



# ComEd Income Eligible Multi-Family Savings Impact Evaluation Report

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

Presented to  
ComEd

DRAFT

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## 1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd’s CY2018 Income Eligible Multi-Family Retrofits 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 Multi-Family Savings (IEMS) 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 LED and energy efficient lighting retrofits, programmable thermostats, advanced power strips, water efficiency devices, weatherization measures, pipe insulation, and heating, cooling and refrigeration equipment.

The IEMS Program is jointly administered by ComEd, and Peoples Gas (PGL) and North Shore Gas (NSG) companies. The program is implemented by Elevate Energy (Elevate) and 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 treated 4,094 individual units in CY2018 and distributed 33,309 measures as shown in the following table and graph. LED lights comprised of 65% of the measure mix, followed by aerators, which were 11% of all the measures installed. Steam trap repair or replacement represented 8% of the total measures installed, followed by showerheads with 6%, and the remaining 10% comprised of steam averaging controls, advanced power strip (Tier 1), smart thermostat, programmable thermostat and other measures.

**Table 2-1. CY2018 Volumetric Findings Detail**

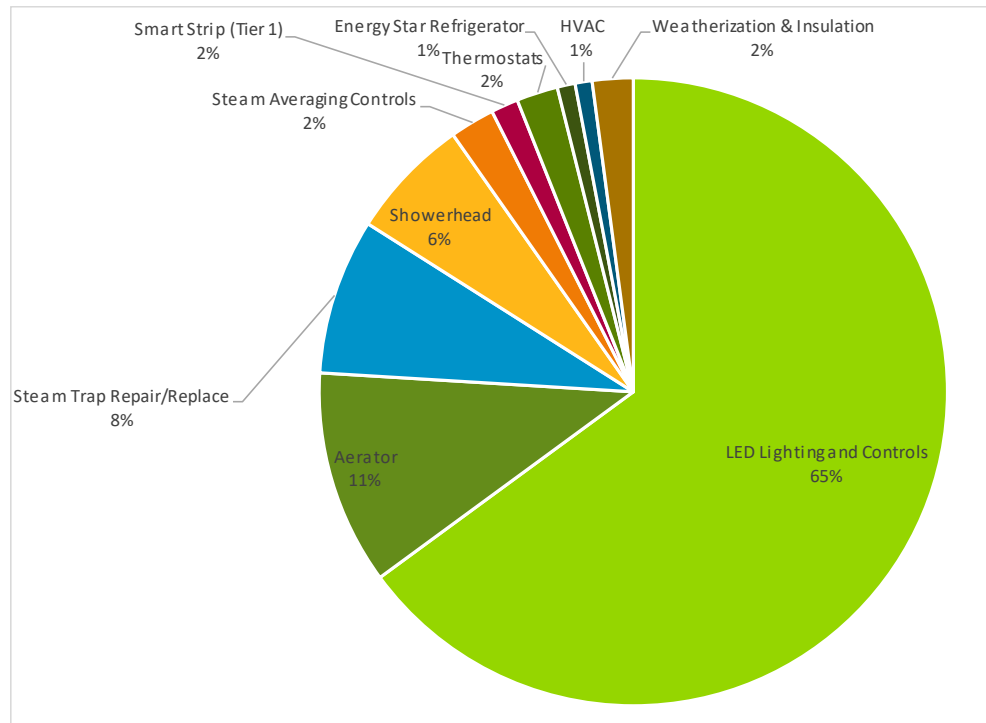
Participation	Quantity
Participants*	4,094
Total Measures	33,309
Installed Projects†	565

\*Participants are comprised of distinct properties, counting each separate apartment

† Number of Unique Project IDs in the tracking data

Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. Percentage of Measures Installed by Type



### 3. PROGRAM SAVINGS DETAIL

Table 3-1 summarizes the incremental energy and demand savings the IEMS Program achieved in CY2018. The gas savings are only those that the gas utilities are not claiming and ComEd can claim.<sup>1</sup>

<sup>1</sup> 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)
<b>Electricity</b>			
Ex Ante Gross Savings	3,885,398	NA	315.93
Program Gross Realization Rate	0.98	NA	1.09
Verified Gross Savings	3,816,278	920.04	344.07
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	3,816,278	920.04	344.07
<b>Converted from Gas*</b>			
Ex Ante Gross Savings	13,247,967	NA	NA
Program Gross Realization Rate	0.97	NA	NA
Verified Gross Savings	12,834,959	NA	NA
Program Net-to-Gross Ratio (NTG)	1.00	NA	NA
Verified Net Savings	12,834,959	NA	NA
<b>Total Electric Plus Gas</b>			
Ex Ante Gross Savings	17,133,364	NA	315.93
Program Gross Realization Rate	0.97	NA	1.09
Verified Gross Savings	16,651,237	920.04	344.07
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	16,651,237	920.04	344.07

\* 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 applicable

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 ex post gross savings for the IEMS Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The total CPAS across all measures is 3,816,278 kWh. The program achieved 12,834,959 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd's goal<sup>2</sup> (the middle table in the following set of tables). Adding the savings converted from gas savings to the electric savings produces 16,651,237 kWh of total CPAS.

