure mix, followed by bathroom exhaust fans, which contributed 6% of the total measures. Room air conditioners represented 4% of the measures installed while the remaining 8% comprised of refrigerators, central air conditioning, heat pumps, air sealing, packaged terminal air conditioners (PTAC) or packaged terminal heat pumps (PTHP), programmable thermostats, bathroom aerators, attic insulation and custom measures.

Table 2-1. CY2018 Volumetric Findings Detail

Participation	Resource Innovation
Participants*	79
Total Measures	5,820
Installed Projects	143

*Participants comprise of distinct last name and property addresses (including apartment numbers)
Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. Number of Measures Installed by Type



Source: ComEd tracking data and Navigant team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the IER-MF Program achieved in CY2018. The gas savings are only those that the gas utilities are not claiming and ComEd can claim.[1]

[1] The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary 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	633,268	NA	111.92
Program Gross Realization Rate	0.99	NA	1.00
Verified Gross Savings	628,175	468.15	112.05
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	628,175	468.15	112.05
Converted from Gas*			
Ex Ante Gross Savings	132,895	NA	NA
Program Gross Realization Rate	0.94	NA	NA
Verified Gross Savings	124,465	NA	NA
Program Net-to-Gross Ratio (NTG)	1.00	NA	NA
Verified Net Savings	124,465	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	766,163	NA	111.92
Program Gross Realization Rate	0.98	NA	1.00
Verified Gross Savings	752,640	468.15	112.05
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	752,640	468.15	112.05

* Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).
NA = Not Available
Note: The coincident Summer Peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June through August.
Source: ComEd tracking data and Navigant team analysis.

4. Cumulative Persisting Annual Savings

The measure-specific and total verified gross savings for the IER-MF Program 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 installed as a part of the program in CY2018 is 628,175 kWh. The program achieved 124,465 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd's goal[2] (the middle table in the following set of tables). Adding the savings converted from gas savings to the electric savings produces a total of 752,640 kWh of total CPAS.

Navigant applied the Illinois Technical Reference Manual version 6.0 (IL TRM v6.0) deemed Energy Independence and Security Act (EISA) baseline adjustment for LED lamps starting in 2021 and respective baseline shifts for early replacement measures. The EISA baseline shift only applies to LED omnidirectional bulbs.

[2] The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary Report.

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
Lighting	LED Indoor Specialty	10.0	32,465	1.00	324,652	32,465	32,465	32,465	32,465	32,465	32,465	32,465	32,465	32,465
Hot Water	Bathroom Aerator Gas	9.0	0	1.00	-									
Hot Water	Bathroom Aerator Electric	9.0	300	1.00	2,703	300	300	300	300	300	300	300	300	300
Custom	Custom	15.0	196,610	1.00	2,949,152	196,610	196,610	196,610	196,610	196,610	196,610	196,610	196,610	196,610
Shell	Custom - Air Sealing	15.0	0	1.00	-									
HVAC	Custom - Room Air Conditioner	9.0	3,806	1.00	34,252	3,806	3,806	3,806	3,806	3,806	3,806	3,806	3,806	3,806
HVAC	Custom - PTAC/PTHP	15.0	13,319	1.00	89,237	13,319	13,319	13,319	13,319	13,319	2,264	2,264	2,264	2,264
HVAC	Custom - Heat Pump	15.0	7,043	1.00	105,651	7,043	7,043	7,043	7,043	7,043	7,043	7,043	7,043	7,043
Shell	Attic Insulation	25.0	14,471	1.00	361,777	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471
Appliance	Refrigerator	12.0	108,446	1.00	525,928	108,446	108,446	108,446	108,446	11,518	11,518	11,518	11,518	11,518
HVAC	Bathroom Exhaust Fan	19.0	31,003	1.00	589,056	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003
HVAC	Central Air Conditioning	18.0	32,223	1.00	290,023	32,223	32,223	32,223	32,223	32,223	32,223	8,057	8,057	8,057
Hot Water	Hot Water Pipe Insulation	15.0	0	1.00	-									
Shell	Air Sealing	15.0	12,538	1.00	188,075	12,538	12,538	12,538	12,538	12,538	12,538	12,538	12,538	12,538
Appliance	Room Air Conditoner	12.0	22,917	1.00	122,438	22,917	22,917	22,917	22,917	3,846	3,846	3,846	3,846	3,846
Lighting	LED Indoor Standard	10.0	4,441	1.00	44,410	4,441	4,441	4,441	4,441	4,441	4,441	4,441	4,441	4,441
Lighting	LED Indoor Standard (Incandescent)	10.0	133,798	1.00	657,080	133,798	133,798	133,798	36,527	36,527	36,527	36,527	36,527	36,527
Lighting	LED Outdoor Standard	6.1	4,749	1.00	28,966	4,749	4,749	4,749	4,749	4,749	4,749	475		
HVAC	Programmable Thermostat	5.0	10,045	1.00	50,224	10,045	10,045	10,045	10,045	10,045				
CY2018 Program Total Electric CPAS			628,175		6,363,624	628,175	628,175	628,175	530,904	414,905	393,805	365,365	364,890	364,890
CY2018 Program Expiring Electric Savings‡							-	-	97,271	213,270	234,370	262,809	263,284	263,284

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED Indoor Specialty	32,465											
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom	196,610	196,610	196,610	196,610	196,610	196,610						
Shell	Custom - Air Sealing												
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP	2,264	2,264	2,264	2,264	2,264	2,264						
HVAC	Custom - Heat Pump	7,043	7,043	7,043	7,043	7,043	7,043						
Shell	Attic Insulation	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471	14,471
Appliance	Refrigerator	11,518	11,518	11,518									
HVAC	Bathroom Exhaust Fan	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003		
HVAC	Central Air Conditioning	8,057	8,057	8,057	8,057	8,057	8,057	8,057	8,057	8,057			
Hot Water	Hot Water Pipe Insulation												
Shell	Air Sealing	12,538	12,538	12,538	12,538	12,538	12,538						
Appliance	Room Air Conditoner	3,846	3,846	3,846									
Lighting	LED Indoor Standard	4,441											
Lighting	LED Indoor Standard (Incandescent)	36,527											
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total Electric CPAS		360,784	287,351	287,351	271,987	271,987	271,987	53,531	53,531	53,531	45,474	14,471	14,471
CY2018 Program Expiring Electric Savings‡		267,390	340,823	340,823	356,188	356,188	356,188	574,643	574,643	574,643	582,700	613,703	613,703

