



ComEd Single Family Retrofit Program Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2018 (CY2018)
(01/01/2018-12/31/2018)

Presented to
ComEd

DRAFT

March 7, 2019

Prepared by:

Jennifer Ma
Navigant Consulting, Inc

Julie Barstow
Navigant Consulting, Inc



Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Randy Gunn, Managing Director 312.583.5714 Randy.Gunn@Navigant.Com	Jeff Erickson, Director 608.497.2322 Jeff.Erickson@Navigant.Com	Chelsea Lamar, Managing Consultant 312.583.2673 Chelsea.Lamar@Navigant.Com
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1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2018 Income Eligible Single Family Retrofit (SFR) Program. It presents a summary of the energy and demand impacts broken out by relevant measure and program channel. CY2018 covers January 1, 2018 through December 31, 2018.

The SFR Program provides retrofits to single-family households in ComEd service areas with incomes at or below 80 percent of the Area Median Income. The program offers assessments, direct installation of energy efficiency measures, replacement of inefficient equipment, technical assistance, and educational information to further save money on energy bills through two program components. One program component is implemented by Franklin Energy Services (Franklin) with the Chicago Bungalow Association (CBA) and is offered jointly with Peoples Gas & Light (PGL). A portion of the program offered outside of the City of Chicago is delivered by the Chicagoland Vintage Home Association (which is an extension of CBA) and is solely offered by ComEd. Resource Innovations implements the other component of the program, leveraging the State of Illinois' Home Weatherization Assistance Program (IHWAP). The IHWAP portion is offered jointly with PGL, North Shore Gas (NSG), and Nicor Gas.

The CBA and IHWAP components of the program are offered in separate sections. The gas savings reported include only those that ComEd is claiming.

2. CHICAGO BUNGALOW ASSOCIATION (CBA)

2.1 Program Component Description

The CBA component had 1,563 participants in CY2018 and distributed 31,743 measures as shown in the following table and graph.

Table 2-1. CY2018 CBA Volumetric Findings Detail

Participation	CBA Total
Participants*	1,563
Total Measures	31,743
Number of Units/Projects	12
Installed Projects†	2,719
Advanced Power Strip - Tier 1	773
HW Pipe Insulation (Linear Feet)	2,295
Low Flow Faucet Aerator - Bathroom	271
Low Flow Faucet Aerator - Kitchen	145
Low Flow Showerhead	690
Advanced Thermostat‡	81
Bathroom Exhaust Fan	1,558
Programmable Thermostat‡	199
Reprogramming Thermostat‡	35
LED Omnidirectional Bulb - Exterior	221
LED Omnidirectional Bulb - Interior	9,364
LED Specialty Lamp	6,899
LED Specialty Lamp - Track and Recessed	3,766
Air Sealing (Projects)	1,561
Attic Insulation (Projects)	1,557
Crawlspace Insulation (Projects)	190
Foundation Insulation (Projects)	195
Wall Insulation (Projects)	1,946

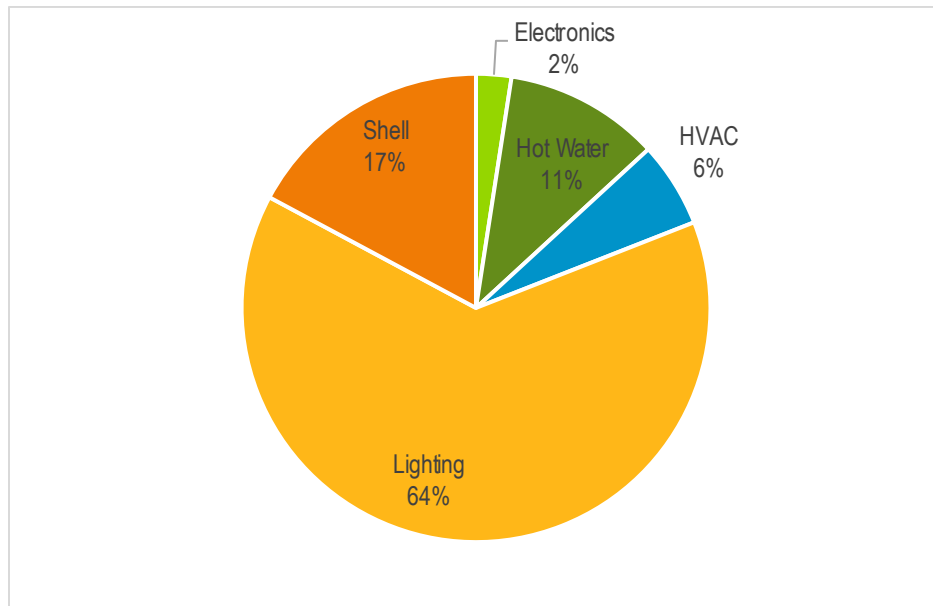
* Participants are defined as unique ComEd account numbers

† Installed projects are defined as unique Project IDs

‡ Includes all thermostat quantities reported in tracking data but thermostat savings capped at one per ComEd account number

Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. CBA Percent of Measures Installed by End Use



Source: ComEd tracking data and Navigant team analysis.

2.2 Cumulative Persisting Annual Savings

The measure-specific and total ex ante gross savings for the CBA component and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The electric CPAS across all measures is 2,041,077 kWh. The component achieved 6,797,742 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd’s goal¹ (Table 2-3 in the following set of tables). Adding the savings converted from gas savings to the electric savings produces a total of 8,838,818 kWh of total CPAS.

¹ The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary Report.

Table 2-2. CBA Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	Verified Gross Savings	NTG*	Lifetime Net Savings†	Verified Net kWh Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Electronics	Advanced Power Strip - Tier 1	7.0	54,937	1.00	384,560	54,937	54,937	54,937	54,937	54,937	54,937	54,937	54,937	54,937	54,937
Hot Water	HW Pipe Insulation	15.0	681	1.00	10,220	681	681	681	681	681	681	681	681	681	681
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	102	1.00	916	102	102	102	102	102	102	102	102	102	102
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	67	1.00	599	67	67	67	67	67	67	67	67	67	67
Hot Water	Low Flow Showerhead	10.0	4,919	1.00	49,194	4,919	4,919	4,919	4,919	4,919	4,919	4,919	4,919	4,919	4,919
HVAC	Advanced Thermostat	10.0	18,314	NA‡	183,142	18,314	18,314	18,314	18,314	18,314	18,314	18,314	18,314	18,314	18,314
HVAC	Bathroom Exhaust Fan	19.0	138,007	1.00	2,622,141	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007
HVAC	Programmable Thermostat	5.0	9,749	1.00	48,747	9,749	9,749	9,749	9,749	9,749					
HVAC	Reprogramming Thermostat	2.0	1,864	1.00	3,728	1,864	1,864								
Lighting	LED Omnidirectional Bulb - Exterior	6.1	19,743	1.00	82,014	19,743	19,743	19,743	7,350	7,350	7,350	735			
Lighting	LED Omnidirectional Bulb - Interior	10.0	265,883	1.00	1,468,655	265,883	265,883	265,883	95,858	95,858	95,858	95,858	95,858	95,858	95,858
Lighting	LED Specialty Lamp	10.0	283,334	1.00	2,833,337	283,334	283,334	283,334	283,334	283,334	283,334	283,334	283,334	283,334	283,334
Lighting	LED Specialty Lamp - Track and Recessed	15.0	174,132	1.00	2,611,974	174,132	174,132	174,132	174,132	174,132	174,132	174,132	174,132	174,132	174,132
Shell	Air Sealing	15.0	542,063	1.00	8,130,949	542,063	542,063	542,063	542,063	542,063	542,063	542,063	542,063	542,063	542,063
Shell	Attic Insulation	25.0	194,895	1.00	4,872,380	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895
Shell	Crawlspace Insulation	25.0	4,499	1.00	112,470	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499
Shell	Foundation Insulation	25.0	73,133	1.00	1,828,327	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133
Shell	Wall Insulation	25.0	254,754	1.00	6,368,851	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754
CY2018 Program Total Electric CPAS			2,041,077		31,612,202	2,041,077	2,041,077	2,039,213	1,856,795	1,856,795	1,847,046	1,840,430	1,784,758	1,784,758	1,784,758
CY2018 Program Expiring Electric Savings§							0	1,864	184,281	184,281	194,031	200,646	256,318	256,318	256,318

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation	681	681	681	681	681	681						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	4,919											
HVAC	Advanced Thermostat	18,314											
HVAC	Bathroom Exhaust Fan	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007		
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	95,858											
Lighting	LED Specialty Lamp	283,334											
Lighting	LED Specialty Lamp - Track and Recessed	174,132	174,132	174,132	174,132	174,132	174,132						
Shell	Air Sealing	542,063	542,063	542,063	542,063	542,063	542,063						
Shell	Attic Insulation	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895	194,895
Shell	Crawlspace Insulation	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499	4,499
Shell	Foundation Insulation	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133	73,133
Shell	Wall Insulation	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754	254,754
CY2018 Program Total Electric CPAS		1,784,590	1,382,165	1,382,165	1,382,165	1,382,165	1,382,165	665,289	665,289	665,289	665,289	527,281	527,281
CY2018 Program Expiring Electric Savings\$		256,487	658,912	658,912	658,912	658,912	658,912	1,375,788	1,375,788	1,375,788	1,375,788	1,513,795	1,513,795

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
HVAC	Advanced Thermostat												
HVAC	Bathroom Exhaust Fan												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	194,895	194,895	194,895	194,895								
Shell	Crawlspace Insulation	4,499	4,499	4,499	4,499								
Shell	Foundation Insulation	73,133	73,133	73,133	73,133								
Shell	Wall Insulation	254,754	254,754	254,754	254,754								
CY2018 Program Total Electric CPAS		527,281	527,281	527,281	527,281	0	0	0	0	0	0	0	0
CY2018 Program Expiring Electric Savings§		1,513,795	1,513,795	1,513,795	1,513,795	2,041,077	2,041,077	2,041,077	2,041,077	2,041,077	2,041,077	2,041,077	2,041,077

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.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: Navigant analysis

Table 2-3. CBA 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	
Electronics	Advanced Power Strip - Tier 1	7.0	0	1.00	0										
Hot Water	HW Pipe Insulation	15.0	535	1.00	8,020	535	535	535	535	535	535	535	535	535	535
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	79	1.00	707	79	79	79	79	79	79	79	79	79	79
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	145	1.00	1,308	145	145	145	145	145	145	145	145	145	145
Hot Water	Low Flow Showerhead	10.0	3,384	1.00	33,845	3,384	3,384	3,384	3,384	3,384	3,384	3,384	3,384	3,384	3,384
HVAC	Advanced Thermostat	10.0	6,561	NA‡	65,606	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561
HVAC	Bathroom Exhaust Fan	19.0	0	1.00	0										
HVAC	Programmable Thermostat	5.0	3,549	1.00	17,746	3,549	3,549	3,549	3,549	3,549					
HVAC	Reprogramming Thermostat	2.0	374	1.00	748	374	374								
Lighting	LED Omnidirectional Bulb - Exterior	6.1	0	1.00	0										
Lighting	LED Omnidirectional Bulb - Interior	10.0	0	1.00	0										
Lighting	LED Specialty Lamp	10.0	0	1.00	0										
Lighting	LED Specialty Lamp - Track and Recessed	15.0	0	1.00	0										
Shell	Air Sealing	15.0	93,758	1.00	1,406,363	93,758	93,758	93,758	93,758	93,758	93,758	93,758	93,758	93,758	93,758
Shell	Attic Insulation	25.0	46,138	1.00	1,153,449	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138
Shell	Crawlspace Insulation	25.0	977	1.00	24,415	977	977	977	977	977	977	977	977	977	977
Shell	Foundation Insulation	25.0	26,995	1.00	674,879	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995
Shell	Wall Insulation	25.0	49,432	1.00	1,235,792	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432
CY2018 Program Total Gas CPAS (Therms)			231,926		4,622,878	231,926	231,926	231,552	231,552	231,552	228,003	228,003	228,003	228,003	228,003
CY2018 Program Total Gas CPAS (kWh Equivalent)§					135,496,561	6,797,742	6,797,742	6,786,784	6,786,784	6,786,784	6,682,757	6,682,757	6,682,757	6,682,757	6,682,757
CY2018 Program Expiring Gas Savings (Therms) 							0	374	374	374	3,923	3,923	3,923	3,923	3,923
CY2018 Program Expiring Gas Savings (kWh Equivalent)§, 							0	10,958	10,958	10,958	114,984	114,984	114,984	114,984	114,984