<sup>2</sup> 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	
Hot Water	Aerator	9.0	5,213	1.00	46,913	5,213	5,213	5,213	5,213	5,213	5,213	5,213	5,213	5,213	
Shell	Air Sealing	15.0	223,182	1.00	3,347,725	223,182	223,182	223,182	223,182	223,182	223,182	223,182	223,182	223,182	
Shell	Attic Insulation	25.0	224,116	1.00	5,602,905	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	
HVAC	Boiler Tune-up	3.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
HVAC	Central AC	18.0	4,064	1.00	73,144	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	
Hot Water	DHW Boiler	20.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Shell	Door Sweep	15.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Shell	Door Weatherstrip	15.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Appliances	Energy Star Refrigerator	12.0	23,909	1.00	192,156	23,909	23,909	23,909	23,909	12,065	12,065	12,065	12,065	12,065	
HVAC	Furnace	20.0	19,032	1.00	380,640	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	
HVAC	Hydronic Boiler	20.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Lighting	LED Exit Sign	16.0	215,734	1.00	3,451,745	215,734	215,734	215,734	215,734	215,734	215,734	215,734	215,734	215,734	
Lighting	LED Lighting (CA Exterior)	10.2	370,827	1.00	3,781,957	370,827	370,827	370,827	370,827	370,827	370,827	370,827	370,827	370,827	
Lighting	LED Lighting (CA Interior 24/7)	5.7	852,790	1.00	4,864,143	852,790	852,790	852,790	852,790	852,790	600,194	-	-	-	
Lighting	LED Lighting (CA Interior TLED)	8.1	749,703	1.00	6,107,007	749,703	749,703	749,703	749,703	749,703	749,703	749,703	749,703	109,382	
Lighting	LED Lighting (IU Specialty)	10.1	109,775	1.00	1,104,469	109,775	109,775	109,775	109,775	109,775	109,775	109,775	109,775	109,775	
Lighting	Occupancy Sensor	8.0	10,312	1.00	82,497	10,312	10,312	10,312	10,312	10,312	10,312	10,312	10,312	10,312	
HVAC	Pipe Insulation	15.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
HVAC	Programmable Thermostat	5.0	171,143	1.00	855,716	171,143	171,143	171,143	171,143	171,143	-	-	-	-	
HVAC	PTHP	15.0	469,986	1.00	7,049,787	469,986	469,986	469,986	469,986	469,986	469,986	469,986	469,986	469,986	
Hot Water	Showerhead (CA)	10.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Hot Water	Showerhead (IU)	10.0	13,645	1.00	136,448	13,645	13,645	13,645	13,645	13,645	13,645	13,645	13,645	13,645	
Consumer Electronics	Advanced Power Strip (Tier 1)	7.0	48,101	1.00	336,707	48,101	48,101	48,101	48,101	48,101	48,101	48,101	48,101	48,101	
HVAC	Smart Thermostat	10.0	32,079	1.00	320,788	32,079	32,079	32,079	32,079	32,079	32,079	32,079	32,079	32,079	
HVAC	Steam Averaging Controls	20.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
HVAC	Steam Boiler	20.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
HVAC	Steam Trap Repair/Replace	6.0	0	1.00	-	-	-	-	-	-	-	-	-	-	
Lighting	LED Lighting (CA Interior)	8.4	60,902	1.00	511,775	60,902	60,902	60,902	60,902	60,902	60,902	60,902	60,902	24,562	
Lighting	LED Lighting (IU Standard, 60W)	10.0	130,083	1.00	1,300,833	130,083	130,083	130,083	130,083	130,083	130,083	130,083	130,083	130,083	
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	10.2	802	1.00	4,850	802	802	802	339	339	339	339	339	339	
Lighting	LED Lighting (CA Interior, 60W Incandescent)	8.4	52,528	1.00	234,500	52,528	52,528	52,528	14,235	14,235	14,235	14,235	14,235	5,741	
Lighting	LED Lighting (CA Exterior, 60W Incandescent)	10.2	9,732	1.00	48,177	9,732	9,732	9,732	2,637	2,637	2,637	2,637	2,637	2,637	
Lighting	LED Lighting (IU Standard, 75W)	10.0	4,530	1.00	23,989	4,530	4,530	4,530	1,486	1,486	1,486	1,486	1,486	1,486	
Lighting	LED Lighting (IU Standard, 40W)	10.0	10,344	1.00	47,398	10,344	10,344	10,344	2,338	2,338	2,338	2,338	2,338	2,338	
Lighting	LED Lighting (CA Interior, 40W Incandescent)	8.4	2,090	1.00	8,823	2,090	2,090	2,090	472	472	472	472	472	191	
Lighting	LED Lighting (IU Standard, 100W)	10.0	1,657	1.00	9,876	1,657	1,657	1,657	701	701	701	701	701	701	
<b>CY2018 Program Total Electric CPAS</b>			<b>3,816,278</b>		<b>39,924,969</b>	<b>3,816,278</b>	<b>3,816,278</b>	<b>3,816,278</b>	<b>3,756,804</b>	<b>3,744,960</b>	<b>3,321,220</b>	<b>2,721,027</b>	<b>2,672,926</b>	<b>1,977,176</b>	
<b>CY2018 Program Expiring Electric Savings‡</b>								<b>59,474</b>	<b>71,318</b>	<b>495,058</b>	<b>1,095,251</b>	<b>1,143,352</b>	<b>1,839,102</b>		

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Hot Water	Aerator												
Shell	Air Sealing	223,182	223,182	223,182	223,182	223,182	223,182						
Shell	Attic Insulation	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116	224,116
HVAC	Boiler Tune-up												
HVAC	Central AC	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064			
Hot Water	DHW Boiler												
Shell	Door Sweep												
Shell	Door Weatherstrip												
Appliances	Energy Star Refrigerator	12,065	12,065	12,065									
HVAC	Furnace	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032	19,032
HVAC	Hydronic Boiler												
Lighting	LED Exit Sign	215,734	215,734	215,734	215,734	215,734	215,734	215,734					
Lighting	LED Lighting (CA Exterior)	370,827	73,683										
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)	109,775	6,718										
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation												
HVAC	Programmable Thermostat												
HVAC	PTHP	469,986	469,986	469,986	469,986	469,986	469,986						
Hot Water	Showerhead (CA)												
Hot Water	Showerhead (IU)	13,645											
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat	32,079											
HVAC	Steam Averaging Controls												
HVAC	Steam Boiler												
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)	130,083											
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	339	67										
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)	2,637	522										
Lighting	LED Lighting (IU Standard, 75W)	1,486											
Lighting	LED Lighting (IU Standard, 40W)	2,338											
Lighting	LED Lighting (CA Interior, 40W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)	701											
<b>CY2018 Program Total Electric CPAS</b>		<b>1,832,089</b>	<b>1,249,169</b>	<b>1,168,178</b>	<b>1,156,113</b>	<b>1,156,113</b>	<b>1,156,113</b>	<b>462,946</b>	<b>247,212</b>	<b>247,212</b>	<b>243,148</b>	<b>243,148</b>	<b>243,148</b>
<b>CY2018 Program Expiring Electric Savings‡</b>		<b>1,984,189</b>	<b>2,567,109</b>	<b>2,648,099</b>	<b>2,660,165</b>	<b>2,660,165</b>	<b>2,660,165</b>	<b>3,353,332</b>	<b>3,569,066</b>	<b>3,569,066</b>	<b>3,573,130</b>	<b>3,573,130</b>	<b>3,592,162</b>



End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Hot Water	Aerator												
Shell	Air Sealing												
Shell	Attic Insulation	224,116	224,116	224,116	224,116								
HVAC	Boiler Tune-up												
HVAC	Central AC												
Hot Water	DHW Boiler												
Shell	Door Sweep												
Shell	Door Weatherstrip												
Appliances	Energy Star Refrigerator												
HVAC	Furnace												
HVAC	Hydronic Boiler												
Lighting	LED Exit Sign												
Lighting	LED Lighting (CA Exterior)												
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)												
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation												
HVAC	Programmable Thermostat												
HVAC	PTHP												
Hot Water	Showerhead (CA)												
Hot Water	Showerhead (IU)												
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat												
HVAC	Steam Averaging Controls												
HVAC	Steam Boiler												
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)												
Lighting	LED Lighting (IU Standard, 75W)												
Lighting	LED Lighting (IU Standard, 40W)												
Lighting	LED Lighting (CA Interior, 40W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)												
<b>CY2018 Program Total Electric CPAS</b>		224,116	224,116	224,116	224,116	-	-	-	-	-	-	-	-
<b>CY2018 Program Expiring Electric Savings†</b>		3,592,162	3,592,162	3,592,162	3,592,162	3,816,278	3,816,278	3,816,278	3,816,278	3,816,278	3,816,278	3,816,278	3,816,278