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Lighting	LED Indoor Specialty												
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom												
Shell	Custom - Air Sealing												
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP												
HVAC	Custom - Heat Pump												
Shell	Attic Insulation	14,471	14,471	14,471	14,471								
Appliance	Refrigerator												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning												
Hot Water	Hot Water Pipe Insulation												
Shell	Air Sealing												
Appliance	Room Air Conditoner												
Lighting	LED Indoor Standard												
Lighting	LED Indoor Standard (Incandescent)												
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total Electric CPAS		14,471	14,471	14,471	14,471	-	-	-	-	-	-	-	-
CY2018 Program Expiring Electric Savings‡		613,703	613,703	613,703	613,703	628,175	628,175	628,175	628,175	628,175	628,175	628,175	628,175

Note: The green highlighted cell shows program total first year electric savings.
* 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
Lighting	LED Indoor Specialty	10.0	-	1.0	-									
Hot Water	Bathroom Aerator Gas	9.0	16	1.0	146	16	16	16	16	16	16	16	16	16
Hot Water	Bathroom Aerator Electric	9.0	-	1.0	-									
Custom	Custom	15.0	-	1.0	-									
Shell	Custom - Air Sealing	15.0	1,908	1.0	28,613	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908
HVAC	Custom - Room Air Conditioner	9.0	-	1.0	-									
HVAC	Custom - PTAC/PTHP	15.0	-	1.0	-									
HVAC	Custom - Heat Pump	15.0	-	1.0	-									
Shell	Attic Insulation	25.0	2,151	1.0	53,773	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151
Appliance	Refrigerator	12.0	-	1.0	-									
HVAC	Bathroom Exhaust Fan	19.0	-	1.0	-									
HVAC	Central Air Conditioning	18.0	-	1.0	-									
Hot Water	Hot Water Pipe Insulation	15.0	172	1.0	2,577	172	172	172	172	172	172	172	172	172
Shell	Air Sealing	15.0	-	1.0	-									
Appliance	Room Air Conditoner	12.0	-	1.0	-									
Lighting	LED Indoor Standard	10.0	-	1.0	-									
Lighting	LED Indoor Standard (Incandescent)	10.0	-	1.0	-									
Lighting	LED Outdoor Standard	6.1	-	1.0	-									
HVAC	Programmable Thermostat	5	-	1	-									
CY2018 Program Total Gas CPAS (Therms)			4,247		85,109	4,247	4,247	4,247	4,247	4,247	4,247	4,247	4,247	4,247
CY2018 Program Total Gas CPAS (kWh Equivalent)‡					2,494,555	124,465	124,465	124,465	124,465	124,465	124,465	124,465	124,465	124,465
CY2018 Program Expiring Gas Savings (Therms)§							-	-	-	-	-	-	-	-
CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§							-	-	-	-	-	-	-	-

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED Indoor Specialty												
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom												
Shell	Custom - Air Sealing	1,908	1,908	1,908	1,908	1,908	1,908						
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP												
HVAC	Custom - Heat Pump												
Shell	Attic Insulation	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151	2,151
Appliance	Refrigerator												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning												
Hot Water	Hot Water Pipe Insulation	172	172	172	172	172	172						
Shell	Air Sealing												
Appliance	Room Air Conditoner												
Lighting	LED Indoor Standard												
Lighting	LED Indoor Standard (Incandescent)												
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total Gas CPAS (Therms)		4,230	4,230	4,230	4,230	4,230	4,230	2,151	2,151	2,151	2,151	2,151	2,151
CY2018 Program Total Gas CPAS (kWh Equivalent)‡		123,989	123,989	123,989	123,989	123,989	123,989	63,043	63,043	63,043	63,043	63,043	63,043
CY2018 Program Expiring Gas Savings (Therms)§		16	16	16	16	16	16	2,096	2,096	2,096	2,096	2,096	2,096
CY2018 Program Expiring Gas Savings (kWh Equivale		476	476	476	476	476	476	61,422	61,422	61,422	61,422	61,422	61,422

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Lighting	LED Indoor Specialty												
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom												
Shell	Custom - Air Sealing												
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP												
HVAC	Custom - Heat Pump												
Shell	Attic Insulation	2,151	2,151	2,151	2,151								
Appliance	Refrigerator												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning												
Hot Water	Hot Water Pipe Insulation												
Shell	Air Sealing												
Appliance	Room Air Conditoner												
Lighting	LED Indoor Standard												
Lighting	LED Indoor Standard (Incandescent)												
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total Gas CPAS (Therms)		2,151	2,151	2,151	2,151	-	-	-	-	-	-	-	-
CY2018 Program Total Gas CPAS (kWh Equivalent)‡		63,043	63,043	63,043	63,043	-	-	-	-	-	-	-	-
CY2018 Program Expiring Gas Savings (Therms)§		2,096	2,096	2,096	2,096	4,247	4,247	4,247	4,247	4,247	4,247	4,247	4,247
CY2018 Program Expiring Gas Savings (kWh Equivale		61,422	61,422	61,422	61,422	124,465	124,465	124,465	124,465	124,465	124,465	124,465	124,465