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation	535	535	535	535	535	535						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	3,384											
HVAC	Advanced Thermostat	6,561											
HVAC	Bathroom Exhaust Fan												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing	93,758	93,758	93,758	93,758	93,758	93,758						
Shell	Attic Insulation	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138	46,138
Shell	Crawlspace Insulation	977	977	977	977	977	977	977	977	977	977	977	977
Shell	Foundation Insulation	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995	26,995
Shell	Wall Insulation	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432	49,432
CY2018 Program Total Gas CPAS (Therms)		227,779	217,834	217,834	217,834	217,834	217,834	123,541	123,541	123,541	123,541	123,541	123,541
CY2018 Program Total Gas CPAS (kWh Equivalent)\$		6,676,193	6,384,702	6,384,702	6,384,702	6,384,702	6,384,702	3,620,999	3,620,999	3,620,999	3,620,999	3,620,999	3,620,999
CY2018 Program Expiring Gas Savings (Therms) 		4,147	14,092	14,092	14,092	14,092	14,092	108,384	108,384	108,384	108,384	108,384	108,384
CY2018 Program Expiring Gas Savings (kWh Equivalent)\$, 		121,548	413,039	413,039	413,039	413,039	413,039	3,176,743	3,176,743	3,176,743	3,176,743	3,176,743	3,176,743

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
HVAC	Advanced Thermostat												
HVAC	Bathroom Exhaust Fan												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	46,138	46,138	46,138	46,138								
Shell	Crawlspace Insulation	977	977	977	977								
Shell	Foundation Insulation	26,995	26,995	26,995	26,995								
Shell	Wall Insulation	49,432	49,432	49,432	49,432								
CY2018 Program Total Gas CPAS (Therms)		123,541	123,541	123,541	123,541	0	0	0	0	0	0	0	0
CY2018 Program Total Gas CPAS (kWh Equivalent)§		3,620,999	3,620,999	3,620,999	3,620,999	0	0	0	0	0	0	0	0
CY2018 Program Expiring Gas Savings (Therms) 		108,384	108,384	108,384	108,384	231,926	231,926	231,926	231,926	231,926	231,926	231,926	231,926
CY2018 Program Expiring Gas Savings (kWh Equivalent)§, 		3,176,743	3,176,743	3,176,743	3,176,743	6,797,742	6,797,742	6,797,742	6,797,742	6,797,742	6,797,742	6,797,742	6,797,742

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.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

§ 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 2-4. CBA 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	
Electronics	Advanced Power Strip - Tier 1	7.0	54,937	1.00	384,560	54,937	54,937	54,937	54,937	54,937	54,937	54,937			
Hot Water	HW Pipe Insulation	15.0	16,352	1.00	245,274	16,352	16,352	16,352	16,352	16,352	16,352	16,352	16,352	16,352	
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	2,405	1.00	21,645	2,405	2,405	2,405	2,405	2,405	2,405	2,405	2,405	2,405	
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	4,327	1.00	38,946	4,327	4,327	4,327	4,327	4,327	4,327	4,327	4,327	4,327	
Hot Water	Low Flow Showerhead	10.0	104,118	1.00	1,041,180	104,118	104,118	104,118	104,118	104,118	104,118	104,118	104,118	104,118	
HVAC	Advanced Thermostat	10.0	210,607	NA‡	2,106,066	210,607	210,607	210,607	210,607	210,607	210,607	210,607	210,607	210,607	
HVAC	Bathroom Exhaust Fan	19.0	138,007	1.00	2,622,141	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	
HVAC	Programmable Thermostat	5.0	113,776	1.00	568,880	113,776	113,776	113,776	113,776	113,776					
HVAC	Reprogramming Thermostat	2.0	12,822	1.00	25,644	12,822	12,822								
Lighting	LED Omnidirectional Bulb - Exterior	6.1	19,743	1.00	82,014	19,743	19,743	19,743	7,350	7,350	7,350	735			
Lighting	LED Omnidirectional Bulb - Interior	10.0	265,883	1.00	1,468,655	265,883	265,883	265,883	95,858	95,858	95,858	95,858	95,858	95,858	
Lighting	LED Specialty Lamp	10.0	283,334	1.00	2,833,337	283,334	283,334	283,334	283,334	283,334	283,334	283,334	283,334	283,334	
Lighting	LED Specialty Lamp - Track and Recessed	15.0	174,132	1.00	2,611,974	174,132	174,132	174,132	174,132	174,132	174,132	174,132	174,132	174,132	
Shell	Air Sealing	15.0	3,290,096	1.00	49,351,443	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	
Shell	Attic Insulation	25.0	1,547,199	1.00	38,679,981	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	
Shell	Crawlspace Insulation	25.0	33,123	1.00	828,086	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	
Shell	Foundation Insulation	25.0	864,361	1.00	21,609,035	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	
Shell	Wall Insulation	25.0	1,703,596	1.00	42,589,902	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	
CY2018 Program Total CPAS			8,838,818		167,108,763	8,838,818	8,838,818	8,825,996	8,643,579	8,643,579	8,529,803	8,523,188	8,467,516	8,467,516	
CY2018 Program Expiring Savings§							0	12,822	195,239	195,239	309,015	315,630	371,303	371,303	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation	16,352	16,352	16,352	16,352	16,352	16,352						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	104,118											
HVAC	Advanced Thermostat	210,607											
HVAC	Bathroom Exhaust Fan	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007	138,007		
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	95,858											
Lighting	LED Specialty Lamp	283,334											
Lighting	LED Specialty Lamp - Track and Recessed	174,132	174,132	174,132	174,132	174,132	174,132						
Shell	Air Sealing	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096	3,290,096						
Shell	Attic Insulation	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199	1,547,199
Shell	Crawlspace Insulation	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123	33,123
Shell	Foundation Insulation	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361	864,361
Shell	Wall Insulation	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596	1,703,596
CY2018 Program Total CPAS		8,460,783	7,766,867	7,766,867	7,766,867	7,766,867	7,766,867	4,286,288	4,286,288	4,286,288	4,286,288	4,148,280	4,148,280
CY2018 Program Expiring Savings\$		378,035	1,071,951	1,071,951	1,071,951	1,071,951	1,071,951	4,552,531	4,552,531	4,552,531	4,552,531	4,690,538	4,690,538

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Electronics	Advanced Power Strip - Tier 1												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
HVAC	Advanced Thermostat												
HVAC	Bathroom Exhaust Fan												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	1,547,199	1,547,199	1,547,199	1,547,199								
Shell	Crawlspace Insulation	33,123	33,123	33,123	33,123								
Shell	Foundation Insulation	864,361	864,361	864,361	864,361								
Shell	Wall Insulation	1,703,596	1,703,596	1,703,596	1,703,596								
CY2018 Program Total CPAS		4,148,280	4,148,280	4,148,280	4,148,280	0	0	0	0	0	0	0	0
CY2018 Program Expiring Savings§		4,690,538	4,690,538	4,690,538	4,690,538	8,838,818	8,838,818	8,838,818	8,838,818	8,838,818	8,838,818	8,838,818	8,838,818

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>.

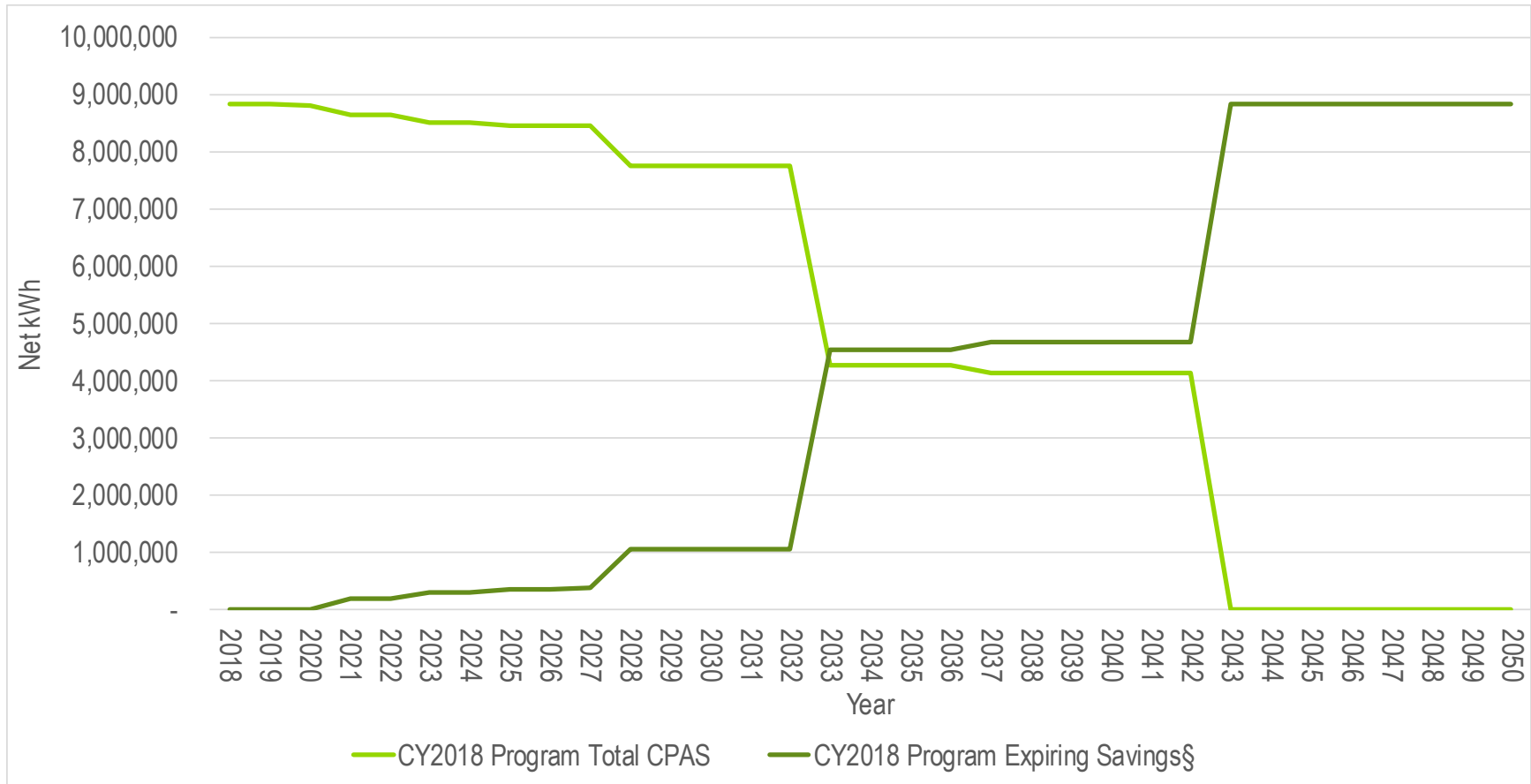
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: Navigant analysis

Figure 2-2. CBA Cumulative Persisting Annual Savings



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

2.3 Program Savings Detail

Table 2-5 summarizes the incremental energy and demand savings the CBA component achieved in CY2018. The gas savings are only those that the gas utilities are not claiming and ComEd can claim.²

Table 2-5. CY2018 CBA Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	2,188,736	NA	1,163
Program Gross Realization Rate	0.93	NA	0.49
Verified Gross Savings	2,041,077	1,960	574
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	2,041,077	1,960	574
Converted from Gas*			
Ex Ante Gross Savings	6,684,193	NA	NA
Program Gross Realization Rate	1.02	NA	NA
Verified Gross Savings	6,797,742	NA	NA
Program Net-to-Gross Ratio (NTG)	1.00	NA	NA
Verified Net Savings	6,797,742	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	8,872,929	NA	1,163
Program Gross Realization Rate	1.00	NA	0.49
Verified Gross Savings	8,838,818	1,960	574
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	8,838,818	1,960	574

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

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.