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	
Hot Water	Aerabr	9.0	9,647	1.0	86,823	9,647	9,647	9,647	9,647	9,647	9,647	9,647	9,647	9,647	
Shell	Air Sealing	15.0	84,015	1.0	1,260,227	84,015	84,015	84,015	84,015	84,015	84,015	84,015	84,015	84,015	
Shell	Attic Insulation	25.0	69,687	1.0	1,742,185	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	
HVAC	Boiler Tune-up	3.0	4,779	1.0	14,338	4,779	4,779	4,779							
HVAC	Central AC	18.0	-	1.0	-										
Hot Water	DHW Boiler	20.0	35	1.0	701	35	35	35	35	35	35	35	35	35	
Shell	Door Sweep	15.0	1,001	1.0	15,014	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	
Shell	Door Weatherstrip	15.0	1,170	1.0	17,549	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	
Appliances	Energy Star Refrigerator	12.0	-	1.0	-										
HVAC	Furnace	20.0	2,473	1.0	49,454	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	
HVAC	Hydronic Boiler	20.0	1,842	1.0	36,844	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	
Lighting	LED Exit Sign	16.0	-	1.0	-										
Lighting	LED Lighting (CA Exterior)	10.2	-	1.0	-										
Lighting	LED Lighting (CA Interior 24/7)	5.7	-	1.0	-										
Lighting	LED Lighting (CA Interior TLED)	8.1	-	1.0	-										
Lighting	LED Lighting (IU Specialty)	10.1	-	1.0	-										
Lighting	Occupancy Sensor	8.0	-	1.0	-										
HVAC	Pipe Insulation	15.0	47,226	1.0	708,387	47,226	47,226	47,226	47,226	47,226	47,226	47,226	47,226	47,226	
HVAC	Programmable Thermostat	5.0	5,128	1.0	25,641	5,128	5,128	5,128	5,128						
HVAC	PTHP	15.0	-	1.0	-										
Hot Water	Showerhead (CA)	10.0	130	1.0	1,298	130	130	130	130	130	130	130	130	130	
Hot Water	Showerhead (IU)	10.0	31,494	1.0	314,943	31,494	31,494	31,494	31,494	31,494	31,494	31,494	31,494	31,494	
Consumer Electronics	Advanced Power Strip (Tier 1)	7.0	-	1.0	-										
HVAC	Smart Thermostat	10.0	15,557	1.0	155,571	15,557	15,557	15,557	15,557	15,557	15,557	15,557	15,557	15,557	
HVAC	Steam Averaging Controls	20.0	16,698	1.0	333,967	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	
HVAC	Steam Boiler	20.0	56,745	1.0	1,134,905	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	
HVAC	Steam Trap Repair/Replace	6.0	90,275	1.0	541,650	90,275	90,275	90,275	90,275	90,275					
Lighting	LED Lighting (CA Interior)	8.4	-	1.0	-										
Lighting	LED Lighting (IU Standard, 60W)	10.0	-	1.0	-										
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	10.2	-	1.0	-										
Lighting	LED Lighting (CA Interior, 60W Incandescent)	8.4	-	1.0	-										
Lighting	LED Lighting (CA Exterior, 60W Incandescent)	10.2	-	1.0	-										
Lighting	LED Lighting (IU Standard, 75W)	10.0	-	1.0	-										
Lighting	LED Lighting (IU Standard, 40W)	10.0	-	1.0	-										
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	10.2	-	1.0	-										
Lighting	LED Lighting (IU Standard, 100W)	10.0	-	1.0	-										
<b>CY2018 Program Total Gas CPAS (Therms)</b>			<b>437,904</b>		<b>6,439,498</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>433,124</b>	<b>433,124</b>	<b>427,996</b>	<b>337,721</b>	<b>337,721</b>	<b>337,721</b>	
<b>CY2018 Program Total Gas CPAS (kWh Equivalent) †</b>					<b>188,741,696</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,694,875</b>	<b>12,694,875</b>	<b>12,544,564</b>	<b>9,898,602</b>	<b>9,898,602</b>	<b>9,898,602</b>	
<b>CY2018 Program Expiring Gas Savings (Therms) ‡</b>								<b>4,779</b>	<b>4,779</b>	<b>9,908</b>	<b>100,183</b>	<b>100,183</b>	<b>100,183</b>	<b>100,183</b>	
<b>CY2018 Program Expiring Gas Savings (kWh Equivalent) †‡</b>								<b>140,085</b>	<b>140,085</b>	<b>290,395</b>	<b>2,936,358</b>	<b>2,936,358</b>	<b>2,936,358</b>	<b>2,936,358</b>	



# ComEd Income Eligible Multi-Family Savings Program Impact Evaluation Report

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Hot Water	Aerator												
Shell	Air Sealing	84,015	84,015	84,015	84,015	84,015	84,015						
Shell	Attic Insulation	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687	69,687
HVAC	Boiler Tune-up												
HVAC	Central AC												
Hot Water	DHW Boiler	35	35	35	35	35	35	35	35	35	35	35	35
Shell	Door Sweep	1,001	1,001	1,001	1,001	1,001	1,001						
Shell	Door Weatherstrip	1,170	1,170	1,170	1,170	1,170	1,170						
Appliances	Energy Star Refrigerator												
HVAC	Furnace	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473
HVAC	Hydronic Boiler	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842	1,842
Lighting	LED Exit Sign												
Lighting	LED Lighting (CA Exterior)												
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)												
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation	47,226	47,226	47,226	47,226	47,226	47,226						
HVAC	Programmable Thermostat												
HVAC	PTHP												
Hot Water	Showerhead (CA)	130											
Hot Water	Showerhead (IU)	31,494											
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat	15,557											
HVAC	Steam Averaging Controls	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698	16,698
HVAC	Steam Boiler	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745	56,745
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)												
Lighting	LED Lighting (IU Standard, 75W)												
Lighting	LED Lighting (IU Standard, 40W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)												
<b>CY2018 Program Total Gas CPAS (Therms)</b>		<b>328,074</b>	<b>280,893</b>	<b>280,893</b>	<b>280,893</b>	<b>280,893</b>	<b>280,893</b>	<b>147,481</b>	<b>147,481</b>	<b>147,481</b>	<b>147,481</b>	<b>147,481</b>	<b>69,687</b>
<b>CY2018 Program Total Gas CPAS (kWh Equivalent)‡</b>		<b>9,615,847</b>	<b>8,232,966</b>	<b>8,232,966</b>	<b>8,232,966</b>	<b>8,232,966</b>	<b>8,232,966</b>	<b>4,322,666</b>	<b>4,322,666</b>	<b>4,322,666</b>	<b>4,322,666</b>	<b>4,322,666</b>	<b>2,042,538</b>
<b>CY2018 Program Expiring Gas Savings (Therms)§</b>		<b>109,830</b>	<b>157,011</b>	<b>157,011</b>	<b>157,011</b>	<b>157,011</b>	<b>157,011</b>	<b>290,423</b>	<b>290,423</b>	<b>290,423</b>	<b>290,423</b>	<b>290,423</b>	<b>368,216</b>
<b>CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§</b>		<b>3,219,112</b>	<b>4,601,993</b>	<b>4,601,993</b>	<b>4,601,993</b>	<b>4,601,993</b>	<b>4,601,993</b>	<b>8,512,293</b>	<b>8,512,293</b>	<b>8,512,293</b>	<b>8,512,293</b>	<b>8,512,293</b>	<b>10,792,421</b>