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

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

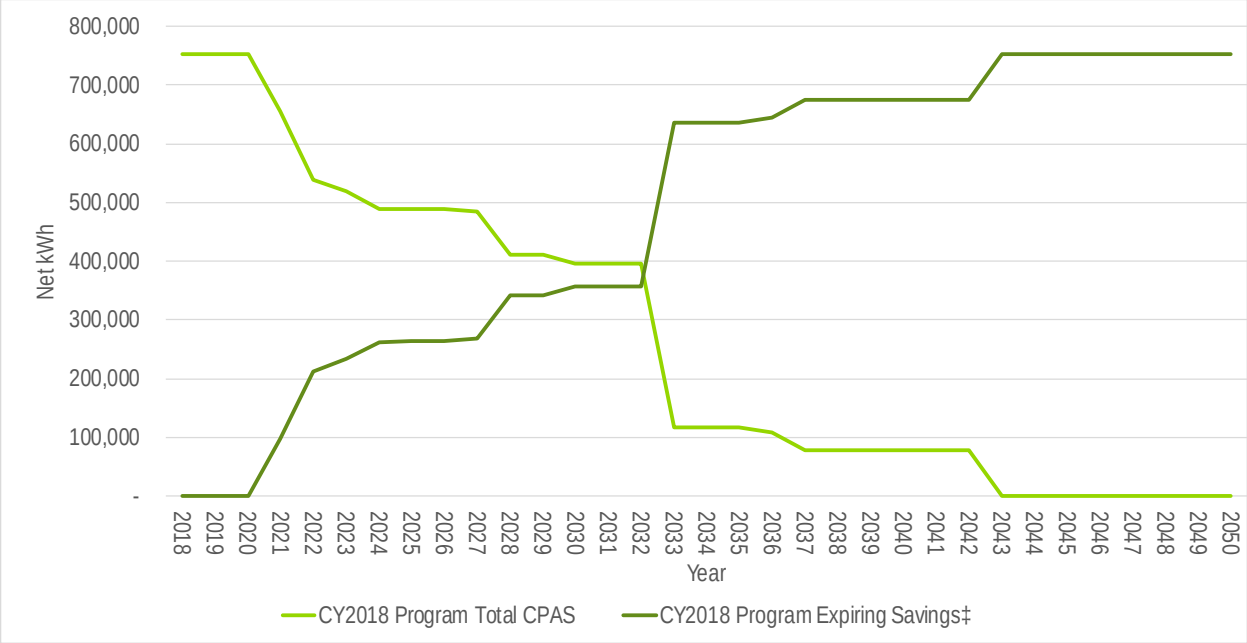
End Use Type	Research Category	EUL	CY2018 Verified Gross Savings	NTG*	Lifetime Net Savings†	Verified Net kWh Savings (Including Those Converted from Gas Savings)								
						2018	2019	2020	2021	2022	2023	2024	2025	2026
Lighting	LED Indoor Specialty	10.0	32,465.2	1.0	324,652	32,465	32,465	32,465	32,465	32,465	32,465	32,465	32,465	32,465
Hot Water	Bathroom Aerator Gas	9.0	476.3	1.0	4,287	476	476	476	476	476	476	476	476	476
Hot Water	Bathroom Aerator Electric	9.0	300.3	1.0	2,703	300	300	300	300	300	300	300	300	300
Custom	Custom	15.0	196,610.1	1.0	2,949,152	196,610	196,610	196,610	196,610	196,610	196,610	196,610	196,610	196,610
Shell	Custom - Air Sealing	15.0	55,909.7	1.0	838,646	55,910	55,910	55,910	55,910	55,910	55,910	55,910	55,910	55,910
HVAC	Custom - Room Air Conditioner	9.0	3,805.8	1.0	34,252	3,806	3,806	3,806	3,806	3,806	3,806	3,806	3,806	3,806
HVAC	Custom - PTAC/PTHP	15.0	13,319.4	1.0	89,237	13,319	13,319	13,319	13,319	13,319	2,264	2,264	2,264	2,264
HVAC	Custom - Heat Pump	15.0	7,043.4	1.0	105,651	7,043	7,043	7,043	7,043	7,043	7,043	7,043	7,043	7,043
Shell	Attic Insulation	25.0	77,514.6	1.0	1,937,864	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515
Appliance	Refrigerator	12.0	108,446.0	1.0	525,928	108,446	108,446	108,446	108,446	11,518	11,518	11,518	11,518	11,518
HVAC	Bathroom Exhaust Fan	19.0	31,003.0	1.0	589,056	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003
HVAC	Central Air Conditioning	18.0	32,223.0	1.0	290,023	32,223	32,223	32,223	32,223	32,223	32,223	8,057	8,057	8,057
Hot Water	Hot Water Pipe Insulation	15.0	5,035.8	1.0	75,536	5,036	5,036	5,036	5,036	5,036	5,036	5,036	5,036	5,036
Shell	Air Sealing	15.0	12,538.3	1.0	188,075	12,538	12,538	12,538	12,538	12,538	12,538	12,538	12,538	12,538
Appliance	Room Air Conditoner	12.0	22,917.0	1.0	122,438	22,917	22,917	22,917	22,917	3,846	3,846	3,846	3,846	3,846
Lighting	LED Indoor Standard	10.0	4,441.0	1.0	44,410	4,441	4,441	4,441	4,441	4,441	4,441	4,441	4,441	4,441
Lighting	LED Indoor Standard (Incandescent)	10.0	133,797.6	1.0	657,080	133,798	133,798	133,798	36,527	36,527	36,527	36,527	36,527	36,527
Lighting	LED Outdoor Standard	6.1	4,748.6	1.0	28,966	4,749	4,749	4,749	4,749	4,749	4,749	475		
HVAC	Programmable Thermostat	5	10,045	1	50,224	10,045	10,045	10,045	10,045	10,045				
CY2018 Program Total CPAS			752,640		8,858,179	752,640	752,640	752,640	655,369	539,370	518,270	489,830	489,355	489,355
CY2018 Program Expiring Savings‡							-	-	97,271	213,270	234,370	262,809	263,284	263,284

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Lighting	LED Indoor Specialty	32,465											
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom	196,610	196,610	196,610	196,610	196,610	196,610						
Shell	Custom - Air Sealing	55,910	55,910	55,910	55,910	55,910	55,910						
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP	2,264	2,264	2,264	2,264	2,264	2,264						
HVAC	Custom - Heat Pump	7,043	7,043	7,043	7,043	7,043	7,043						
Shell	Attic Insulation	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515	77,515
Appliance	Refrigerator	11,518	11,518	11,518									
HVAC	Bathroom Exhaust Fan	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003	31,003		
HVAC	Central Air Conditioning	8,057	8,057	8,057	8,057	8,057	8,057	8,057	8,057	8,057			
Hot Water	Hot Water Pipe Insulation	5,036	5,036	5,036	5,036	5,036	5,036						
Shell	Air Sealing	12,538	12,538	12,538	12,538	12,538	12,538						
Appliance	Room Air Conditoner	3,846	3,846	3,846									
Lighting	LED Indoor Standard	4,441											
Lighting	LED Indoor Standard (Incandescent)	36,527											
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total CPAS		484,773	411,340	411,340	395,976	395,976	395,976	116,575	116,575	116,575	108,518	77,515	77,515
CY2018 Program Expiring Savings‡		267,867	341,300	341,300	356,664	356,664	356,664	636,065	636,065	636,065	644,122	675,125	675,125

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Lighting	LED Indoor Specialty												
Hot Water	Bathroom Aerator Gas												
Hot Water	Bathroom Aerator Electric												
Custom	Custom												
Shell	Custom - Air Sealing												
HVAC	Custom - Room Air Conditioner												
HVAC	Custom - PTAC/PTHP												
HVAC	Custom - Heat Pump												
Shell	Attic Insulation	77,515	77,515	77,515	77,515								
Appliance	Refrigerator												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning												
Hot Water	Hot Water Pipe Insulation												
Shell	Air Sealing												
Appliance	Room Air Conditoner												
Lighting	LED Indoor Standard												
Lighting	LED Indoor Standard (Incandescent)												
Lighting	LED Outdoor Standard												
HVAC	Programmable Thermostat												
CY2018 Program Total CPAS		77,515	77,515	77,515	77,515	-	-	-	-	-	-	-	-
CY2018 Program Expiring Savings‡		675,125	675,125	675,125	675,125	752,640	752,640	752,640	752,640	752,640	752,640	752,640	752,640

Note: The green highlighted cell shows program total first year electric savings (including direct electric savings and those converted from gas).
* 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 energy and demand savings for each measure installed as a part of the program are shown in Table 5-1 through Table 5-5.