2.4 Program Savings by Measure

The CBA component includes 18 measures as shown in the following tables. All 18 measures contributed to electric savings, but only 12 of those contributed to gas savings. The air sealing, wall insulation, and attic insulation measures contributed the most savings at 37, 19, and 18 percent of combined electric and gas savings, respectively. Lighting contributed 8 percent of combined electric and gas savings. The program realization rate for peak demand savings is 0.49 primarily due to discrepancies in air sealing, wall insulation, and attic insulation described in Section 2.5.2.7 Air Sealing and Section 2.5.2.8 2.5.2.8 All Insulation (Attic, Crawl Space, Foundation Wall, and Wall).

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

Table 2-6. CY2018 CBA 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
Consumer Electronics	Advanced Power Strip - Tier 1	72,631	0.76	54,937	1.00	54,937	7.0
Hot Water	HW Pipe Insulation	682	1.00	681	1.00	681	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	82	1.24	102	1.00	102	9.0
Hot Water	Low Flow Faucet Aerator - Kitchen	131	0.51	67	1.00	67	9.0
Hot Water	Low Flow Showerhead	4,919	1.00	4,919	1.00	4,919	10.0
HVAC	Advanced Thermostat	20,514	0.89	18,314	NA†	18,314	10.0
HVAC	Bathroom Exhaust Fan	138,662	1.00	138,007	1.00	138,007	19.0
HVAC	Programmable Thermostat	9,690	1.01	9,749	1.00	9,749	5.0
HVAC	Reprogramming Thermostat	1,881	0.99	1,864	1.00	1,864	2.0
Lighting	LED Omnidirectional Bulb - Exterior	19,743	1.00	19,743	1.00	19,743	6.1
Lighting	LED Omnidirectional Bulb - Interior	265,880	1.00	265,883	1.00	265,883	10.0
Lighting	LED Specialty Lamp	284,448	1.00	283,334	1.00	283,334	10.0
Lighting	LED Specialty Lamp - Track and Recessed	173,992	1.00	174,132	1.00	174,132	15.0
Shell	Air Sealing	535,311	1.01	542,063	1.00	542,063	15.0
Shell	Attic Insulation	237,256	0.82	194,895	1.00	194,895	25.0
Shell	Crawlspace Insulation	4,792	0.94	4,499	1.00	4,499	25.0
Shell	Foundation Insulation	69,357	1.05	73,133	1.00	73,133	25.0
Shell	Wall Insulation	348,766	0.73	254,754	1.00	254,754	25.0
Total		2,188,736	0.93	2,041,077		2,041,077	

* 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 IL TRM algorithm calculates net savings for advanced thermostats.
Source: ComEd tracking data and Navigant team analysis.

Table 2-7. CY2018 CBA 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)
Consumer Electronics	Advanced Power Strip - Tier 1	NA	NA	7.71	1.00	7.71
Hot Water	HW Pipe Insulation	NA	NA	5.95	1.00	5.95
Hot Water	Low Flow Faucet Aerator - Bathroom	NA	NA	7.27	1.00	7.27
Hot Water	Low Flow Faucet Aerator - Kitchen	NA	NA	0.71	1.00	0.71
Hot Water	Low Flow Showerhead	NA	NA	16.29	1.00	16.29
HVAC	Advanced Thermostat	NA	NA	26.39	NA†	26.39
HVAC	Bathroom Exhaust Fan	NA	NA	15.74	1.00	15.74
HVAC	Programmable Thermostat	NA	NA	0.00	1.00	0.00
HVAC	Reprogramming Thermostat	NA	NA	0.00	1.00	0.00
Lighting	LED Omnidirectional Bulb - Exterior	NA	NA	7.98	1.00	7.98
Lighting	LED Omnidirectional Bulb - Interior	NA	NA	366.83	1.00	366.83
Lighting	LED Specialty Lamp	NA	NA	293.02	1.00	293.02
Lighting	LED Specialty Lamp - Track and Recessed	NA	NA	211.67	1.00	211.67
Shell	Air Sealing	NA	NA	545.61	1.00	545.61
Shell	Attic Insulation	NA	NA	166.69	1.00	166.69
Shell	Crawlspace Insulation	NA	NA	2.69	1.00	2.69
Shell	Foundation Insulation	NA	NA	70.18	1.00	70.18
Shell	Wall Insulation	NA	NA	215.58	1.00	215.58
Total		NA	NA	1,960.30		1,960.30

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

Table 2-8. CY2018 CBA 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)
Consumer Electronics	Advanced Power Strip - Tier 1	13.27	0.46	6.16	1.00	6.16
Hot Water	HWPipe Insulation	0.08	1.00	0.08	1.00	0.08
Hot Water	Low Flow Faucet Aerator - Bathroom	0.13	1.26	0.16	1.00	0.16
Hot Water	Low Flow Faucet Aerator - Kitchen	0.03	0.51	0.02	1.00	0.02
Hot Water	Low Flow Showerhead	0.45	1.00	0.45	1.00	0.45
HVAC	Advanced Thermostat	6.22	0.99	6.15	NA†	6.15
HVAC	Bathroom Exhaust Fan	0.00	NA	15.74	1.00	15.74
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
HVAC	Reprogramming Thermostat	0.00	NA	0.00	1.00	0.00
Lighting	LED Omnidirectional Bulb - Exterior	2.18	1.00	2.18	1.00	2.18
Lighting	LED Omnidirectional Bulb - Interior	26.09	1.00	26.06	1.00	26.06
Lighting	LED Specialty Lamp	30.79	1.00	30.88	1.00	30.88
Lighting	LED Specialty Lamp - Track and Recessed	19.28	1.00	19.27	1.00	19.27
Shell	Air Sealing	639.76	0.40	254.26	1.00	254.26
Shell	Attic Insulation	145.39	0.53	77.68	1.00	77.68
Shell	Crawlspace Insulation	1.61	0.78	1.26	1.00	1.26
Shell	Foundation Insulation	42.83	0.76	32.70	1.00	32.70
Shell	Wall Insulation	234.61	0.43	100.46	1.00	100.46
Total		1,162.71	0.49	573.50		573.50

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

Table 2-9. CY2018 CBA 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
Consumer Electronics	Advanced Power Strip - Tier 1	0	NA	0	1.00	0	7.0
Hot Water	HW Pipe Insulation	543	0.98	535	1.00	535	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	79	1.00	79	1.00	79	9.0
Hot Water	Low Flow Faucet Aerator - Kitchen	145	1.00	145	1.00	145	9.0
Hot Water	Low Flow Showerhead	2,457	1.38	3,384	1.00	3,384	10.0
HVAC	Advanced Thermostat	6,560	1.00	6,561	NA†	6,561	10.0
HVAC	Bathroom Exhaust Fan	0	NA	0	1.00	0	19.0
HVAC	Programmable Thermostat	3,577	0.99	3,549	1.00	3,549	5.0
HVAC	Reprogramming Thermostat	374	1.00	374	1.00	374	2.0
Lighting	LED Omnidirectional Bulb - Exterior	0	NA	0	1.00	0	6.1
Lighting	LED Omnidirectional Bulb - Interior	0	NA	0	1.00	0	10.0
Lighting	LED Specialty Lamp	0	NA	0	1.00	0	10.0
Lighting	LED Specialty Lamp - Track and Recessed	0	NA	0	1.00	0	15.0
Shell	Air Sealing	92,303	1.02	93,758	1.00	93,758	15.0
Shell	Attic Insulation	45,624	1.01	46,138	1.00	46,138	25.0
Shell	Crawlspace Insulation	979	1.00	977	1.00	977	25.0
Shell	Foundation Insulation	26,729	1.01	26,995	1.00	26,995	25.0
Shell	Wall Insulation	48,682	1.02	49,432	1.00	49,432	25.0
	Total Therms	228,052	1.02	231,926		231,926	
	Total kWh Converted from Therms‡	6,684,193	1.02	6,797,742		6,797,742	

* 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 IL TRM algorithm calculates net savings for advanced thermostats.

‡ 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 2-10. CY2018 CBA 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)
Consumer Electronics	Advanced Power Strip - Tier 1	72,631	0.76	54,937	1.00	54,937
Hot Water	HW Pipe Insulation	16,596	0.99	16,352	1.00	16,352
Hot Water	Low Flow Faucet Aerator - Bathroom	2,385	1.01	2,405	1.00	2,405
Hot Water	Low Flow Faucet Aerator - Kitchen	4,392	0.99	4,327	1.00	4,327
Hot Water	Low Flow Showerhead	76,941	1.35	104,118	1.00	104,118
HVAC	Advanced Thermostat	212,799	0.99	210,607	NA†	210,607
HVAC	Bathroom Exhaust Fan	138,662	1.00	138,007	1.00	138,007
HVAC	Programmable Thermostat	114,519	0.99	113,776	1.00	113,776
HVAC	Reprogramming Thermostat	12,839	1.00	12,822	1.00	12,822
Lighting	LED Omnidirectional Bulb - Exterior	19,743	1.00	19,743	1.00	19,743
Lighting	LED Omnidirectional Bulb - Interior	265,880	1.00	265,883	1.00	265,883
Lighting	LED Specialty Lamp	284,448	1.00	283,334	1.00	283,334
Lighting	LED Specialty Lamp - Track and Recessed	173,992	1.00	174,132	1.00	174,132
Shell	Air Sealing	3,240,702	1.02	3,290,096	1.00	3,290,096
Shell	Attic Insulation	1,574,499	0.98	1,547,199	1.00	1,547,199
Shell	Crawlspace Insulation	33,473	0.99	33,123	1.00	33,123
Shell	Foundation Insulation	852,778	1.01	864,361	1.00	864,361
Shell	Wall Insulation	1,775,649	0.96	1,703,596	1.00	1,703,596
Total‡		8,872,929	1.00	8,838,818		8,838,818

* 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 IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: ComEd tracking data and Navigant team analysis.

2.5 Impact Analysis Findings and Recommendations

2.5.1 Impact Parameter Estimates

Navigant calculated verified gross and net program impacts for the above 18 measures. These measures account for all quantifiable CY2018 electric savings. Navigant calculated verified gross energy and demand savings using the algorithms in the Illinois Technical Reference Manual (TRM) v6 and v6 Errata where applicable. The following table presents the deemed input parameter source that Navigant used by measure. The IL TRM v6.0 allows for custom or actual values to be used for some of the input parameters. Navigant based these values on the program tracking database when available.

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, Illinois Stakeholder Advisory Group (SAG) defined NTG estimates used to calculate net verified savings³.