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Hot Water	Aerator												
Shell	Air Sealing												
Shell	Attic Insulation	69,687	69,687	69,687	69,687								
HVAC	Boiler Tune-up												
HVAC	Central AC												
Hot Water	DHW Boiler												
Shell	Door Sweep												
Shell	Door Weatherstrip												
Appliances	Energy Star Refrigerator												
HVAC	Furnace												
HVAC	Hydronic Boiler												
Lighting	LED Exit Sign												
Lighting	LED Lighting (CA Exterior)												
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)												
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation												
HVAC	Programmable Thermostat												
HVAC	PTHP												
Hot Water	Showerhead (CA)												
Hot Water	Showerhead (IU)												
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat												
HVAC	Steam Averaging Controls												
HVAC	Steam Boiler												
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)												
Lighting	LED Lighting (IU Standard, 75W)												
Lighting	LED Lighting (IU Standard, 40W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)												
<b>CY2018 Program Total Gas CPAS (Therms)</b>		<b>69,687</b>	<b>69,687</b>	<b>69,687</b>	<b>69,687</b>	-	-	-	-	-	-	-	-
<b>CY2018 Program Total Gas CPAS (kWh Equivalent) ‡</b>		<b>2,042,538</b>	<b>2,042,538</b>	<b>2,042,538</b>	<b>2,042,538</b>	-	-	-	-	-	-	-	-
<b>CY2018 Program Expiring Gas Savings (Therms) §</b>		<b>368,216</b>	<b>368,216</b>	<b>368,216</b>	<b>368,216</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>	<b>437,904</b>
<b>CY2018 Program Expiring Gas Savings (kWh Equivalent) †§</b>		<b>10,792,421</b>	<b>10,792,421</b>	<b>10,792,421</b>	<b>10,792,421</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>	<b>12,834,959</b>

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	
Hot Water	Aerator	9.0	287,967	1.0	2,591,706	287,967	287,967	287,967	287,967	287,967	287,967	287,967	287,967	287,967	
Shell	Air Sealing	15.0	2,685,665	1.0	40,284,973	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	
Shell	Attic Insulation	25.0	2,266,654	1.0	56,666,362	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	
HVAC	Boiler Tune-up	3.0	140,085	1.0	420,254	140,085	140,085	140,085							
HVAC	Central AC	18.0	4,064	1.0	73,144	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	
Hot Water	DHW Boiler	20.0	1,027	1.0	20,534	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	
Shell	Door Sweep	15.0	29,338	1.0	440,063	29,338	29,338	29,338	29,338	29,338	29,338	29,338	29,338	29,338	
Shell	Door Weatherstrip	15.0	34,290	1.0	514,356	34,290	34,290	34,290	34,290	34,290	34,290	34,290	34,290	34,290	
Appliances	Energy Star Refrigerator	12.0	23,909	1.0	192,156	23,909	23,909	23,909	23,909	12,065	12,065	12,065	12,065	12,065	
HVAC	Furnace	20.0	91,506	1.0	1,830,127	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	
HVAC	Hydronic Boiler	20.0	53,995	1.0	1,079,893	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	
Lighting	LED Exit Sign	16.0	215,734	1.0	3,451,745	215,734	215,734	215,734	215,734	215,734	215,734	215,734	215,734	215,734	
Lighting	LED Lighting (CA Exterior)	10.2	370,827	1.0	3,781,957	370,827	370,827	370,827	370,827	370,827	370,827	370,827	370,827	370,827	
Lighting	LED Lighting (CA Interior 24/7)	5.7	852,790	1.0	4,864,143	852,790	852,790	852,790	852,790	852,790	600,194				
Lighting	LED Lighting (CA Interior TLED)	8.1	749,703	1.0	6,107,007	749,703	749,703	749,703	749,703	749,703	749,703	749,703	749,703	109,382	
Lighting	LED Lighting (IU Specialty)	10.1	109,775	1.0	1,104,469	109,775	109,775	109,775	109,775	109,775	109,775	109,775	109,775	109,775	
Lighting	Occupancy Sensor	8.0	10,312	1.0	82,497	10,312	10,312	10,312	10,312	10,312	10,312	10,312	10,312		
HVAC	Pipe Insulation	15.0	1,384,189	1.0	20,762,834	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	
HVAC	Programmable Thermostat	5.0	321,453	1.0	1,607,267	321,453	321,453	321,453	321,453	321,453					
HVAC	PTHP	15.0	469,986	1.0	7,049,787	469,986	469,986	469,986	469,986	469,986	469,986	469,986	469,986	469,986	
Hot Water	Showerhead (CA)	10.0	3,805	1.0	38,047	3,805	3,805	3,805	3,805	3,805	3,805	3,805	3,805	3,805	
Hot Water	Showerhead (IU)	10.0	936,743	1.0	9,367,432	936,743	936,743	936,743	936,743	936,743	936,743	936,743	936,743	936,743	
Consumer Electronics	Advanced Power Strip (Tier 1)	7.0	48,101	1.0	336,707	48,101	48,101	48,101	48,101	48,101	48,101	48,101	48,101		
HVAC	Smart Thermostat	10.0	488,057	1.0	4,880,566	488,057	488,057	488,057	488,057	488,057	488,057	488,057	488,057	488,057	
HVAC	Steam Averaging Controls	20.0	489,428	1.0	9,788,567	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	
HVAC	Steam Boiler	20.0	1,663,204	1.0	33,264,074	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	
HVAC	Steam Trap Repair/Replace	6.0	2,645,963	1.0	15,875,776	2,645,963	2,645,963	2,645,963	2,645,963	2,645,963	2,645,963				
Lighting	LED Lighting (CA Interior)	8.4	60,902	1.0	511,775	60,902	60,902	60,902	60,902	60,902	60,902	60,902	60,902	24,562	
Lighting	LED Lighting (IU Standard, 60W)	10.0	130,083	1.0	1,300,833	130,083	130,083	130,083	130,083	130,083	130,083	130,083	130,083	130,083	
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	10.2	802	1.0	4,850	802	802	802	339	339	339	339	339	339	
Lighting	LED Lighting (CA Interior, 60W Incandescent)	8.4	52,528	1.0	234,500	52,528	52,528	52,528	14,235	14,235	14,235	14,235	14,235	5,741	
Lighting	LED Lighting (CA Exterior, 60W Incandescent)	10.2	9,732	1.0	48,177	9,732	9,732	9,732	2,637	2,637	2,637	2,637	2,637	2,637	
Lighting	LED Lighting (IU Standard, 75W)	10.0	4,530	1.0	23,989	4,530	4,530	4,530	1,486	1,486	1,486	1,486	1,486	1,486	
Lighting	LED Lighting (IU Standard, 40W)	10.0	10,344	1.0	47,398	10,344	10,344	10,344	2,338	2,338	2,338	2,338	2,338	2,338	
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	10.2	802	1.0	8,823	2,090	2,090	2,090	472	472	472	472	472	191	
Lighting	LED Lighting (IU Standard, 100W)	10	1,657	1.0	9,876	1,657	1,657	1,657	701	701	701	701	701	701	
<b>CY2018 Program Total CPAS</b>			<b>16,649,949</b>		<b>228,666,665</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,451,678</b>	<b>16,439,835</b>	<b>15,865,785</b>	<b>12,619,628</b>	<b>12,571,527</b>	<b>11,875,778</b>	
<b>CY2018 Program Expiring Savings‡</b>								<b>199,559</b>	<b>211,403</b>	<b>785,453</b>	<b>4,031,609</b>	<b>4,079,710</b>	<b>4,775,459</b>		