The program includes 19 measures as shown in the following tables. The two custom projects that included installation of Variable Speed Drives for HVAC Pumps in a multifamily building complex contributed the most savings, representing 31% of the verified gross energy savings, followed by the refrigerator measure, which represents 17.26% of the verified gross energy savings. The rest of the savings come from the LED lighting, room air conditioner, bathroom exhaust fan and other 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
Lighting	LED Indoor Specialty	32,465	1.00	32,465	1.00	32,465	10.0
Hot Water	Bathroom Aerator Gas	0	NA	0	1.00	0	9.0
Hot Water	Bathroom Aerator Electric	300	1.00	300	1.00	300	9.0
Custom	Custom	200,586	0.98	196,610	1.00	196,610	15.0
Shell	Custom - Air Sealing	0	NA	0	1.00	0	15.0
HVAC	Custom - Room Air Conditioner	3,741	1.02	3,806	1.00	3,806	9.0
HVAC	Custom - PTAC/PTHP	13,319	1.00	13,319	1.00	13,319	15.0
HVAC	Custom - Heat Pump	8,226	0.86	7,043	1.00	7,043	15.0
Shell	Attic Insulation	14,471	1.00	14,471	1.00	14,471	25.0
Appliance	Refrigerator	108,446	1.00	108,446	1.00	108,446	12.0
HVAC	Bathroom Exhaust Fan	31,003	1.00	31,003	1.00	31,003	19.0
HVAC	Central Air Conditioning	32,223	1.00	32,223	1.00	32,223	18.0
Hot Water	Hot Water Pipe Insulation	0	NA	0	1.00	0	15.0
Shell	Air Sealing	12,538	1.00	12,538	1.00	12,538	15.0
Appliance	Room Air Conditoner	22,917	1.00	22,917	1.00	22,917	12.0
Lighting	LED Indoor Standard	4,441	1.00	4,441	1.00	4,441	10.0
Lighting	LED Indoor Standard (Incandescent)	133,798	1.00	133,798	1.00	133,798	10.0
Lighting	LED Outdoor Standard	4,749	1.00	4,749	1.00	4,749	6.1
HVAC	Programmable Thermostat	10,045	1.00	10,045	1.00	10,045	5.0
	Total	633,268		628,175		628,175	

* 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)
Lighting	LED Indoor Specialty	NA	NA	52.27	1.00	52.27
Hot Water	Bathroom Aerator Gas	NA	NA	0.00	1.00	0.00
Hot Water	Bathroom Aerator Electric	NA	NA	13.65	1.00	13.65
Custom	Custom	NA	NA	0.00	1.00	0.00
Shell	Custom - Air Sealing	NA	NA	0.00	1.00	0.00
HVAC	Custom - Room Air Conditioner	NA	NA	14.98	1.00	14.98
HVAC	Custom - PTAC/PTHP	NA	NA	1.50	1.00	1.50
HVAC	Custom - Heat Pump	NA	NA	1.94	1.00	1.94
Shell	Attic Insulation	NA	NA	9.05	1.00	9.05
Appliance	Refrigerator	NA	NA	12.37	1.00	12.37
HVAC	Bathroom Exhaust Fan	NA	NA	3.54	1.00	3.54
HVAC	Central Air Conditioning	NA	NA	61.62	1.00	61.62
Hot Water	Hot Water Pipe Insulation	NA	NA	0.00	1.00	0.00
Shell	Air Sealing	NA	NA	0.00	1.00	0.00
Appliance	Room Air Conditoner	NA	NA	107.92	1.00	107.92
Lighting	LED Indoor Standard	NA	NA	6.02	1.00	6.02
Lighting	LED Indoor Standard (Incandescent)	NA	NA	181.37	1.00	181.37
Lighting	LED Outdoor Standard	NA	NA	1.92	1.00	1.92
HVAC	Programmable Thermostat	NA	NA	0.00	1.00	0.00
	Total			468.15		468.15

* 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.
NA = Not available
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)
Lighting	LED Indoor Specialty	3.92	1.00	3.92	1.00	3.92
Hot Water	Bathroom Aerator Gas	0.00	NA	0.00	1.00	0.00
Hot Water	Bathroom Aerator Electric	0.30	1.00	0.30	1.00	0.30
Custom	Custom	0.00	NA	0.00	1.00	0.00
Shell	Custom - Air Sealing	0.00	NA	0.00	1.00	0.00
HVAC	Custom - Room Air Conditioner	7.04	1.02	7.16	1.00	7.16
HVAC	Custom - PTAC/PTHP	0.72	1.00	0.72	1.00	0.72
HVAC	Custom - Heat Pump	0.92	1.01	0.93	1.00	0.93
Shell	Attic Insulation	4.22	1.00	4.22	1.00	4.22
Appliance	Refrigerator	16.35	1.00	16.35	1.00	16.35
HVAC	Bathroom Exhaust Fan	3.54	1.00	3.54	1.00	3.54
HVAC	Central Air Conditioning	28.72	1.00	28.72	1.00	28.72
Hot Water	Hot Water Pipe Insulation	0.00	NA	0.00	1.00	0.00
Shell	Air Sealing	0.00	NA	0.00	1.00	0.00
Appliance	Room Air Conditoner	32.38	1.00	32.38	1.00	32.38
Lighting	LED Indoor Standard	0.43	0.99	0.43	1.00	0.43
Lighting	LED Indoor Standard (Incandescent)	12.88	1.00	12.88	1.00	12.88
Lighting	LED Outdoor Standard	0.52	1.01	0.52	1.00	0.52
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
	Total	111.94		112.05		112.05

* 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.
NA = Not available
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
Lighting	LED Indoor Specialty	0	NA	0	1.00	0	10.0
Hot Water	Bathroom Aerator Gas	16	1.00	16	1.00	16	9.0
Hot Water	Bathroom Aerator Electric	0	NA	0	1.00	0	9.0
Custom	Custom	0	NA	0	1.00	0	15.0
Shell	Custom - Air Sealing	2,195	0.87	1,908	1.00	1,908	15.0
HVAC	Custom - Room Air Conditioner	0	NA	0	1.00	0	9.0
HVAC	Custom - PTAC/PTHP	0	NA	0	1.00	0	15.0
HVAC	Custom - Heat Pump	0	NA	0	1.00	0	15.0
Shell	Attic Insulation	2,151	1.00	2,151	1.00	2,151	25.0
Appliance	Refrigerator	0	NA	0	1.00	0	12.0
HVAC	Bathroom Exhaust Fan	0	NA	0	1.00	0	19.0
HVAC	Central Air Conditioning	0	NA	0	1.00	0	18.0
Hot Water	Hot Water Pipe Insulation	172	1.00	172	1.00	172	15.0
Shell	Air Sealing	0	NA	0	1.00	0	15.0
Appliance	Room Air Conditoner	0	NA	0	1.00	0	12.0
Lighting	LED Indoor Standard	0	NA	0	1.00	0	10.0
Lighting	LED Indoor Standard (Incandescent)	0	NA	0	1.00	0	10.0
Lighting	LED Outdoor Standard	0	NA	0	1.00	0	6.1
HVAC	Programmable Thermostat	0	NA	0	1.00	0	5.0
	Total Therms	4,534		4,247		4,247	
	Total kWh Converted From Therms†	132,895		124,465		124,465	