Table 2-11. CBA Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	Number of measures	Evaluated	ComEd Tracking Data and Navigant Evaluation
NTG	Varies		Deemed	IL SAG Consensus†
Advanced Power Strip – Tier 1	71	Each	Deemed	IL TRM v6.0 – Section 5.2.01
HW Pipe Insulation	23	Linear Feet	Deemed	IL TRM v6.0 – Section 5.4.01
Low Flow Faucet Aerator – Bathroom	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.04
Low Flow Faucet Aerator - Kitchen	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.04
Low Flow Showerhead	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.05
Advanced Thermostat	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.16
Bathroom Exhaust Fan	89	Each	Deemed	IL TRM v6.0 – Section 5.3.09
Programmable Thermostat	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.11
LED Omnidirectional Bulbs	Varies	Each	Deemed	IL TRM v6.0 Errata – Section 5.5.08
LED Specialty Lamps	Varies	Each	Deemed	IL TRM v6.0 Errata – Section 5.5.06
Air Sealing	Varies	Projects	Deemed	IL TRM v6.0 – Section 5.6.01
Attic Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.04
Crawlspace Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.03
Foundation Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.04
Wall Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.04

* 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>.

2.5.2 Other Impact Findings and Recommendations

2.5.2.1 Advanced Power Strip – Tier 1

Finding 1. The evaluation team found that energy and demand realization rates were 76 and 46 percent, respectively, for all advanced power strip (APS) projects. In all installations, the implementer likely claimed energy savings for product B in Tier 2 instead of savings for Tier 1. Similarly, the implementer likely claimed demand savings for product G in Tier 2 instead of savings for Tier 1.

Recommendation 1. Navigant recommends the implementer calculate energy and demand savings using the algorithm for Tier 1 APS.

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>.

2.5.2.2 Water Efficiency Measures

Finding 2. The evaluation team found that the implementer reported savings using different inputs for the different utilities. For ComEd, the implementer calculated savings using values from the TRM; for PGL and NSG, the implementer calculated savings using custom values from their Master Measurement Database (MMDB)⁴. Table 2-12 lists each measure and differences between inputs.

Table 2-12. Differences in Hot Water Inputs

Measure	Input	TRM-deemed Value Used to Calculate ComEd Ex Ante Savings	MMDB Value Used to Calculate PG NSG Ex Ante Savings	Value Used by Navigant for ComEd Analysis
HW Pipe Insulation	Rnew	2.8	3.8	3.8
Low Flow Faucet Aerator - Bathroom	GPM_base	1.39	1.5355	1.5355
Low Flow Faucet Aerator - Bathroom	GPM_low	0.94	0.969	0.969
Low Flow Faucet Aerator - Kitchen	GPM_base	1.39	1.6351	1.6351
Low Flow Faucet Aerator - Kitchen	GPM_low	0.94	1.406	1.406
Low Flow Showerhead	GPM_base	2.67	2.35	2.67

Source: ComEd tracking data and Navigant team analysis.

The implementer informed us that this was an oversight for ComEd and that ComEd savings should be calculated using custom values from the MMDB. The IL TRM v6.0 allows custom values for the aerator and pipe insulation inputs, but not for showerhead GPM_base. Therefore, we used custom values for aerators and pipe insulation and TRM values for showerheads which:

- Increased the gas realization rate for pipe insulation by two percent
- Increased the electric energy and demand realization rates for bathroom aerator by 24 and 26 percent, respectively
- Decreased the electric energy and demand realization rates for kitchen aerator each by 49 percent
- Increased the gas realization rate for showerheads by 38 percent

Recommendation 2. Navigant recommends the implementer use consistent inputs to calculate savings across utilities.

Finding 3. The evaluation team found one low flow faucet aerator and one low flow showerhead project under the same project ID 3261582 that had conflicting fuel type information. Their measure descriptions had “Gas Aerator” and “Gas Showerhead,” but the Hot_Water_Fuel field stated “Other”. Navigant made note of this but calculated savings using the measure description.

Recommendation 3. Navigant recommends the implementer confirm that the measure descriptions, and not Hot_Water_Fuel, provide the correct fuel type. Navigant recommends the implementer report hot water fuel in the measure name and the Hot_Water_Fuel field consistently for each project.

⁴ “RESIDENTIAL PG NSG MMDB PY7 2018-08-09.xlsx”

2.5.2.3 Advanced Thermostat

Finding 4. The evaluation team found that the implementer had collected data for the cooling system seasonal energy efficiency ratio (SEER) of each advanced thermostat project, but calculated ex ante savings using TRM-default values. The TRM recommends using actual SEER values to calculate savings when available. Navigant used collected existing cooling system SEER values to estimate advanced thermostat savings, which reduced the combined electric and gas savings for advanced thermostats by one percent.

Recommendation 4. Navigant recommends the implementer calculate advanced thermostat ex ante savings using collected data for cooling system SEER where possible.

Finding 5. The evaluation team found one project (project ID 3744374) that had no existing cooling system, but the implementer calculated peak demand savings for this project. Navigant calculated zero demand savings because the IL TRM v6.0 advises that peak demand savings do not exist when there is no existing cooling system.

Recommendation 5. Per the IL TRM v6.0, Navigant recommends the implementer not calculate demand savings when there is no existing cooling system.

Finding 6. The evaluation team noted that for 46 projects, the baseline thermostat indicated in the measure description differed from the baseline indicated in the “Existing_Thermostat_Type” field. Examples of this finding are shown in Table 2-13.

Table 2-13. Advanced Thermostat Baseline Discrepancy

Project ID	Measure_Description	Existing_Thermostat_Type	Ex Ante Savings (kWh)
3456808	Gas Tstat - Smart Stat (Nest E) Baseline Manual	Programmable On Hold	259.1
3485202	Gas Tstat - Smart Stat (Nest E) Baseline Manual	Programmable On Hold	259.1
3615670	Gas Tstat - Smart Stat (Nest E) Baseline Program	Manual	229.5
3628424	Gas Tstat - Smart Stat (Nest E) Baseline Program	Manual	229.5

Source: ComEd tracking data and Navigant team analysis.

In these cases, we found that the baseline thermostat indicated in the measure description more closely matched ex ante savings calculations. We used the measure description to calculate verified savings and noted the discrepancy.

Recommendation 6. Navigant recommends the implementer confirm that the measure descriptions, and not Existing_Thermostat_Type, provide the correct existing thermostat type. Navigant recommends the implementer report the existing thermostat type in the measure name and the Existing_Thermostat_Type field consistently for each project.

2.5.2.4 Bathroom Exhaust Fan

Finding 7. The evaluation team found that the implementer did not calculate demand savings for any projects even though bathroom exhaust fans result in demand reduction per the IL TRM v6.0.

Recommendation 7. Navigant recommends the implementer claim demand savings for bathroom exhaust fans consistent with the IL TRM v6.0.

2.5.2.5 Programmable Thermostat

Finding 8. The impact analysis team found three projects with either a 50 percent electric or gas realization rate. For each project there were two thermostats installed at each premise, and the implementer accounted for savings from both thermostats. Navigant only accounted for the savings of one thermostat per residence. Section 5.3.11 of IL TRM v6.0 states that programmable thermostat savings are estimated on a household level and additional thermostats do not result in additional savings. Navigant capped the quantity of thermostats at one per account number, reducing the number of programmable thermostats by three.

Recommendation 8. Navigant recommends the implementer claim savings for only one programmable thermostat per account number.

Finding 9. The impact analysis team found 30 projects where the realization rate of gas programmable thermostat savings was not 100 percent. This is due to the value of gas heating consumption used for projects with gas boilers. The implementer used TRM-deemed values of gas heating consumption from the table in Section 5.3.11 Programmable Thermostat. However, these values are specifically for furnaces. IL TRM v6.0 footnote 396 indicates that those TRM values came from furnace gas heating load divided by furnace efficiency. For gas boiler projects, the impact analysis team estimated gas heating consumption using boiler gas heating loads from Section 5.3.7 Gas High Efficiency Boiler divided by the projects' existing heating system efficiency.

Recommendation 9. Navigant recommends the implementer use boiler gas heating load divided by efficiency to estimate gas heating consumption for programmable thermostat projects with gas boilers.

2.5.2.6 Lighting

Table 2-14 shows detailed savings for LED Omnidirectional bulbs and LED Specialty Lamps.

Table 2-14. Ex Ante and Verified Savings Detail for LEDs

End Use Type	Research Category	Ex Ante Gross Savings (kWh/Unit)	Ex Ante Gross Peak Demand Reduction (kW/Unit)	Verified Gross Savings (kWh/Unit)	Verified Gross Savings Realization Rate	Verified Gross Peak Demand Reduction (kW/Unit)	Verified Gross Peak Demand Realization Rate
Lighting	Exterior LED - 11W (75W)	100.7	0.01	100.7	100%	0.01	100%
Lighting	Exterior LED - 15W (100W)	136.7	0.02	136.7	100%	0.02	100%
Lighting	Exterior LED - 15W PAR38 (120W)	242.2	0.03	242.2	100%	0.03	100%
Lighting	Exterior LED - 5W Candelabra (40W)	84.7	0.00	83.9	99%	0.01	226%
Lighting	Exterior LED - 6W (40W)	55.2	0.01	55.2	100%	0.01	100%
Lighting	Exterior LED - 8W Flood (65W)	136.7	0.02	136.7	100%	0.02	100%
Lighting	Exterior LED - 9W (60W)	81.5	0.01	81.5	100%	0.01	100%
Lighting	Interior LED - 11W (75W)	32.7	0.00	32.7	100%	0.00	100%
Lighting	Interior LED - 15W (100W)	44.4	0.00	44.4	100%	0.00	99%
Lighting	Interior LED - 5W Candelabra (40W)	43.1	0.00	43.1	100%	0.00	100%
Lighting	Interior LED - 6/12/19W 3-Way (50/100/150W)	59.1	0.01	55.0	93%	0.01	93%
Lighting	Interior LED - 6W (40W)	17.9	0.00	17.9	100%	0.00	98%
Lighting	Interior LED - 6W Globe (40/60W)	28.6	0.00	28.9	101%	0.00	101%
Lighting	Interior LED - 7W Mini-Flood PAR20 (50W)	38.0	0.00	38.0	100%	0.00	100%
Lighting	Interior LED - 7W Track Light (50W)	38.0	0.00	38.0	100%	0.00	100%
Lighting	Interior LED - 8W Flood (65W)	50.4	0.01	50.4	100%	0.01	100%
Lighting	Interior LED - 9W (60W)	26.5	0.00	26.5	100%	0.00	100%
Lighting	Interior LED - 8W Mini-Flood PAR20 (45W)	29.7	0.00	32.7	110%	0.00	125%

Source: ComEd tracking data and Navigant team analysis.

Finding 10. The impact analysis team found that the implementer calculated demand savings using the interior coincidence factor (CF), 0.121, to calculate verified peak demand savings for “Exterior LED - 5W Candelabra (40W)” lamps instead of the exterior CF, 0.273. This results in a demand realization rate of 226 percent.

Recommendation 10. Navigant recommends the implementer change the exterior candelabra coincidence factor from 0.121 to 0.273. Navigant recommends the implementer verify that the CF values for LED candelabra bulbs match the installation locations to prevent the use of interior CF values for bulbs installed in exterior locations.

Finding 11. The evaluation team found that the implementer used an 80W baseline wattage for 3-way lamps. The TRM has 75W for 3-way lamps with lumens between 1100 and 1599. After reviewing the efficient bulb’s specification sheet, Navigant determined 75W is more appropriate based on 1300 lumens for the efficient 12W bulb. Savings were calculated using 75W as the baseline for 6/12/19W 3-Way LEDs. This results in the energy and demand realization rate for this lamp type to be 93 percent.