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Hot Water	Aerator												
Shell	Air Sealing	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665	2,685,665						
Shell	Attic Insulation	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654	2,266,654
HVAC	Boiler Tune-up												
HVAC	Central AC	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064	4,064			
Hot Water	DHW Boiler	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027	1,027
Shell	Door Sweep	29,338	29,338	29,338	29,338	29,338	29,338						
Shell	Door Weatherstrip	34,290	34,290	34,290	34,290	34,290	34,290						
Appliances	Energy Star Refrigerator	12,065	12,065	12,065									
HVAC	Furnace	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506	91,506
HVAC	Hydronic Boiler	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995	53,995
Lighting	LED Exit Sign	215,734	215,734	215,734	215,734	215,734	215,734	215,734					
Lighting	LED Lighting (CA Exterior)	370,827	73,683										
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)	109,775	6,718										
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189	1,384,189						
HVAC	Programmable Thermostat												
HVAC	PTHP	469,986	469,986	469,986	469,986	469,986	469,986						
Hot Water	Showerhead (CA)	3,805											
Hot Water	Showerhead (IU)	936,743											
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat	488,057											
HVAC	Steam Averaging Controls	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428	489,428
HVAC	Steam Boiler	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204	1,663,204
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)	130,083											
Lighting	LED Lighting (CA Exterior, 100W Incandescent)	339	67										
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)	2,637	522										
Lighting	LED Lighting (IU Standard, 75W)	1,486											
Lighting	LED Lighting (IU Standard, 40W)	2,338											
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)	701											
<b>CY2018 Program Total CPAS</b>		<b>11,447,936</b>	<b>9,482,135</b>	<b>9,401,145</b>	<b>9,389,079</b>	<b>9,389,079</b>	<b>9,389,079</b>	<b>4,785,612</b>	<b>4,569,878</b>	<b>4,569,878</b>	<b>4,565,814</b>	<b>4,565,814</b>	<b>2,266,654</b>
<b>CY2018 Program Expiring Savings†</b>		<b>5,203,302</b>	<b>7,169,102</b>	<b>7,250,093</b>	<b>7,262,158</b>	<b>7,262,158</b>	<b>7,262,158</b>	<b>11,865,625</b>	<b>12,081,360</b>	<b>12,081,360</b>	<b>12,085,423</b>	<b>12,085,423</b>	<b>14,384,583</b>

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Hot Water	Aerator												
Shell	Air Sealing												
Shell	Attic Insulation	2,266,654	2,266,654	2,266,654	2,266,654								
HVAC	Boiler Tune-up												
HVAC	Central AC												
Hot Water	DHW Boiler												
Shell	Door Sweep												
Shell	Door Weatherstrip												
Appliances	Energy Star Refrigerator												
HVAC	Furnace												
HVAC	Hydronic Boiler												
Lighting	LED Exit Sign												
Lighting	LED Lighting (CA Exterior)												
Lighting	LED Lighting (CA Interior 24/7)												
Lighting	LED Lighting (CA Interior TLED)												
Lighting	LED Lighting (IU Specialty)												
Lighting	Occupancy Sensor												
HVAC	Pipe Insulation												
HVAC	Programmable Thermostat												
HVAC	PTHP												
Hot Water	Showerhead (CA)												
Hot Water	Showerhead (IU)												
Consumer Electronics	Advanced Power Strip (Tier 1)												
HVAC	Smart Thermostat												
HVAC	Steam Averaging Controls												
HVAC	Steam Boiler												
HVAC	Steam Trap Repair/Replace												
Lighting	LED Lighting (CA Interior)												
Lighting	LED Lighting (IU Standard, 60W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (CA Interior, 60W Incandescent)												
Lighting	LED Lighting (CA Exterior, 60W Incandescent)												
Lighting	LED Lighting (IU Standard, 75W)												
Lighting	LED Lighting (IU Standard, 40W)												
Lighting	LED Lighting (CA Exterior, 100W Incandescent)												
Lighting	LED Lighting (IU Standard, 100W)												
<b>CY2018 Program Total CPAS</b>		<b>2,266,654</b>	<b>2,266,654</b>	<b>2,266,654</b>	<b>2,266,654</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>CY2018 Program Expiring Savings†</b>		<b>14,384,583</b>	<b>14,384,583</b>	<b>14,384,583</b>	<b>14,384,583</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>	<b>16,651,237</b>

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

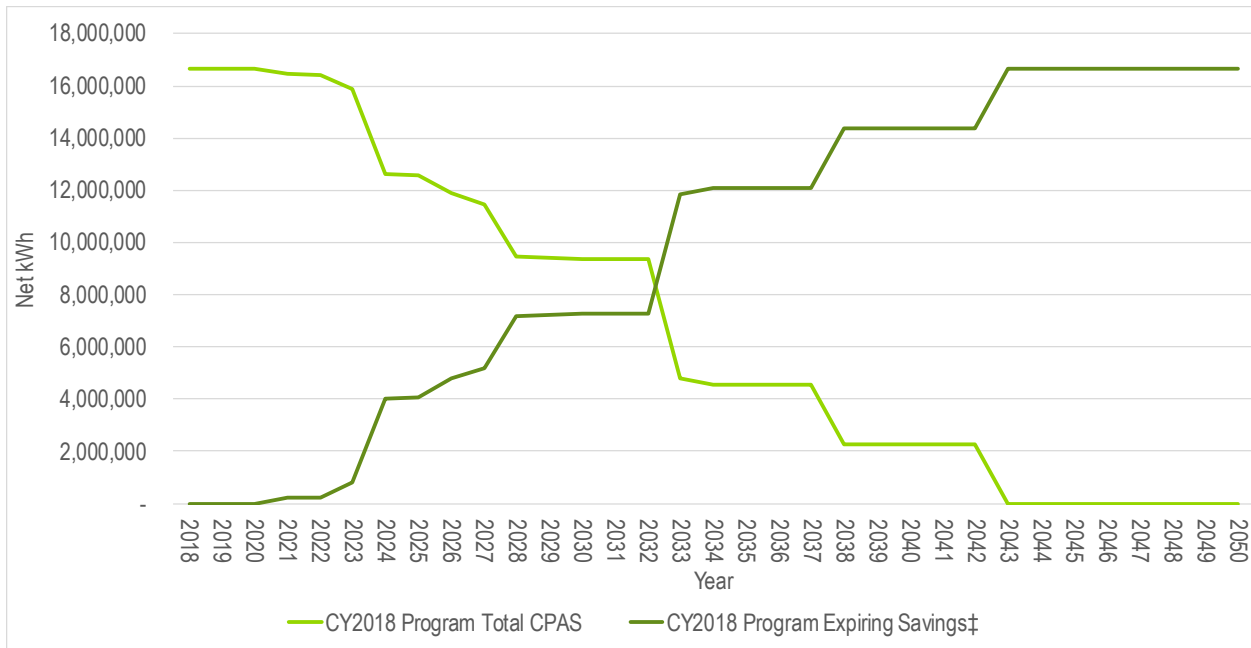
\* A deemed value. Source: ComEd\_NTG\_History\_and\_PY10\_Recommendations\_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