* 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 * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).
NA = Not available
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)
Lighting	LED Indoor Specialty	32,465	1.00	32,465	1.00	32,465
Hot Water	Bathroom Aerator Gas	476	1.00	476	1.00	476
Hot Water	Bathroom Aerator Electric	300	1.00	300	1.00	300
Custom	Custom	200,586	0.98	196,610	1.00	196,610
Shell	Custom - Air Sealing	64,339	0.87	55,910	1.00	55,910
HVAC	Custom - Room Air Conditioner	3,741	1.02	3,806	1.00	3,806
HVAC	Custom - PTAC/PTHP	13,319	1.00	13,319	1.00	13,319
HVAC	Custom - Heat Pump	8,226	0.86	7,043	1.00	7,043
Shell	Attic Insulation	77,515	1.00	77,515	1.00	77,515
Appliance	Refrigerator	108,446	1.00	108,446	1.00	108,446
HVAC	Bathroom Exhaust Fan	31,003	1.00	31,003	1.00	31,003
HVAC	Central Air Conditioning	32,223	1.00	32,223	1.00	32,223
Hot Water	Hot Water Pipe Insulation	5,036	1.00	5,036	1.00	5,036
Shell	Air Sealing	12,538	1.00	12,538	1.00	12,538
Appliance	Room Air Conditoner	22,917	1.00	22,917	1.00	22,917
Lighting	LED Indoor Standard	4,441	1.00	4,441	1.00	4,441
Lighting	LED Indoor Standard (Incandescent)	133,798	1.00	133,798	1.00	133,798
Lighting	LED Outdoor Standard	4,749	1.00	4,749	1.00	4,749
HVAC	Programmable Thermostat	10,045	1.00	10,045	1.00	10,045
	Total†	766,163		752,640		752,640

* 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

Navigant used the savings algorithms and inputs deemed by the IL TRM v6.0 and IL TRM v6.0 Errata, where applicable, to calculate the energy and demand savings for each measure installed as a part of the program in CY2018. Table 6-1 lists all the inputs used to calculate the savings, along with its source. A more detailed breakdown of the unit energy and demand savings for each measure can be found in Appendix 2. The lifetime energy savings are estimated by multiplying the verified savings by the effective useful life for each measure.

Table 6-1. Savings Parameters

Measure	Custom Input Parameters	Deemed Input Parameters	Deemed* Input Data Source
Custom - Air Sealing	N_gasket, N_sweep, LF_sealing, LF_wx	ΔTherms_gasket, ΔTherms_sweep, ΔTherms_sealing, ΔTherms_wx, ADJ_RXAirsealing	IL TRM v6.0 – Section 5.6.1
Custom - Heat Pump	kBtu/hr_cool, SEER_ee, HSPF_ee, EER_ee, kBtu/hr_heat, COP_ee	SEER_base, EER_base, COP_base, HSPF_base, EFLH_cool, EFLH_heat, CF	IL TRM v6.0 – Section 4.4.9
Custom - PTAC/PTHP	kBtu/hr_cool, kBtu/hr_heat, EER_ee, COP_ee	EFLH_cool, EFLH_heat, EER_exist, EER_base, COP_exist, COP_base, CF	IL TRM v6.0 – Section 4.4.13
Custom - Room Air Conditioner	Btu/hr, EER_ee	FLH_roomAC, CF, EER_base	IL TRM v6.0 – Section 4.4.7
Room Air Conditioner	Btu.hr, CEER_ee, CEER_base	FLH_roomAC, EER_exist, CF	IL TRM v6.0 – Section 5.1.7
Refrigerator	None	UEC_exist, UEC_base, UEC_ee, TAF, LSAF, Hours	IL TRM v6.0 – Section 5.1.6
Attic Insulation	R_old, R_attic, A_attic, Eff_cool, Eff_heat	Framing Factor_attic, CDD, DUA, HDD, ADJ_WallAtticCool, F_e, CF, FLH_cooling, ADJ_WallAtticHeat	IL TRM v6.0 – Section 5.6.4
Air Sealing	CFM50_existing, CFM50_new	N_heat, HDD, Eff_heat	IL TRM v6.0 – Section 5.6.1
Hot Water Pipe Insulation	R_new, C, L	R_exist, Eff_DHW, ΔT	IL TRM v6.0 – Section 5.4.1
Programmable Thermostats	None	%Electric Heat, Elec_Heating_Consumption, Heating_Reduction, HF, Eff_ISR	IL TRM v6.0 – Section 5.3.11
Central Air Conditioning	SEER_ee, EER_ee, SEER_exist, EER_exist	FLH_cool, SEER_base, EER_base, CF	IL TRM v6.0 – Section 5.3.3
Bathroom Aerator	None	%Electric_DHW, GPM_base, GPM_low, L_base, L_low, Household, DF, FPH, EPG_electric, ISR, Hours, CF %Fossil_DHW, EPG_gas	IL TRM v6.0 – Section 5.4.4
LED Lighting	Watts_ee, Watts_base	ISR, Leakage, Hours, WHF_e, WHF_d, CF	IL TRM v6.0 – Section 5.5.6, Section 5.5.8 and Errata
Bathroom Exhaust Fan	None	CFM, Eff_baseline, Eff_efficient, Hours, CF	IL TRM v6.0 – Section 5.3.9

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

6.2 Other Impact Findings and Recommendations

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

Finding 1. For the Mini Split Heat Pump measure installed in the community room as a part of the Saratoga tower project, the ex ante savings are calculated using a $HSPF_{BASE}$ value of 7.4. The IL TRM v 6.0 recommends using the value of 7.7 per the IECC 2015 standard. For the Mini Split Heat Pump measure installed in the kitchen as a part of the Saratoga tower project, the ex ante savings are calculated using a capacity of 34 kBtu/hr, though the specification sheet for the measure indicates that the actual capacity is 34.4 kBtu/hr.

Recommendation 1. The implementer should update the $HSPF_{BASE}$ value for this measure per the IECC 2015 standard as recommended by the IL TRM v6.0 and update the capacity of the unit for this measure per the specification sheet.