Recommendation 11. Navigant recommends the implementer decrease the baseline wattage to 75W for the lamp type 6/12/19W 3-Way LEDs to comply with IL TRM v6.0 lumen watt equivalency.

Finding 12. The evaluation team found a discrepancy with energy savings for the lamp type “Interior LED - 8W Mini-Flood PAR20.” After investigation into the implementer’s MMDB calculator, Navigant believes the tracking data ex ante savings of 29.7 kWh/unit is a result of 37.1 kWh/unit, a value which was hardcoded into the calculator, multiplied by a NTG value of

0.8. In other areas of the implementer's calculator, the savings for this lamp match our verified savings, 32.7 kWh/unit.

Recommendation 12. Navigant recommends the implementer clarify the underlying assumptions used to estimate 32.7 kWh/unit as the "Interior LED - 8W Mini-Flood PAR20" ex ante savings.

2.5.2.7 Air Sealing

Finding 13. The evaluation team found a number of differences between the implementer's MMDB calculator and Navigant's savings algorithms. Namely, the implementer:

- Calculated demand savings using summer system peak coincidence factor (CF_{SSP}) rather than the Pennsylvania-New Jersey-Maryland coincidence factor (CF_{PJM})
- Calculated peak demand savings using $(\text{total kWh savings}) / (\text{FLH}_{\text{cooling}} * CF)$ instead of $(\text{kWh}_{\text{cooling}}) / (\text{FLH}_{\text{cooling}} * CF)$
- Assumed 66 percent of homes have central air conditioning instead of using collected data on project's cooling system type
- Assumed η_{Cool} is 12 for all projects instead of using collected data where available. If collected data is unavailable, the implementer should use the TRM-deemed value based on the average age of the existing equipment

Recommendation 13. Navigant recommends the implementer:

- Use the CF_{PJM} rather than the CF_{SSP} to calculate peak demand savings
- Calculate the peak demand savings using the formula $(\text{kWh}_{\text{cooling}}) / (\text{FLH}_{\text{cooling}} * CF)$
- Use collected data on the presence of central air conditioning rather than using an assumption that 66% of homes have central air conditioning
- Use collected data for the value η_{Cool} . If collected data is unavailable, use the TRM-deemed value based on the average age of the existing equipment
- Record both the SEER of existing cooling systems and the age of existing cooling systems

Finding 14. The evaluation team found 164 projects where the home had a gas boiler as the existing heating type and no existing cooling type. The implementer claimed electric energy and demand savings for these projects. However, the IL TRM does not estimate electric energy and demand savings for projects without a gas furnace or central air conditioning. Navigant did not verify electric energy or demand savings for these projects.

Recommendation 14. Navigant recommends the implementer comply with the IL TRM v6.0 and not claim energy or demand savings for projects that have no cooling system and natural gas boiler heating.

2.5.2.8 All Insulation (Attic, Crawl Space, Foundation Wall, and Wall)

Finding 15. The evaluation team found a number of differences between the implementer's MMDB calculator and Navigant's savings algorithms. This resulted in electric realization rates of 82, 94, 105, and 73 percent and demand realization rates of 53, 78, 76 and 43 percent respectively for attic, crawl space, and foundation wall, and wall insulation. Namely, the implementer:

- Assumed 66 percent of homes have central air conditioning instead of using collected data on project's cooling system type
- Assumed η_{Cool} is 12 for all projects instead of using collected data where available. If collected data is unavailable, the implementer should use TRM-deemed value based on the average age of the existing equipment.

- Used 1.00 for the cooling adjustment factor for attic insulation. This value is deemed in the IL TRM v6.0 to be 0.8.

Recommendation 15. Navigant recommends the implementer:

- Use collected data on the presence of central air conditioning rather than using an assumption that 66% of homes have central air conditioning
- Use collected data for the value η_{Cool} . If collected data is unavailable, use the TRM-deemed value based on the average age of the existing equipment
- Use 0.8 as the cooling adjustment factor for attic insulation

Finding 16. The evaluation team found that for energy and demand savings calculations, the implementer averaged savings for groups of R values. For example, the table below shows the deemed, average savings for attic insulation:

Table 2-15. Attic Insulation Deemed Ex Ante Unit Savings

Measure Description	Gross Therms Per Square Foot
Attic Insulation - Existing R-0 - Final R-49+	0.173
Attic Insulation - Existing R-1-3 - Final R-49+	0.120
Attic Insulation - Existing R-4-6 - Final R-49+	0.078
Attic Insulation - Existing R-7-10 - Final R-49+	0.051
Attic Insulation - Existing R-11-14 - Final R-49+	0.034
Attic Insulation - Existing R-15-19 - Final R-49+	0.025

Source: RESIDENTIAL PG NSG MMDB PY7 2018-08-09.xlsx

Based on Table 2-15, the implementer reported savings for all “Attic Insulation - Existing R-1-3 - Final R-49+” projects as 0.120 therms per square foot, the average of savings for R = 1, R = 2, and R = 3. This assumes that there is an even distribution of R = 1, R = 2, and R = 3 projects for that measure.

Navigant found from analyzing ComEd tracking data that the actual tracking data does not match this even distribution of measures. Where possible, we calculated savings using collected data from the ComEd data set. Where data was missing, we used an average R value from existing ComEd data for the measure. For example, if an “Attic Insulation - Existing R-1-3 - Final R-49+” project did not have recorded data for pre-installation R value, we used the average pre-installation R value for the other “Attic Insulation - Existing R-1-3 - Final R-49+” projects.

Recommendation 16. Navigant recommends the implementer collect pre and post R value data for each individual project and use collected data to calculate savings.

Finding 17. The evaluation team found instances for both pre-installation and post-installation R values, where the data collected did not match the measure name for <1 percent of insulation projects. For example, the measure name for Project ID 3682751 was “Attic Insulation - Existing R-4-6 - Final R-49+,” indicating an existing R value of 4-6. However, the value in “Attic_Insulation_Pre_R_Value” was 7. These discrepancies were noted but data was not altered.

Recommendation 17. Navigant recommends that the implementer should ensure that R values indicated by the measure name match what are recorded in pre-installation and post-installation R value fields.

Finding 18. The evaluation team found that the deemed insulation savings values increased since Wave 1. The Wave 1 calculator and Wave 1 ex ante values of savings per unit matched. However, after the increase in deemed savings values, the ex ante savings at end of year do not match the Wave 1 calculator. For example, the project a0P0y00000Rj2YEEAZ in the mid-year data had 56.64 kWh savings and in the end of year data it had 71.04 kWh savings. The savings per unit increased from 0.059 kWh/unit to 0.074 kWh/unit.

Recommendation 18. Navigant recommends that the implementer update their MMDB calculator when this occurs and that they provide further explanation to justify an increase in savings after mid-year.

Finding 19. The evaluation team found 434 projects where the home had a gas boiler as the existing heating type and no existing cooling type. The implementer claimed electric energy and demand savings for these projects. However, the IL TRM does not estimate electric energy and demand savings for projects without a gas furnace or central air conditioning. Navigant did not verify electric energy or demand savings for these projects.

Recommendation 19. Navigant recommends the implementer comply with the IL TRM v6.0 and not calculate energy or demand savings for projects that have no cooling system and natural gas boiler heating.

2.6 Total Resource Cost Detail

Table 2-16 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. Energy savings displayed in Table 2-16Table 3-15 are electric savings only and do not include electric savings converted from gas.

Table 2-16. CBA 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)	NTG*	Verified Net Savings (kWh)	Verified Net Peak Demand Reduction (kW)
Consumer Electronics	Advanced Power Strip - Tier 1	Each	773	7.0	72,631	13.27	54,937	6.16	1.00	54,937	6.16
Hot Water	HW Pipe Insulation	Linear Feet	2,295	15.0	682	0.08	681	0.08	1.00	681	0.08
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	271	9.0	82	0.13	102	0.16	1.00	102	0.16
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	145	9.0	131	0.03	67	0.02	1.00	67	0.02
Hot Water	Low Flow Showerhead	Each	690	10.0	4,919	0.45	4,919	0.45	1.00	4,919	0.45
HVAC	Advanced Thermostat	Each	81	10.0	20,514	6.22	18,314	6.15	NA†	18,314	6.15
HVAC	Bathroom Exhaust Fan	Each	1,558	19.0	138,662	0.00	138,007	15.74	1.00	138,007	15.74
HVAC	Programmable Thermostat	Each	199	5.0	9,690	0.00	9,749	0.00	1.00	9,749	0.00
HVAC	Reprogramming Thermostat	Each	35	2.0	1,881	0.00	1,864	0.00	1.00	1,864	0.00
Lighting	LED Omnidirectional Bulb - Exterior	Each	221	6.1	19,743	2.18	19,743	2.18	1.00	19,743	2.18
Lighting	LED Omnidirectional Bulb - Interior	Each	9,364	10.0	265,880	26.09	265,883	26.06	1.00	265,883	26.06
Lighting	LED Specialty Lamp	Each	6,899	10.0	284,448	30.79	283,334	30.88	1.00	283,334	30.88
Lighting	LED Specialty Lamp - Track and Recessed	Each	3,766	15.0	173,992	19.28	174,132	19.27	1.00	174,132	19.27
Shell	Air Sealing	ΔCFM	3,264,090	15.0	535,311	639.76	542,063	254.26	1.00	542,063	254.26
Shell	Attic Insulation	Square Feet	1,454,997	25.0	237,256	145.39	194,895	77.68	1.00	194,895	77.68
Shell	Crawlspace Insulation	Square Feet	33,392	25.0	4,792	1.61	4,499	1.26	1.00	4,499	1.26
Shell	Foundation Insulation	Square Feet	50,770	25.0	69,357	42.83	73,133	32.70	1.00	73,133	32.70
Shell	Wall Insulation	Square Feet	1,431,726	25.0	348,766	234.61	254,754	100.46	1.00	254,754	100.46

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

3. STATE OF ILLINOIS' HOME WEATHERIZATION ASSISTANCE PROGRAM (IHWAP)

3.1 Program Component Description

The IHWAP component had 365 participants in CY2018 and distributed 11,423 measures as shown in the following table and graph. The team separated early replacement (ER) from time of sale (TOS) measures where appropriate.