†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 22 measures as shown in the following tables. The LED lighting measure contributed the most savings, representing 67% of the verified gross kWh savings, followed by packaged terminal heat pump (PTHP) which represents 12% of the verified gross kWh savings. The rest of the savings come from attic insulation, air sealing, programmable thermostats and the other remaining 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
Hot Water	Aerator	5,213	1.00	5,213	1.00	5,213	9.0
Shell	Air Sealing	180,113	1.24	223,182	1.00	223,182	15.0
Shell	Attic Insulation	203,768	1.10	224,116	1.00	224,116	25.0
HVAC	Boiler Tune-up	0	NA	0	1.00	0	3.0
HVAC	Central AC	4,064	1.00	4,064	1.00	4,064	18.0
Hot Water	DHW Boiler	0	NA	0	1.00	0	20.0
Shell	Door Sweep	0	NA	0	1.00	0	15.0
Shell	Door Weatherstrip	0	NA	0	1.00	0	15.0
Appliances	Energy Star Refrigerator	23,914	1.00	23,909	1.00	23,909	12.0
HVAC	Furnace	19,032	1.00	19,032	1.00	19,032	20.0
HVAC	Hydronic Boiler	0	NA	0	1.00	0	20.0
Lighting	LED Lighting	2,665,835	0.96	2,571,497	1.00	2,571,497	8.5
Lighting	Occupancy Sensor	10,312	1.00	10,312	1.00	10,312	8.0
HVAC	Pipe Insulation	0	NA	0	1.00	0	15.0
HVAC	Programmable Thermostat	174,124	0.98	171,143	1.00	171,143	5.0
HVAC	PTHP	523,858	0.90	469,986	1.00	469,986	15.0
Hot Water	Showerhead	13,646	1.00	13,645	1.00	13,645	10.0
Consumer Electronics	Advanced Power Strip (Tier 1)	33,157	1.45	48,101	1.00	48,101	7.0
HVAC	Smart Thermostat	28,363	1.13	32,079	1.00	32,079	10.0
HVAC	Steam Averaging Controls	0	NA	0	1.00	0	20.0
HVAC	Steam Boiler	0	NA	0	1.00	0	20.0
HVAC	Steam Trap Repair/Replace	0	NA	0	1.00	0	6.0
<b>Total</b>		<b>3,885,398</b>	<b>0.98</b>	<b>3,816,278</b>		<b>3,816,278</b>	

\* 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 applicable

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)
Hot Water	Aerator	NA	NA	100.20	1.00	100.20
Shell	Air Sealing	NA	NA	0.00	1.00	0.00
Shell	Attic Insulation	NA	NA	35.51	1.00	35.51
HVAC	Boiler Tune-up	NA	NA	0.00	1.00	0.00
HVAC	Central AC	NA	NA	1.76	1.00	1.76
Hot Water	DHW Boiler	NA	NA	0.00	1.00	0.00
Shell	Door Sweep	NA	NA	0.00	1.00	0.00
Shell	Door Weatherstrip	NA	NA	0.00	1.00	0.00
Appliances	Energy Star Refrigerator	NA	NA	2.73	1.00	2.73
HVAC	Furnace	NA	NA	12.00	1.00	12.00
HVAC	Hydronic Boiler	NA	NA	0.00	1.00	0.00
Lighting	LED Lighting	NA	NA	657.39	1.00	657.39
Lighting	Occupancy Sensor	NA	NA	6.21	1.00	6.21
HVAC	Pipe Insulation	NA	NA	0.00	1.00	0.00
HVAC	Programmable Thermostat	NA	NA	0.00	1.00	0.00
HVAC	PTHP	NA	NA	11.15	1.00	11.15
Hot Water	Showerhead	NA	NA	55.02	1.00	55.02
Consumer Electronics	Advanced Power Strip (Tier 1)	NA	NA	6.75	1.00	6.75
HVAC	Smart Thermostat	NA	NA	31.34	1.00	31.34
HVAC	Steam Averaging Controls	NA	NA	0.00	1.00	0.00
HVAC	Steam Boiler	NA	NA	0.00	1.00	0.00
HVAC	Steam Trap Repair/Replace	NA	NA	0.00	1.00	0.00
<b>Total</b>				<b>920.04</b>		<b>920.04</b>

\* 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 applicable

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)
Hot Water	Aerator	2.20	1.00	2.20	1.00	2.20
Shell	Air Sealing	0.00	NA	0.00	1.00	0.00
Shell	Attic Insulation	0.00	NA	24.14	1.00	24.14
HVAC	Boiler Tune-up	0.00	NA	0.00	1.00	0.00
HVAC	Central AC	0.00	NA	1.20	1.00	1.20
Hot Water	DHW Boiler	0.00	NA	0.00	1.00	0.00
Shell	Door Sweep	0.00	NA	0.00	1.00	0.00
Shell	Door Weatherstrip	0.00	NA	0.00	1.00	0.00
Appliances	Energy Star Refrigerator	0.00	NA	3.60	1.00	3.60
HVAC	Furnace	0.00	NA	8.16	1.00	8.16
HVAC	Hydronic Boiler	0.00	NA	0.00	1.00	0.00
Lighting	LED Lighting	282.71	0.97	272.90	1.00	272.90
Lighting	Occupancy Sensor	3.97	1.00	3.97	1.00	3.97
HVAC	Pipe Insulation	0.00	NA	0.00	1.00	0.00
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
HVAC	PTHP	0.00	NA	10.18	1.00	10.18
Hot Water	Showerhead	1.53	1.00	1.53	1.00	1.53
Consumer Electronics	Advanced Power Strip (Tier 1)	5.42	1.00	5.40	1.00	5.40
HVAC	Smart Thermostat	20.10	0.54	10.79	1.00	10.79
HVAC	Steam Averaging Controls	0.00	NA	0.00	1.00	0.00
HVAC	Steam Boiler	0.00	NA	0.00	1.00	0.00
HVAC	Steam Trap Repair/Replace	0.00	NA	0.00	1.00	0.00
<b>Total</b>		<b>315.93</b>	<b>1.09</b>	<b>344.07</b>		<b>344.07</b>

\* 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 applicable

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
Hot Water	Aerator	9,647	1.00	9,647	1.00	9,647	9.0
Shell	Air Sealing	84,043	1.00	84,015	1.00	84,015	15.0
Shell	Attic Insulation	69,842	1.00	69,687	1.00	69,687	25.0
HVAC	Boiler Tune-up	5,929	0.81	4,779	1.00	4,779	3.0
HVAC	Central AC	0	NA	0	1.00	0	18.0
Hot Water	DHW Boiler	35	1.00	35	1.00	35	20.0
Shell	Door Sweep	1,001	1.00	1,001	1.00	1,001	15.0
Shell	Door Weatherstrip	1,182	0.99	1,170	1.00	1,170	15.0
Appliances	Energy Star Refrigerator	0	NA	0	1.00	0	12.0
HVAC	Furnace	2,607	0.95	2,473	1.00	2,473	20.0
HVAC	Hydronic Boiler	1,842	1.00	1,842	1.00	1,842	20.0
Lighting	LED Lighting	0	NA	0	1.00	0	8.5
Lighting	Occupancy Sensor	0	NA	0	1.00	0	8.0
HVAC	Pipe Insulation	52,945	0.89	47,226	1.00	47,226	15.0
HVAC	Programmable Thermostat	7,785	0.66	5,128	1.00	5,128	5.0
HVAC	PTHP	0	NA	0	1.00	0	15.0
Hot Water	Showerhead	31,530	1.00	31,624	1.00	31,624	10.0
Consumer Electronics	Advanced Power Strip (Tier 1)	0	NA	0	1.00	0	7.0
HVAC	Smart Thermostat	18,339	0.85	15,557	1.00	15,557	10.0
HVAC	Steam Averaging Controls	17,829	0.94	16,698	1.00	16,698	20.0
HVAC	Steam Boiler	57,165	0.99	56,745	1.00	56,745	20.0
HVAC	Steam Trap Repair/Replace	90,273	1.00	90,275	1.00	90,275	6.0
<b>Total Therms</b>		<b>451,995</b>	<b>0.97</b>	<b>437,904</b>		<b>437,904</b>	
<b>Total kWh Converted From Therms†</b>		<b>13,247,967</b>	<b>0.97</b>	<b>12,834,959</b>		<b>12,834,959</b>	