Finding 2. For the Custom – Room Air Conditioner measure installed as a part of the Saratoga tower project, the ex ante savings are calculated using 11,500 Btuh as the capacity, while the verified savings are calculated using 11,700 Btuh as the capacity as per the specifications sheet in the revised backup excel document..

Recommendation 2. Navigant recommends the implementer update the capacity to match the equipment model number.

Finding 3. For the Custom – Air Sealing measure installed as a part of the North Lake Farms project, the ex ante savings for window weather-stripping were calculated using the linear feet for window caulking installed. Navigant calculated verified savings using the linear feet for the weather-stripping installed on window bottoms.

Recommendation 3. The savings for window weather-stripping should be calculated using the linear feet of window bottoms that were weather stripped and not the linear feet of window caulking installed, which is already a part of the weather sealing component of the savings calculations.

Finding 4. For the Custom Variable Speed Drive Pumps measures installed as a part of the Wentworth Gardens project, the ex ante calculations convert the Horse Power (HP) of the motor to kW before applying the Energy Savings Factor (ESF) deemed in the IL TRM v6.0. The ESF deemed in the IL TRM v6.0 can only be applied to HP values. Additionally, the proposed replacement pump kWh consumption calculations should also be updated from kWh = New kW input*Operating Hours*(ESF) to kWh = New kW input*Operating Hours*(1-ESF), because a direct multiplication of the ESF can only be used while calculating the energy savings and not the energy consumption

Recommendation 4. The implementer should not convert HP to kW before applying the ESF. The implementer should use the energy savings factor correctly when calculating the savings for this measure.

7. Appendix 1. Impact Analysis Methodology

Navigant determined verified gross savings for each program measure by:

1. Reviewing the savings algorithm inputs in the measure workbook for agreement with the TRM v6.0 and the IL TRM v6.0 Errata, where applicable.
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 calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross ratio (NTG). In CY2018, the NTG estimates used to calculate the net verified savings were deemed as one, based on a consensus process through the Illinois Stakeholder Advisory Group (SAG), as documented in a spreadsheet.[3]

8. Appendix 2. Impact Analysis Detail

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

- Final CY2018 tracking data: "IHWAP-MF_2018_EOY_Data_Rev1_03262019"
- Final CY2018 tracking data: "RI_ComEd_IER_MF_Saratoga Towers Detail 2018 v2"
- Final CY2018 tracking data: "RI_ComEd_NSG_MF_NLF Detail 2018"
- Final CY2018 tracking data: "CEDA Wentworth Gardens Engineering Review Document 9418_EOY"
- 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
- Implementer Savings Calculations: "Income Eligible Retrofits_Resource Innovations Savings Calcs_Revised 07102018"

Table 8-1. Verified Measure Per Unit Impact Detail (Electricity)

End Use Type	Research Category	Ex Ante Gross kWh/Unit Savings	Ex Ante Gross kW/Unit Savings	Verified Gross kWh/Unit Savings	Verified Gross kW/Unit Savings	kWh Savings RR	kW Savings RR	Source
Lighting	LED Indoor Specialty (52W to 7W)	28.98	0.0035	28.98	0.0035	100%	100%	5.5.6
Lighting	LED Indoor Specialty (60W to 10W)	32.20	0.0039	32.20	0.0039	100%	100%	5.5.6
Hot Water	Bathroom Aerator Gas	0.00	0.0000	0.00	0.0000	NA	NA	5.4.4
Hot Water	Bathroom Aerator Electric	25.03	0.0250	25.03	0.0250	100%	100%	5.4.4
Custom	Custom - Heating and Domestic Hot Water Pumps	141,798.00	0.0000	139,810.63	0.0000	99%	NA	4.4.17
Custom	Custom - Pressure Booster Pumps	58,788.00	0.0000	56,799.48	0.0000	97%	NA	4.4.17
Shell	Custom - Air Sealing First Floor	0.00	0.0000	0.00	0.0000	NA	NA	5.6.1
Shell	Custom - Air Sealing Second Floor	0.00	0.0000	0.00	0.0000	NA	NA	5.6.1
HVAC	Custom - Room Air Conditioner with Reverse Cycle	3,740.74	7.0397	3805.80	7.1621	102%	102%	4.4.7
HVAC	Custom - PTAC Front West Office	2,891.13	0.1726	2,891.13	0.1726	100%	100%	4.4.13

[3] 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.

End Use Type	Research Category	Ex Ante Gross kWh/Unit Savings	Ex Ante Gross kW/Unit Savings	Verified Gross kWh/Unit Savings	Verified Gross kW/Unit Savings	kWh Savings RR	kW Savings RR	Source
HVAC	Custom - Mini Split Heat Pump Community Room	5,915.23	0.6859	5,087.43	0.6859	86%	100%	4.4.9
HVAC	Custom - Mini Split Heat Pump Kitchen	1,836.52	0.1792	1,555.82	0.1813	85%	101%	4.4.9
HVAC	Custom - Mini Split Heat Pump Front East Office	474.68	0.0590	400.15	0.0590	84%	100%	4.4.9
HVAC	Custom - PTAC Front East Office	3,768.55	0.1867	3,768.55	0.1867	100%	100%	4.4.13
HVAC	Custom - PTAC Library	3,768.55	0.1867	3,768.55	0.1867	100%	100%	4.4.13
HVAC	Custom - PTAC Laundry Room	2,891.13	0.1726	2,891.13	0.1726	100%	100%	4.4.13
Shell	Attic Insulation (Natural Gas, CAC)	0.29	0.0002	0.29	0.0002	100%	100%	5.6.4
Shell	Attic Insulation (Electric Resistance, None or Other)	2.14	0.0000	2.14	0.0000	100%	NA	5.6.4
Appliance	Refrigerator	417.10	0.0629	417.10	0.0629	100%	100%	5.1.6
HVAC	Bathroom Exhaust Fan	88.58	0.0101	88.58	0.0101	100%	100%	5.3.9
HVAC	Central Air Conditioning (24000, 16, 12)	700.50	0.5592	700.50	0.5592	100%	100%	5.3.3
HVAC	Central Air Conditioning (24000, 16, 13)	700.50	0.6309	700.50	0.6309	100%	100%	5.3.3
HVAC	Central Air Conditioning (18000, 16, 12)	525.38	0.4194	525.38	0.4194	100%	100%	5.3.3
HVAC	Central Air Conditioning (18000, 16, 13)	525.38	0.4732	525.38	0.4732	100%	100%	5.3.3
Shell	Air Sealing (Ebony Nelson - 587 Main St Unit 1 - 12.12.2018 - MEA-2018.12.20-43767)	890.60	0.0000	890.60	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Jared Dietz - 587 Main St Unit 2 - 12.12.2018 - MEA-2018.12.20-43770)	679.33	0.0000	679.33	0.0000	100%	NA	5.6.1
Shell	Air Sealing (john bautista - 587 Main #3 - 12.19.2018 - MEA-2018.12.20-43925)	927.98	0.0000	927.98	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Christie Gordon - 587 Main St Unit 4 - 12.12.2018 - MEA-2018.12.20-43937)	1,488.67	0.0000	1,488.67	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Jolisa Atkins - 587 Main St Unit 5 - 12.12.2018 - MEA-2018.12.20-43938)	1,186.39	0.0000	1,186.39	0.0000	100%	NA	5.6.1