Table 3-1. CY2018 IHWAP Volumetric Findings Detail

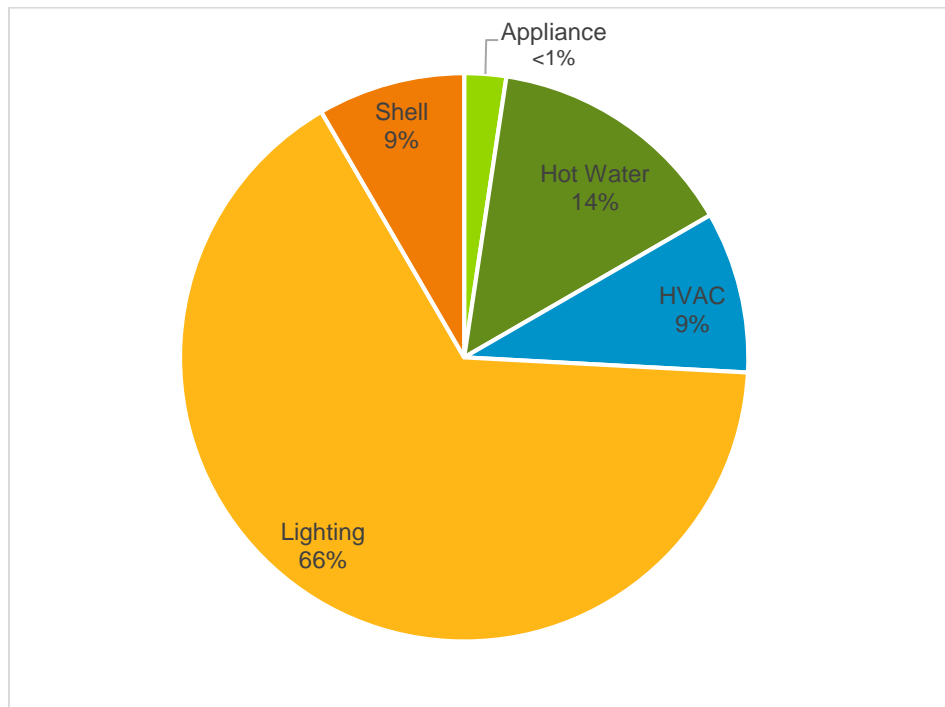
Participation	IHWAP Total
Participants*	365
Total Measures	11,423
Number of Units/Projects	31
Installed Projects†	368
Freezer	49
Refrigerator - ER	140
Refrigerator - TOS	4
Room AC - ER	74
Room AC - TOS	5
Gas Water Heater - ER	126
Gas Water Heater - TOS	11
HW Pipe Insulation (Linear Feet)	1,081
Low Flow Faucet Aerator - Bathroom	182
Low Flow Faucet Aerator - Kitchen	67
Low Flow Showerhead	162
Water Heater Wrap	2
Advanced Thermostat	126
Air Source Heat Pump - TOS	1
Bathroom Exhaust Fan	359
Central Air Conditioning - ER	165
Central Air Conditioning - TOS	56
Furnace Blower Motor	1
Gas High Efficiency Boiler - ER	11
Gas High Efficiency Boiler - TOS	5
Gas High Efficiency Furnace - ER	214
Gas High Efficiency Furnace - TOS	71
Programmable Thermostat	41
LED Omnidirectional Bulb - Exterior	309
LED Omnidirectional Bulb - Interior	5,140
LED Specialty Lamp	1,723
LED Specialty Lamp - Track and Recessed	340
Air Sealing (Projects)	336
Attic Insulation (Projects)	308
Basement Sidewall Insulation (Projects)	182
Floor Insulation (Projects)	32
Wall Insulation (Projects)	100

* Participants are defined as unique ComEd account numbers

† Installed projects are defined as unique Project IDs

Source: ComEd tracking data and Navigant team analysis.

Figure 3-1. IHWAP Percent of Measures Installed by End Use



Source: ComEd tracking data and Navigant team analysis.

3.2 Cumulative Persisting Annual Savings

The measure-specific and total ex ante gross savings for the IHWAP component and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The electric CPAS across all measures is 979,707 kWh. The program achieved 1,463,183 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd’s goal⁵ (Table 3-3 in the following set of tables). Adding the savings converted from gas savings to the electric savings produces a total of 2,442,890 kWh of total CPAS.

⁵ The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary Report.

Table 3-2. IHWAP Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2018			Verified Net kWh Savings									
			Verified Gross Savings	NTG ⁺	Lifetime Net Savings [†]	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Appliance	Freezer	11.0	1,720	1.00	18,918	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	
Appliance	Refrigerator - ER	12.0	62,366	1.00	298,577	62,366	62,366	62,366	62,366	6,139	6,139	6,139	6,139	6,139	
Appliance	Refrigerator - TOS	12.0	177	1.00	2,126	177	177	177	177	177	177	177	177	177	
Appliance	Room AC - ER	12.0	5,795	1.00	29,687	5,795	5,795	5,795	5,795	813	813	813	813	813	
Appliance	Room AC - TOS	12.0	74	1.00	891	74	74	74	74	74	74	74	74	74	
Hot Water	Gas Water Heater - ER	13.0	0	1.00	0										
Hot Water	Gas Water Heater - TOS	13.0	0	1.00	0										
Hot Water	HW Pipe Insulation	15.0	1,747	1.00	26,198	1,747	1,747	1,747	1,747	1,747	1,747	1,747	1,747	1,747	
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	259	1.00	2,328	259	259	259	259	259	259	259	259	259	
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	1,177	1.00	10,589	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	1,177	
Hot Water	Low Flow Showerhead	10.0	3,381	1.00	33,805	3,381	3,381	3,381	3,381	3,381	3,381	3,381	3,381	3,381	
Hot Water	Water Heater Wrap	5.0	287	1.00	1,434	287	287	287	287	287					
HVAC	Advanced Thermostat	10.0	23,722	NA [‡]	237,224	23,722	23,722	23,722	23,722	23,722	23,722	23,722	23,722	23,722	
HVAC	Air Source Heat Pump - TOS	18.0	335	1.00	6,025	335	335	335	335	335	335	335	335	335	
HVAC	Bathroom Exhaust Fan	19.0	31,800	1.00	604,203	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	
HVAC	Central Air Conditioning - ER	18.0	141,270	1.00	1,209,114	141,270	141,270	141,270	141,270	141,270	141,270	30,125	30,125	30,125	
HVAC	Central Air Conditioning - TOS	18.0	10,117	1.00	182,110	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	
HVAC	Furnace Blower Motor	20.0	732	1.00	14,640	732	732	732	732	732	732	732	732	732	
HVAC	Gas High Efficiency Boiler - ER	25.0	0	1.00	0										
HVAC	Gas High Efficiency Boiler - TOS	25.0	0	1.00	0										
HVAC	Gas High Efficiency Furnace - ER	20.0	151,544	1.00	3,030,880	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	
HVAC	Gas High Efficiency Furnace - TOS	20.0	50,476	1.00	1,009,520	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	
HVAC	Programmable Thermostat	5.0	2,077	1.00	10,386	2,077	2,077	2,077	2,077	2,077					
Lighting	LED Omnidirectional Bulb - Exterior	6.1	40,068	1.00	136,050	40,068	40,068	40,068	5,112	5,112	5,112	511			
Lighting	LED Omnidirectional Bulb - Interior	10.0	195,057	1.00	737,616	195,057	195,057	195,057	21,778	21,778	21,778	21,778	21,778	21,778	
Lighting	LED Specialty Lamp	10.0	56,098	1.00	560,976	56,098	56,098	56,098	56,098	56,098	56,098	56,098	56,098	56,098	
Lighting	LED Specialty Lamp - Track and Recessed	15.0	20,842	1.00	312,623	20,842	20,842	20,842	20,842	20,842	20,842	20,842	20,842	20,842	
Shell	Air Sealing	15.0	91,842	1.00	1,377,636	91,842	91,842	91,842	91,842	91,842	91,842	91,842	91,842	91,842	
Shell	Attic Insulation	25.0	33,185	1.00	829,627	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	
Shell	Basement Sidewall Insulation	25.0	40,012	1.00	1,000,294	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	
Shell	Floor Insulation	25.0	1,490	1.00	37,258	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	
Shell	Wall Insulation	25.0	12,059	1.00	301,473	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	
CY2018 Program Total Electric CPAS			979,707		12,022,207	979,707	979,707	979,707	771,472	710,263	707,899	592,154	591,643	591,643	
CY2018 Program Expiring Electric Savings[§]							0	0	208,235	269,444	271,808	387,553	388,064	388,064	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Freezer	1,720	1,720										
Appliance	Refrigerator - ER	6,139	6,139	6,139									
Appliance	Refrigerator - TOS	177	177	177									
Appliance	Room AC - ER	813	813	813									
Appliance	Room AC - TOS	74	74	74									
Hot Water	Gas Water Heater - ER												
Hot Water	Gas Water Heater - TOS												
Hot Water	HW Pipe Insulation	1,747	1,747	1,747	1,747	1,747	1,747						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	3,381											
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat	23,722											
HVAC	Air Source Heat Pump - TOS	335	335	335	335	335	335	335	335	335			
HVAC	Bathroom Exhaust Fan	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800		
HVAC	Central Air Conditioning - ER	30,125	30,125	30,125	30,125	30,125	30,125	30,125	30,125	30,125			
HVAC	Central Air Conditioning - TOS	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117			
HVAC	Furnace Blower Motor	732	732	732	732	732	732	732	732	732	732	732	
HVAC	Gas High Efficiency Boiler - ER												
HVAC	Gas High Efficiency Boiler - TOS												
HVAC	Gas High Efficiency Furnace - ER	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	151,544	
HVAC	Gas High Efficiency Furnace - TOS	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	50,476	
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	21,778											
Lighting	LED Specialty Lamp	56,098											
Lighting	LED Specialty Lamp - Track and Recessed	20,842	20,842	20,842	20,842	20,842	20,842						
Shell	Air Sealing	91,842	91,842	91,842	91,842	91,842	91,842						
Shell	Attic Insulation	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185	33,185
Shell	Basement Sidewall Insulation	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012	40,012
Shell	Floor Insulation	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490
Shell	Wall Insulation	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059	12,059
CY2018 Program Total Electric CPAS		590,207	485,229	483,509	476,305	476,305	476,305	361,875	361,875	361,875	321,298	289,498	86,746
CY2018 Program Expiring Electric Savings\$		389,500	494,478	496,198	503,402	503,402	503,402	617,832	617,832	617,832	658,409	690,209	892,961

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Appliance	Freezer												
Appliance	Refrigerator - ER												
Appliance	Refrigerator - TOS												
Appliance	Room AC - ER												
Appliance	Room AC - TOS												
Hot Water	Gas Water Heater - ER												
Hot Water	Gas Water Heater - TOS												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat												
HVAC	Air Source Heat Pump - TOS												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning - ER												
HVAC	Central Air Conditioning - TOS												
HVAC	Furnace Blower Motor												
HVAC	Gas High Efficiency Boiler - ER												
HVAC	Gas High Efficiency Boiler - TOS												
HVAC	Gas High Efficiency Furnace - ER												
HVAC	Gas High Efficiency Furnace - TOS												
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	33,185	33,185	33,185	33,185								
Shell	Basement Sidewall Insulation	40,012	40,012	40,012	40,012								
Shell	Floor Insulation	1,490	1,490	1,490	1,490								
Shell	Wall Insulation	12,059	12,059	12,059	12,059								
CY2018 Program Total Electric CPAS		86,746	86,746	86,746	86,746	0	0	0	0	0	0	0	0
CY2018 Program Expiring Electric Savings§		892,961	892,961	892,961	892,961	979,707	979,707	979,707	979,707	979,707	979,707	979,707	979,707

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.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: Navigant analysis