\* 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 applicable

† Gas savings converted to kWh by multiplying therms \* 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)
Hot Water	Aerator	287,966	1.00	287,967	1.00	287,967
Shell	Air Sealing	2,643,408	1.02	2,685,665	1.00	2,685,665
Shell	Attic Insulation	2,250,832	1.01	2,266,654	1.00	2,266,654
HVAC	Boiler Tune-up	173,773	0.81	140,085	1.00	140,085
HVAC	Central AC	4,064	1.00	4,064	1.00	4,064
Hot Water	DHW Boiler	1,027	1.00	1,027	1.00	1,027
Shell	Door Sweep	29,336	1.00	29,338	1.00	29,338
Shell	Door Weatherstrip	34,652	0.99	34,290	1.00	34,290
Appliances	Energy Star Refrigerator	23,914	1.00	23,909	1.00	23,909
HVAC	Furnace	95,456	0.96	91,506	1.00	91,506
HVAC	Hydronic Boiler	53,995	1.00	53,995	1.00	53,995
Lighting	LED Lighting	2,665,835	0.96	2,571,497	1.00	2,571,497
Lighting	Occupancy Sensor	10,312	1.00	10,312	1.00	10,312
HVAC	Pipe Insulation	1,551,824	0.89	1,384,189	1.00	1,384,189
HVAC	Programmable Thermostat	402,308	0.80	321,453	1.00	321,453
HVAC	PTHP	523,858	0.90	469,986	1.00	469,986
Hot Water	Showerhead	937,794	1.00	940,548	1.00	940,548
Consumer Electronics	Advanced Power Strip (Tier 1)	33,157	1.45	48,101	1.00	48,101
HVAC	Smart Thermostat	565,879	0.86	488,057	1.00	488,057
HVAC	Steam Averaging Controls	522,576	0.94	489,428	1.00	489,428
HVAC	Steam Boiler	1,675,499	0.99	1,663,204	1.00	1,663,204
HVAC	Steam Trap Repair/Replace	2,645,900	1.00	2,645,963	1.00	2,645,963
<b>Total†</b>		<b>17,133,364</b>	<b>0.97</b>	<b>16,651,237</b>		<b>16,651,237</b>

\* 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. Navigant also conducted research to validate the parameters that were not specified in the TRM.

**Table 6-1. Savings Parameters**

Measure	Custom Input Parameters	Deemed Input Parameters	Deemed* Input Data Source
Aerator	None	%Electric_DHW, GPM_base, GPM_low, L_base, L_low, Household, DF, FPH, EPG_electric, ISR, Hours, %Fossil_DHW, EPG_gas	IL TRM v6.0 – Section 5.4.4
Air Sealing	LF_sealing	ΔTherms_sealing, ADJ_RXAirsealing	IL TRM v6.0 – Section 5.6.1
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
Boiler Tune-up	Capacity, Eff_actual, Eff_base	EFLH	IL TRM v6.0 – Section 4.4.10
Central AC	Capacity, SEER_ee, EER_ee, SEER_base, EER_base	FLH_cool	IL TRM v6.0 – Section 5.3.3
DHW Boiler	Eff_ee, Eff_base, Household	T_out, T_in, GPD, Specific Heat of Water, Specific Weight of Water	IL TRM v6.0 – Section 4.3.10
Door Sweep	N_sweep	ΔTherms_sweep, ADJ_RXAirsealing	IL TRM v6.0 – Section 5.6.1
Door Weatherstrip	LF_weatherstripping	ΔTherms_wx, ADJ_RXAirsealing	IL TRM v6.0 – Section 5.6.1
Energy Star Refrigerator	UEC_exist, UEC_base, UEC_ee,	TAF, LSAF, Hours	IL TRM v6.0 – Section 5.1.6
Furnace	AFUE_ee	Heating Savings_kWh, Cooling Savings_kWh, Shoulder Season Savings_kWh, FLH_cooling, CF, Gas Furnace Heating Load, HF, AFUE_base, Derating_base, Derating_ee	IL TRM v6.0 – Section 5.3.7
Hydronic Boiler	Capacity, Eff_actual, Eff_base	EFLH	IL TRM v6.0 – Section 4.4.10
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
Occupancy Sensor	kW_controlled	Hours, ESF, WHF_e, WHF_d, CF_baseline, CF_os	IL TRM v6.0 – Section 4.5.10
Pipe Insulation	(Q_base – Q_eff), R_new, L, C	EFLH, Eff_boiler, TRF, R_exist, Eff_DHW, ΔT	IL TRM v6.0 – Section 4.4.14, Section 5.4.1
Programmable Thermostat	None	%Electric Heat, Elec_Heating_Consumption, Heating Reduction, HF, ISR, ΔTherms, F_e, %Fossil Heat, Gas_Heating_Consumption	IL TRM v6.0 – Section 5.3.11
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
Showerhead	None	%Fossil_DHW, GPM_base, GPM_low, L_base, L_low, NSPD, EPG_gas, ISR, %Electric_DHW, SPCD, Household, SPH, EPG_electric, ISR, Hours, CF	IL TRM v6.0 – Section 5.4.5, Section 4.3.3
Smart Strip (Tier 1)	None	kWh, ISR, Hours, CF	IL TRM v6.0 – Section 5.2.1
Smart Thermostat	None	%AC, FLH, Btu/hr, SEER, Cooling_Reduction, ISR, F_e, CF, %Fossil_Heat, Gas_Heating_Consumption, Heating Reduction	IL TRM v6.0 – Section 5.3.16

Measure	Custom Input Parameters	Deemed Input Parameters	Deemed* Input Data Source
Steam Averaging Controls	Capacity	SF, EFLH	IL TRM v6.0 – Section 4.4.36
Steam Boiler	Capacity, Eff_actual, Eff_base	EFLH	IL TRM v6.0 – Section 4.4.10
Steam Trap Repair/Replacement	Total Heating Load, %Cap	S_a, H_v, B, Hours, L	IL TRM v6.0 – Section 4.4.16

\* 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 Pipe Insulation (Common Area [CA], Domestic Hot Water [DHW]) measure, the ex ante savings are calculated using a boiler efficiency of 0.67, while the section 4.4.14 of the IL TRM v6.0 deems an efficiency value of 0.819 for water boilers.

**Recommendation 1.** Navigant recommends updating the boiler efficiency for this measure to 0.819 as per the IL TRM v6.0.