End Use Type	Research Category	Ex Ante Gross kWh/Unit Savings	Ex Ante Gross kW/Unit Savings	Verified Gross kWh/Unit Savings	Verified Gross kW/Unit Savings	kWh Savings RR	kW Savings RR	Source
Shell	Air Sealing (Shanell Pracher - 587 Main St Unit 6 - 12.12.2018 - MEA-2018.12.20-43944)	1,186.39	0.0000	1,186.39	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Allissa Derkson - 587 Main St Unit 7 - 12.12.2018 - MEA-2018.12.26-44179)	1,165.26	0.0000	1,165.26	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Evelyn Rivera - 587 Main St Unit 8 - 12.12.2018 - MEA-2018.12.26-44182)	429.05	0.0000	429.05	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Rozelyn Brown - 587 Main St Unit 9 - 12.12.2018 - MEA-2018.12.26-44189)	983.24	0.0000	983.24	0.0000	100%	NA	5.6.1
Shell	Air Sealing (christopher nickerson - 587 main #10 - 12.19.2018 - MEA-2018.12.26-44159)	1,452.92	0.0000	1,452.92	0.0000	100%	NA	5.6.1
Shell	Air Sealing (Amy Lloyd - 587 Main St Unit 11 - 12.12.2018 - MEA-2018.12.26-44176)	1,118.13	0.0000	1,118.13	0.0000	100%	NA	5.6.1
Shell	Air Sealing (sharon wire - 587 main #12 - 12.19.2018 - MEA-2018.12.26-44145)	1,030.37	0.0000	1,030.37	0.0000	100%	NA	5.6.1
Appliance	Room Air Conditioner (10000, 12.1, 8)	101.90	0.1441	101.90	0.1441	100%	100%	5.1.7
Appliance	Room Air Conditioner (5000, 11.2, 8.1)	46.07	0.0622	46.07	0.0622	100%	100%	5.1.7
Appliance	Room Air Conditioner (5000, 12, 6.5)	79.26	0.1070	79.26	0.1070	100%	100%	5.1.7
Appliance	Room Air Conditioner (5000, 12, 7.5)	56.47	0.0762	56.47	0.0762	100%	100%	5.1.7
Appliance	Room Air Conditioner (5000, 12, 8.2)	43.82	0.0592	43.82	0.0592	100%	100%	5.1.7
Appliance	Room Air Conditioner (5000, 12, 8.1)	52.62	0.0710	52.62	0.0710	100%	100%	5.1.7
Lighting	LED Indoor Standard (28W to 8W)	15.30	0.0015	15.30	0.0015	100%	98%	5.5.8
Lighting	LED Indoor Standard (26W to 8W)	13.77	0.0013	13.77	0.0013	100%	102%	5.5.8
Lighting	LED Indoor Standard (60W to 8W)	39.77	0.0038	39.77	0.0038	100%	100%	5.5.8
Lighting	LED Indoor Standard (70W to 13W)	43.60	0.0042	43.60	0.0042	100%	100%	5.5.8

End Use Type	Research Category	Ex Ante Gross kWh/Unit Savings	Ex Ante Gross kW/Unit Savings	Verified Gross kWh/Unit Savings	Verified Gross kW/Unit Savings	kWh Savings RR	kW Savings RR	Source
Lighting	LED Indoor Standard (65W to 13W)	39.77	0.0038	39.77	0.0038	100%	101%	5.5.8
Lighting	LED Outdoor Standard (28W to 8W)	47.97	0.0053	47.97	0.0053	100%	100%	5.5.8
Hot Water	Hot Water Pipe Insulation	0.00	0.0000	0.00	0.0000	NA	NA	5.4.1
HVAC	Programmable Thermostat	837.07	0.0000	837.07	0.0000	100%	NA	5.3.11

Source: ComEd Tracking Data and Navigant Analysis

Table 8-2. Verified Measure per-Unit Impact Detail (Gas)

End Use Type	Research Category	Ex Ante Gross Therms/Unit Savings	Verified Gross Therms/Unit Savings	Therms Savings RR	Source
Lighting	LED Indoor Specialty (52W to 7W)	0.00	0.00	NA	5.5.6
Lighting	LED Indoor Specialty (60W to 10W)	0.00	0.00	NA	5.5.6
Hot Water	Bathroom Aerator Gas	1.25	1.25	100%	5.4.4
Hot Water	Bathroom Aerator Electric	0.00	0.00	NA	5.4.4
Custom	Custom - Heating and Domestic Hot Water Pumps	0.00	0.00	NA	4.4.17
Custom	Custom - Pressure Booster Pumps	0.00	0.00	NA	4.4.17
Shell	Custom - Air Sealing First Floor	159.64	137.52	86%	5.6.1
Shell	Custom - Air Sealing Second Floor	172.95	150.83	87%	5.6.1
HVAC	Custom - Room Air Conditioner with Reverse Cycle	0.00	0.00	NA	4.4.7
HVAC	Custom - PTAC Front West Office	0.00	0.00	NA	4.4.13
HVAC	Custom - Mini Split Heat Pump Community Room	0.00	0.00	NA	4.4.9
HVAC	Custom - Mini Split Heat Pump Kitchen	0.00	0.00	NA	4.4.9
HVAC	Custom - Mini Split Heat Pump Front East Office	0.00	0.00	NA	4.4.9
HVAC	Custom - PTAC Front East Office	0.00	0.00	NA	4.4.13
HVAC	Custom - PTAC Library	0.00	0.00	NA	4.4.13
HVAC	Custom - PTAC Laundry Room	0.00	0.00	NA	4.4.13
Shell	Attic Insulation (Natural Gas, CAC)	0.13	0.13	100%	5.6.4
Shell	Attic Insulation (Electric Resistance, None or Other)	0.00	0.00	NA	5.6.4
Appliance	Refrigerator	0.00	0.00	NA	5.1.6
HVAC	Bathroom Exhaust Fan	0.00	0.00	NA	5.3.9
HVAC	Central Air Conditioning (24000, 16, 12)	0.00	0.00	NA	5.3.3
HVAC	Central Air Conditioning (24000, 16, 13)	0.00	0.00	NA	5.3.3