Table 3-3. IHWAP Cumulative Persisting Annual Savings (CPAS) – Gas

End Use Type	Research Category	EUL	CY2018 Verified Gross Savings (Therms)			Lifetime Net Savings†	Verified Net Therms Savings									
			EUL	Savings (Therms)	NTG*		2018	2019	2020	2021	2022	2023	2024	2025	2026	
Appliance	Freezer	11.0	0	1.00	0											
Appliance	Refrigerator - ER	12.0	0	1.00	0											
Appliance	Refrigerator - TOS	12.0	0	1.00	0											
Appliance	Room AC - ER	12.0	0	1.00	0											
Appliance	Room AC - TOS	12.0	0	1.00	0											
Hot Water	Gas Water Heater - ER	13.0	2,123	1.00	14,395	2,123	2,123	2,123	2,123	656	656	656	656	656	656	656
Hot Water	Gas Water Heater - TOS	13.0	56	1.00	733	56	56	56	56	56	56	56	56	56	56	56
Hot Water	HW Pipe Insulation	15.0	492	1.00	7,387	492	492	492	492	492	492	492	492	492	492	492
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	42	1.00	380	42	42	42	42	42	42	42	42	42	42	42
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	122	1.00	1,098	122	122	122	122	122	122	122	122	122	122	122
Hot Water	Low Flow Showerhead	10.0	467	1.00	4,672	467	467	467	467	467	467	467	467	467	467	467
Hot Water	Water Heater Wrap	5.0	0	1.00	0											
HVAC	Advanced Thermostat	10.0	3,124	NA‡	31,240	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124
HVAC	Air Source Heat Pump - TOS	18.0	0	1.00	0											
HVAC	Bathroom Exhaust Fan	19.0	0	1.00	0											
HVAC	Central Air Conditioning - ER	18.0	0	1.00	0											
HVAC	Central Air Conditioning - TOS	18.0	0	1.00	0											
HVAC	Furnace Blower Motor	20.0	0	1.00	0											
HVAC	Gas High Efficiency Boiler - ER	25.0	1,527	1.00	26,688	1,527	1,527	1,527	1,527	1,527	1,527	1,527	1,527	1,527	1,527	851
HVAC	Gas High Efficiency Boiler - TOS	25.0	56	1.00	1,397	56	56	56	56	56	56	56	56	56	56	56
HVAC	Gas High Efficiency Furnace - ER	20.0	13,343	1.00	136,281	13,343	13,343	13,343	13,343	13,343	13,343	13,343	4,016	4,016	4,016	4,016
HVAC	Gas High Efficiency Furnace - TOS	20.0	4,857	1.00	97,144	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857
HVAC	Programmable Thermostat	5.0	1,149	1.00	5,747	1,149	1,149	1,149	1,149	1,149						
Lighting	LED Omnidirectional Bulb - Exterior	6.1	0	1.00	0											
Lighting	LED Omnidirectional Bulb - Interior	10.0	0	1.00	0											
Lighting	LED Specialty Lamp	10.0	0	1.00	0											
Lighting	LED Specialty Lamp - Track and Recessed	15.0	0	1.00	0											
Shell	Air Sealing	15.0	10,221	1.00	153,318	10,221	10,221	10,221	10,221	10,221	10,221	10,221	10,221	10,221	10,221	10,221
Shell	Attic Insulation	25.0	4,753	1.00	118,830	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753
Shell	Basement Sidewall Insulation	25.0	4,694	1.00	117,362	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694
Shell	Floor Insulation	25.0	181	1.00	4,528	181	181	181	181	181	181	181	181	181	181	181
Shell	Wall Insulation	25.0	2,712	1.00	67,793	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712
CY2018 Program Total Gas CPAS (Therms)			49,921		788,993	49,921	49,921	49,921	49,921	48,454	47,305	37,977	37,977	37,977	37,302	
CY2018 Program Total Gas CPAS (kWh Equivalent)§					23,125,384	1,463,183	1,463,183	1,463,183	1,463,183	1,420,184	1,386,498	1,113,120	1,113,120	1,113,120	1,093,335	
CY2018 Program Expiring Gas Savings (Therms) 						0	0	0	0	1,467	2,616	11,943	11,943	12,619		
CY2018 Program Expiring Gas Savings (kWh Equivalent)§, 						0	0	0	0	42,999	76,685	350,063	350,063	350,063	369,848	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Freezer												
Appliance	Refrigerator - ER												
Appliance	Refrigerator - TOS												
Appliance	Room AC - ER												
Appliance	Room AC - TOS												
Hot Water	Gas Water Heater - ER	656	656	656	656								
Hot Water	Gas Water Heater - TOS	56	56	56	56								
Hot Water	HW Pipe Insulation	492	492	492	492	492	492						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	467											
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat	3,124											
HVAC	Air Source Heat Pump - TOS												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning - ER												
HVAC	Central Air Conditioning - TOS												
HVAC	Furnace Blower Motor												
HVAC	Gas High Efficiency Boiler - ER	851	851	851	851	851	851	851	851	851	851	851	851
HVAC	Gas High Efficiency Boiler - TOS	56	56	56	56	56	56	56	56	56	56	56	56
HVAC	Gas High Efficiency Furnace - ER	4,016	4,016	4,016	4,016	4,016	4,016	4,016	4,016	4,016	4,016	4,016	4,016
HVAC	Gas High Efficiency Furnace - TOS	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857	4,857
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing	10,221	10,221	10,221	10,221	10,221	10,221						
Shell	Attic Insulation	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753	4,753
Shell	Basement Sidewall Insulation	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694
Shell	Floor Insulation	181	181	181	181	181	181	181	181	181	181	181	181
Shell	Wall Insulation	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712	2,712
CY2018 Program Total Gas CPAS (Therms)		37,138	33,547	33,547	33,547	32,835	32,835	22,121	22,121	22,121	22,121	22,121	13,248
CY2018 Program Total Gas CPAS (kWh Equivalent)§		1,088,521	983,262	983,262	983,262	962,385	962,385	648,367	648,367	648,367	648,367	648,367	388,296
CY2018 Program Expiring Gas Savings (Therms) 		12,783	16,374	16,374	16,374	17,086	17,086	27,800	27,800	27,800	27,800	27,800	36,673
CY2018 Program Expiring Gas Savings (kWh Equivalent)		374,662	479,921	479,921	479,921	500,798	500,798	814,816	814,816	814,816	814,816	814,816	1,074,887

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Appliance	Freezer												
Appliance	Refrigerator - ER												
Appliance	Refrigerator - TOS												
Appliance	Room AC - ER												
Appliance	Room AC - TOS												
Hot Water	Gas Water Heater - ER												
Hot Water	Gas Water Heater - TOS												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat												
HVAC	Air Source Heat Pump - TOS												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning - ER												
HVAC	Central Air Conditioning - TOS												
HVAC	Furnace Blower Motor												
HVAC	Gas High Efficiency Boiler - ER	851	851	851	851								
HVAC	Gas High Efficiency Boiler - TOS	56	56	56	56								
HVAC	Gas High Efficiency Furnace - ER												
HVAC	Gas High Efficiency Furnace - TOS												
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	4,753	4,753	4,753	4,753								
Shell	Basement Sidewall Insulation	4,694	4,694	4,694	4,694								
Shell	Floor Insulation	181	181	181	181								
Shell	Wall Insulation	2,712	2,712	2,712	2,712								
CY2018 Program Total Gas CPAS (Therms)		13,248	13,248	13,248	13,248	0	0	0	0	0	0	0	0
CY2018 Program Total Gas CPAS (kWh Equivalent)§		388,296	388,296	388,296	388,296	0	0	0	0	0	0	0	0
CY2018 Program Expiring Gas Savings (Therms) 		36,673	36,673	36,673	36,673	49,921	49,921	49,921	49,921	49,921	49,921	49,921	49,921
CY2018 Program Expiring Gas Savings (kWh Equivalent)†		1,074,887	1,074,887	1,074,887	1,074,887	1,463,183	1,463,183	1,463,183	1,463,183	1,463,183	1,463,183	1,463,183	1,463,183

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.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

§ 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 3-4. IHWAP 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	
Appliance	Freezer	11.0	1,720	1.00	18,918	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	
Appliance	Refrigerator - ER	12.0	62,366	1.00	298,577	62,366	62,366	62,366	62,366	6,139	6,139	6,139	6,139	6,139	
Appliance	Refrigerator - TOS	12.0	177	1.00	2,126	177	177	177	177	177	177	177	177	177	
Appliance	Room AC - ER	12.0	5,795	1.00	29,687	5,795	5,795	5,795	5,795	813	813	813	813	813	
Appliance	Room AC - TOS	12.0	74	1.00	891	74	74	74	74	74	74	74	74	74	
Hot Water	Gas Water Heater - ER	13.0	62,224	1.00	421,919	62,224	62,224	62,224	62,224	19,225	19,225	19,225	19,225	19,225	
Hot Water	Gas Water Heater - TOS	13.0	1,653	1.00	21,483	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	
Hot Water	HW Pipe Insulation	15.0	16,180	1.00	242,706	16,180	16,180	16,180	16,180	16,180	16,180	16,180	16,180	16,180	
Hot Water	Low Flow Faucet Aerator - Bathroom	9.0	1,497	1.00	13,474	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	
Hot Water	Low Flow Faucet Aerator - Kitchen	9.0	4,752	1.00	42,770	4,752	4,752	4,752	4,752	4,752	4,752	4,752	4,752	4,752	
Hot Water	Low Flow Showerhead	10.0	17,073	1.00	170,729	17,073	17,073	17,073	17,073	17,073	17,073	17,073	17,073	17,073	
Hot Water	Water Heater Wrap	5.0	287	1.00	1,434	287	287	287	287	287	287	287	287	287	
HVAC	Advanced Thermostat	10.0	115,288	NA‡	1,152,881	115,288	115,288	115,288	115,288	115,288	115,288	115,288	115,288	115,288	
HVAC	Air Source Heat Pump - TOS	18.0	335	1.00	6,025	335	335	335	335	335	335	335	335	335	
HVAC	Bathroom Exhaust Fan	19.0	31,800	1.00	604,203	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	
HVAC	Central Air Conditioning - ER	18.0	141,270	1.00	1,209,114	141,270	141,270	141,270	141,270	141,270	141,270	30,125	30,125	30,125	
HVAC	Central Air Conditioning - TOS	18.0	10,117	1.00	182,110	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	
HVAC	Furnace Blower Motor	20.0	732	1.00	14,640	732	732	732	732	732	732	732	732	732	
HVAC	Gas High Efficiency Boiler - ER	25.0	44,743	1.00	782,219	44,743	44,743	44,743	44,743	44,743	44,743	44,743	44,743	24,957	
HVAC	Gas High Efficiency Boiler - TOS	25.0	1,637	1.00	40,935	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	
HVAC	Gas High Efficiency Furnace - ER	20.0	542,628	1.00	7,025,280	542,628	542,628	542,628	542,628	542,628	542,628	269,251	269,251	269,251	
HVAC	Gas High Efficiency Furnace - TOS	20.0	192,840	1.00	3,856,809	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	
HVAC	Programmable Thermostat	5.0	35,764	1.00	178,818	35,764	35,764	35,764	35,764	35,764	35,764	35,764	35,764	35,764	
Lighting	LED Omnidirectional Bulb - Exterior	6.1	40,068	1.00	136,050	40,068	40,068	40,068	5,112	5,112	5,112	511	511	511	
Lighting	LED Omnidirectional Bulb - Interior	10.0	195,057	1.00	737,616	195,057	195,057	195,057	21,778	21,778	21,778	21,778	21,778	21,778	
Lighting	LED Specialty Lamp	10.0	56,098	1.00	560,976	56,098	56,098	56,098	56,098	56,098	56,098	56,098	56,098	56,098	
Lighting	LED Specialty Lamp - Track and Recessed	15.0	20,842	1.00	312,623	20,842	20,842	20,842	20,842	20,842	20,842	20,842	20,842	20,842	
Shell	Air Sealing	15.0	391,426	1.00	5,871,393	391,426	391,426	391,426	391,426	391,426	391,426	391,426	391,426	391,426	
Shell	Attic Insulation	25.0	172,501	1.00	4,312,524	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	
Shell	Basement Sidewall Insulation	25.0	177,607	1.00	4,440,177	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	
Shell	Floor Insulation	25.0	6,799	1.00	169,984	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	
Shell	Wall Insulation	25.0	91,540	1.00	2,288,499	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	
CY2018 Program Total CPAS			2,442,890		35,147,591	2,442,890	2,442,890	2,442,890	2,234,655	2,130,448	2,094,397	1,705,274	1,704,763	1,684,977	
CY2018 Program Expiring Savings§							0	0	208,235	312,442	348,493	737,616	738,127	757,913	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Freezer	1,720	1,720										
Appliance	Refrigerator - ER	6,139	6,139	6,139									
Appliance	Refrigerator - TOS	177	177	177									
Appliance	Room AC - ER	813	813	813									
Appliance	Room AC - TOS	74	74	74									
Hot Water	Gas Water Heater - ER	19,225	19,225	19,225	19,225								
Hot Water	Gas Water Heater - TOS	1,653	1,653	1,653	1,653								
Hot Water	HW Pipe Insulation	16,180	16,180	16,180	16,180	16,180	16,180						
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead	17,073											
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat	115,288											
HVAC	Air Source Heat Pump - TOS	335	335	335	335	335	335	335	335	335			
HVAC	Bathroom Exhaust Fan	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800	31,800		
HVAC	Central Air Conditioning - ER	30,125	30,125	30,125	30,125	30,125	30,125	30,125	30,125	30,125			
HVAC	Central Air Conditioning - TOS	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117	10,117			
HVAC	Furnace Blower Motor	732	732	732	732	732	732	732	732	732	732	732	
HVAC	Gas High Efficiency Boiler - ER	24,957	24,957	24,957	24,957	24,957	24,957	24,957	24,957	24,957	24,957	24,957	24,957
HVAC	Gas High Efficiency Boiler - TOS	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637	1,637
HVAC	Gas High Efficiency Furnace - ER	269,251	269,251	269,251	269,251	269,251	269,251	269,251	269,251	269,251	269,251	269,251	269,251
HVAC	Gas High Efficiency Furnace - TOS	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840	192,840
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	21,778											
Lighting	LED Specialty Lamp	56,098											
Lighting	LED Specialty Lamp - Track and Recessed	20,842	20,842	20,842	20,842	20,842	20,842						
Shell	Air Sealing	391,426	391,426	391,426	391,426	391,426	391,426						
Shell	Attic Insulation	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501	172,501
Shell	Basement Sidewall Insulation	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607	177,607
Shell	Floor Insulation	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799	6,799
Shell	Wall Insulation	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540	91,540
CY2018 Program Total CPAS		1,678,728	1,468,492	1,466,772	1,459,568	1,438,690	1,438,690	1,010,242	1,010,242	1,010,242	969,666	937,865	475,042
CY2018 Program Expiring Savings\$		764,162	974,399	976,118	983,322	1,004,200	1,004,200	1,432,648	1,432,648	1,432,648	1,473,224	1,505,025	1,967,848