**Finding 2.** For the Advanced Power Strip Tier 1 (APS) measure, the ex ante savings are calculated using an ISR of 0.69, while the section 5.2.1 of the IL TRM v6.0 deems and ISR of 1.0 for direct install APS measures.

**Recommendation 2.** Navigant recommends updating the ISR for this measure to 1 as per the IL TRM v6.0.

**Finding 3.** For the Gas Showerhead (CA) measure, the ex ante savings are calculated using the algorithm deemed in section 5.4.5 of the IL TRM v6.0, which only applied to measures installed inside apartment units.

**Recommendation 3.** Navigant recommends calculating the energy savings using section 4.3.3 of the IL TRM v6.0, which applies to measures installed in common areas of a multi-family building.

**Finding 4.** For the Steam Boiler, PTHP, Steam Pipe Averaging Controls and Boiler Tune-up measures, the ex ante savings are calculated using the IL TRM v6.0 deemed Equivalent Full Load Hours (EFLH) for Multi-family Mid-Rise building type even though the tracking data indicates that some of the buildings are Multi-family High-Rise buildings.

**Recommendation 4.** Navigant recommends using the appropriate IL TRM v6.0 deemed EFLH for heating and cooling for each building type.

**Finding 5.** For the Attic Insulation measure, the ex ante calculations do not consider the cooling system demand savings for centrally cooled buildings and cooling system energy savings for some of the centrally cooled buildings. Additionally, the ex ante calculations do not consider heating system energy savings for some buildings that are heated using a furnace.

**Recommendation 5.** Navigant recommends updating the ex ante calculations to include energy and demand savings for centrally cooled buildings and energy savings for buildings that are heated using a furnace.

**Finding 6.** The demand savings provided in the tracking data for the Smart Thermostat and therm savings for the Attic Insulation measure (Project ID: 10001019) respectively do not align with the corresponding inputs provided in the tracking data.

**Recommendation 6.** Navigant recommends providing the source of the ex ante demand savings provided in the tracking data.

**Finding 7.** For the Smart Thermostat (Programmable, Gas Furnace and AC) measure, the ex ante energy savings are calculated using a Heating Reduction (HR) factor of 8.8%, which is the IL TRM v6.0 deemed value for smart thermostat measures replacing Manual Thermostats.

**Recommendation 7.** Navigant recommends using the HR factor of 5.6% instead, which is the IL TRM v6.0 deemed value for smart thermostats replacing Programmable Thermostats.

**Finding 8.**

The ex ante savings for the LED Common Area (CA) measures are calculated using an In-Service Rate (ISR) of 1.00, while the verified savings are calculated using an ISR of 0.957 as per the measure section 4.5.4 of the IL TRM v6.0.

The ex ante savings for the 15W LED Flood (CA Exterior, 23W CFL) measure are calculated using 2475 as the hours of use, while the verified savings are calculated using 4903 as the hours of use as per the IL TRM v6.0 for exterior space type.

The ex ante savings for the 2ft by 2ft LED Troffer (CA Interior, 2L 2ft T8/T12U) measure are not consistent with the deemed inputs for this measure in the implementer's calculator.

The ex ante savings for the 4W LED Candelabra (CA Interior, 40W Incandescent) measure are not included in the implementer's calculator.

The ex ante savings for the 5W LED Candelabra (IU Exterior, 40W) and the 6/12/19W LED 3-Way (IU Interior, 50/100/150W) measures are calculated using an ISR of 1.00, while the verified savings are calculated using an ISR of 0.969 as per the measure section 5.5.6 of the IL TRM v6.0.

**Recommendation 8.**

Update the ISR for the LED Common Area measures to 0.957 as per the IL TRM v6.0.

Update the hours of use for the 15W LED Flood (CA Exterior, 23W CFL) measure to 4903 as per the IL TRM v6.0.

Navigant would like to request the algorithm used to calculate the ex ante savings for the 2ft by 2ft LED Troffer (CA Interior, 2L 2ft T8/T12U) measure.

Navigant would like to request the algorithm and the deemed inputs used to calculate the ex ante savings for the 4W LED Candelabra (CA Interior, 40W Incandescent) measure.

Update the ISR for the 5W LED Candelabra (IU Exterior, 40W) and the 6/12/19W LED 3-Way (IU Interior, 50/100/150W) measures to 0.969 as per the IL TRM v6.0.

## 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.
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 (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 Illinois Stakeholder Advisory Group (IL:SAG), as documented in a spreadsheet.<sup>3</sup>

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

- Final CY2018 tracking data: “MFIE\_2018\_EOY\_Data\_Rev1\_02012019”
- 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: “2018\_IEMS\_PHES\_Variable Documentation\_112318”
- Implementer Savings Calculations: “corrected\_measures\_comed\_111218”
- Implementer Savings Calculations: “Sample for Elevate\_03082019\_resubmission”

## 8. APPENDIX 3. TOTAL RESOURCE COST DETAIL

Table 8-1, 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 8-1. Total Resource Cost Savings Summary**

End Use Type	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (kWh)	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)
Hot Water	Aerator	Each	3,676	9.0	5,213	2.20	5,213	2.20
Shell	Air Sealing	Linear Feet	249,667	15.0	180,113	0.00	223,182	0.00
Shell	Attic Insulation	Square Feet	724,431	25.0	203,768	0.00	224,116	24.14
HVAC	Boiler Tune-up	kBtu/hr	25,771	3.0	0	0.00	0	0.00
HVAC	Central AC	Each	26	18.0	4,064	0.00	4,064	1.20
Hot Water	DHW Boiler	Each	2	20.0	0	0.00	0	0.00
Shell	Door Sweep	Each	159	15.0	0	0.00	0	0.00
Shell	Door Weatherstrip	Each	169	15.0	0	0.00	0	0.00
Appliances	Energy Star Refrigerator	Each	307	12.0	23,914	0.00	23,909	3.60
HVAC	Furnace	Each	26	20.0	19,032	0.00	19,032	8.16
HVAC	Hydronic Boiler	kBtu/hr	958	20.0	0	0.00	0	0.00
Lighting	LED Lighting	Lamp	21,582	8.5	2,665,835	282.71	2,571,497	272.90
Lighting	Occupancy Sensor	Each	45	8.0	10,312	3.97	10,312	3.97
HVAC	Pipe Insulation	Linear Feet	22,820	15.0	0	0.00	0	0.00
HVAC	Programmable Thermostat	Each	350	5.0	174,124	0.00	171,143	0.00
HVAC	PTHP	Each	240	15.0	523,858	0.00	469,986	10.18
Hot Water	Showerhead	Each	2,092	10.0	13,646	1.53	13,645	1.53
Consumer Electronics	Advanced Power Strip (Tier 1)	Each	467	7.0	33,157	5.42	48,101	5.40
HVAC	Smart Thermostat	Each	359	10.0	28,363	20.10	32,079	10.79
HVAC	Steam Averaging Controls	Each	768	20.0	0	0.00	0	0.00
HVAC	Steam Boiler	kBtu/hr	56,823	20.0	0	0.00	0	0.00
HVAC	Steam Trap Repair/Replace	Each	2,673	6.0	0	0.00	0	0.00

Source: ComEd tracking data and Navigant team analysis.

<sup>3</sup> 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>.