End Use Type	Research Category	Ex Ante Gross Therms/Unit Savings	Verified Gross Therms/Unit Savings	Therms Savings RR	Source
HVAC	Central Air Conditioning (18000, 16, 12)	0.00	0.00	NA	5.3.3
HVAC	Central Air Conditioning (18000, 16, 13)	0.00	0.00	NA	5.3.3
Shell	Air Sealing (Ebony Nelson - 587 Main St Unit 1 - 12.12.2018 - MEA-2018.12.20-43767)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Jared Dietz - 587 Main St Unit 2 - 12.12.2018 - MEA-2018.12.20-43770)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (john bautista - 587 Main #3 - 12.19.2018 - MEA-2018.12.20-43925)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Christie Gordon - 587 Main St Unit 4 - 12.12.2018 - MEA-2018.12.20-43937)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Jolisa Atkins - 587 Main St Unit 5 - 12.12.2018 - MEA-2018.12.20-43938)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Shanell Pracher - 587 Main St Unit 6 - 12.12.2018 - MEA-2018.12.20-43944)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Allissa Derkson - 587 Main St Unit 7 - 12.12.2018 - MEA-2018.12.26-44179)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Evelyn Rivera - 587 Main St Unit 8 - 12.12.2018 - MEA-2018.12.26-44182)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Rozelyn Brown - 587 Main St Unit 9 - 12.12.2018 - MEA-2018.12.26-44189)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (christopher nickerson - 587 main #10 - 12.19.2018 - MEA-2018.12.26-44159)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (Amy Lloyd - 587 Main St Unit 11 - 12.12.2018 - MEA-2018.12.26-44176)	0.00	0.00	NA	5.6.1
Shell	Air Sealing (sharon wire - 587 main #12 - 12.19.2018 - MEA-2018.12.26-44145)	0.00	0.00	NA	5.6.1
Appliance	Room Air Conditioner (10000, 12.1, 8)	0.00	0.00	NA	5.1.7
Appliance	Room Air Conditioner (5000, 11.2, 8.1)	0.00	0.00	NA	5.1.7
Appliance	Room Air Conditioner (5000, 12, 6.5)	0.00	0.00	NA	5.1.7
Appliance	Room Air Conditioner (5000, 12, 7.5)	0.00	0.00	NA	5.1.7
Appliance	Room Air Conditioner (5000, 12, 8.2)	0.00	0.00	NA	5.1.7
Appliance	Room Air Conditioner (5000, 12, 8.1)	0.00	0.00	NA	5.1.7
Lighting	LED Indoor Standard (28W to 8W)	0.00	0.00	NA	5.5.8
Lighting	LED Indoor Standard (26W to 8W)	0.00	0.00	NA	5.5.8
Lighting	LED Indoor Standard (60W to 8W)	0.00	0.00	NA	5.5.8
Lighting	LED Indoor Standard (70W to 13W)	0.00	0.00	NA	5.5.8
Lighting	LED Indoor Standard (65W to 13W)	0.00	0.00	NA	5.5.8
Lighting	LED Outdoor Standard (28W to 8W)	0.00	0.00	NA	5.5.8
Hot Water	Hot Water Pipe Insulation	1.10	1.10	100%	5.4.1
HVAC	Programmable Thermostat	0.00	0.00	NA	5.3.11

Source: ComEd Tracking Data and Navigant 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	Verified Net Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Savings Therms	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Lighting	LED Indoor Specialty	Lamp	1,025	10.0	32,465	3.92	0.00	(1,547.36)	(670.15)	1.00	32,465	3.92	0.00	(1,547.36)	(670.15)
Hot Water	Bathroom Aerator Gas	Each	13	9.0	0	0.00	16.25	0.00	0.00	1.00	0	0.00	16.25	0.00	0.00
Hot Water	Bathroom Aerator Electric	Each	12	9.0	300	0.30	0.00	0.00	0.00	1.00	300	0.30	0.00	0.00	0.00
Custom	Custom	Project	2	15.0	196,610	0.00	0.00	0.00	0.00	1.00	196,610	0.00	0.00	0.00	0.00
Shell	Custom - Air Sealing	Project	13	15.0	0	0.00	1,907.53	0.00	0.00	1.00	0	0.00	1,907.53	0.00	0.00
HVAC	Custom - Room Air Conditioner	Project	1	9.0	3,806	7.16	0.00	0.00	0.00	1.00	3,806	7.16	0.00	0.00	0.00
HVAC	Custom - PTAC/PTHP*	Project	4	15.0	13,319	0.72	0.00	0.00	0.00	1.00	13,319	0.72	0.00	0.00	0.00
HVAC	Custom - Heat Pump	Project	3	15.0	7,043	0.93	0.00	0.00	0.00	1.00	7,043	0.93	0.00	0.00	0.00
Shell	Attic Insulation	Square Feet	28,206	25.0	14,471	4.22	2,150.92	0.00	0.00	1.00	14,471	4.22	2,150.92	0.00	0.00
Appliance	Refrigerator*	Each	260	12.0	108,446	16.35	0.00	0.00	0.00	1.00	108,446	16.35	0.00	0.00	0.00
HVAC	Bathroom Exhaust Fan	Each	350	19.0	31,003	3.54	0.00	0.00	0.00	1.00	31,003	3.54	0.00	0.00	0.00
HVAC	Central Air Conditioning*	Each	47	18.0	32,223	28.72	0.00	0.00	0.00	1.00	32,223	28.72	0.00	0.00	0.00
Hot Water	Hot Water Pipe Insulation	Linear Feet	156	15.0	0	0.00	171.81	0.00	0.00	1.00	0	0.00	171.81	0.00	0.00
Shell	Air Sealing	Project	12	15.0	12,538	0.00	0.00	0.00	0.00	1.00	12,538	0.00	0.00	0.00	0.00
Appliance	Room Air Conditoner*	Each	231	12.0	22,917	32.38	0.00	0.00	0.00	1.00	22,917	32.38	0.00	0.00	0.00
Lighting	LED Indoor Standard	Lamp	307	10.0	4,441	0.43	0.00	0.00	(101.99)	1.00	4,441	0.43	0.00	0.00	(101.99)
Lighting	LED Indoor Standard (Incandescent)*	Lamp	3,362	10.0	133,798	12.88	0.00	(598.23)	(3,043.55)	1.00	133,798	12.88	0.00	(598.23)	(3,043.55)
Lighting	LED Outdoor Standard	Lamp	99	6.1	4,749	0.52	0.00	0.00	0.00	1.00	4,749	0.52	0.00	0.00	0.00
HVAC	Programmable Thermostat	Each	36	5.0	10,045	0.00	0.00	0.00	0.00	1.00	10,045	0.00	0.00	0.00	0.00

*The CY2018 contribution to CPAS for these measures varies over time. See CPAS tables in section 4.
Source: ComEd tracking data and Navigant team analysis.