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Appliance	Freezer												
Appliance	Refrigerator - ER												
Appliance	Refrigerator - TOS												
Appliance	Room AC - ER												
Appliance	Room AC - TOS												
Hot Water	Gas Water Heater - ER												
Hot Water	Gas Water Heater - TOS												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Hot Water	Water Heater Wrap												
HVAC	Advanced Thermostat												
HVAC	Air Source Heat Pump - TOS												
HVAC	Bathroom Exhaust Fan												
HVAC	Central Air Conditioning - ER												
HVAC	Central Air Conditioning - TOS												
HVAC	Furnace Blower Motor												
HVAC	Gas High Efficiency Boiler - ER	24,957	24,957	24,957	24,957								
HVAC	Gas High Efficiency Boiler - TOS	1,637	1,637	1,637	1,637								
HVAC	Gas High Efficiency Furnace - ER												
HVAC	Gas High Efficiency Furnace - TOS												
HVAC	Programmable Thermostat												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Lighting	LED Specialty Lamp												
Lighting	LED Specialty Lamp - Track and Recessed												
Shell	Air Sealing												
Shell	Attic Insulation	172,501	172,501	172,501	172,501								
Shell	Basement Sidewall Insulation	177,607	177,607	177,607	177,607								
Shell	Floor Insulation	6,799	6,799	6,799	6,799								
Shell	Wall Insulation	91,540	91,540	91,540	91,540								
CY2018 Program Total CPAS		475,042	475,042	475,042	475,042	0	0	0	0	0	0	0	0
CY2018 Program Expiring Savings§		1,967,848	1,967,848	1,967,848	1,967,848	2,442,890	2,442,890	2,442,890	2,442,890	2,442,890	2,442,890	2,442,890	2,442,890

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>.

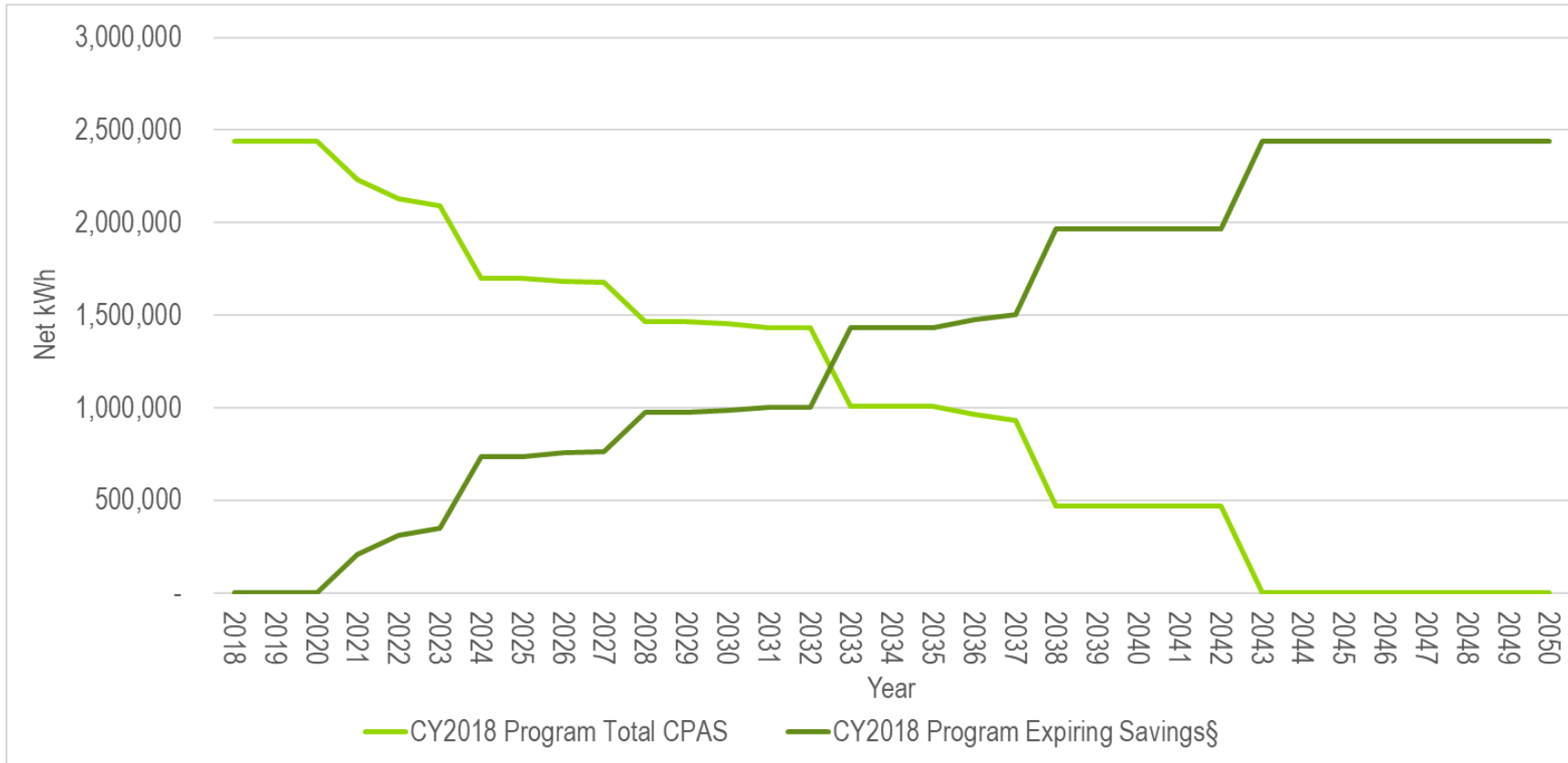
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ The IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: Navigant analysis

Figure 3-2. IHWAP Cumulative Persisting Annual Savings



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

3.3 Program Savings Detail

Table 3-5 summarizes the incremental energy and demand savings IHWAP achieved in CY2018. The gas savings are only those that the gas utilities are not claiming and ComEd can claim.⁶

Table 3-5. CY2018 IHWAP Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	980,385	NA	300
Program Gross Realization Rate	1.00	NA	1.00
Verified Gross Savings	979,707	1,022	300
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	979,707	1,022	300
Converted from Gas*			
Ex Ante Gross Savings	1,421,223	NA	NA
Program Gross Realization Rate	1.03	NA	NA
Verified Gross Savings	1,463,183	NA	NA
Program Net-to-Gross Ratio (NTG)	1.00	NA	NA
Verified Net Savings	1,463,183	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	2,401,608	NA	300
Program Gross Realization Rate	1.02	NA	1.00
Verified Gross Savings	2,442,890	1,022	300
Program Net-to-Gross Ratio (NTG)	1.00	1.00	1.00
Verified Net Savings	2,442,890	1,022	300

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

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.

3.4 Program Savings by Measure

The IHWAP component includes 32 measures as shown in the following tables; 28 of the measures contributed to electric savings and 17 of the measures contributed to gas savings. The early replacement gas high efficiency furnace measure and air sealing measures contributed the most savings at 22 and 16 percent of total combined savings, respectively.

⁶ The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary Report.

Table 3-6. CY2018 IHWAP 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
Appliance	Freezer	1,720	1.00	1,720	1.00	1,720	11.0
Appliance	Refrigerator - ER	62,366	1.00	62,366	1.00	62,366	12.0
Appliance	Refrigerator - TOS	177	1.00	177	1.00	177	12.0
Appliance	Room AC - ER	5,795	1.00	5,795	1.00	5,795	12.0
Appliance	Room AC - TOS	478	0.16	74	1.00	74	12.0
Hot Water	Gas Water Heater - ER	0	NA	0	1.00	0	13.0
Hot Water	Gas Water Heater - TOS	0	NA	0	1.00	0	13.0
Hot Water	HW Pipe Insulation	1,747	1.00	1,747	1.00	1,747	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	259	1.00	259	1.00	259	9.0
Hot Water	Low Flow Faucet Aerator - Kitchen	1,177	1.00	1,177	1.00	1,177	9.0
Hot Water	Low Flow Showerhead	3,381	1.00	3,381	1.00	3,381	10.0
Hot Water	Water Heater Wrap	287	1.00	287	1.00	287	5.0
HVAC	Advanced Thermostat	24,614	0.96	23,722	NA+	23,722	10.0
HVAC	Air Source Heat Pump - TOS	335	1.00	335	1.00	335	18.0
HVAC	Bathroom Exhaust Fan	31,800	1.00	31,800	1.00	31,800	19.0
HVAC	Central Air Conditioning - ER	141,270	1.00	141,270	1.00	141,270	18.0
HVAC	Central Air Conditioning - TOS	10,117	1.00	10,117	1.00	10,117	18.0
HVAC	Furnace Blower Motor	732	1.00	732	1.00	732	20.0
HVAC	Gas High Efficiency Boiler - ER	0	NA	0	1.00	0	25.0
HVAC	Gas High Efficiency Boiler - TOS	0	NA	0	1.00	0	25.0
HVAC	Gas High Efficiency Furnace - ER	151,544	1.00	151,544	1.00	151,544	20.0
HVAC	Gas High Efficiency Furnace - TOS	50,476	1.00	50,476	1.00	50,476	20.0
HVAC	Programmable Thermostat	2,077	1.00	2,077	1.00	2,077	5.0
Lighting	LED Omnidirectional Bulb - Exterior	40,068	1.00	40,068	1.00	40,068	6.1
Lighting	LED Omnidirectional Bulb - Interior	195,057	1.00	195,057	1.00	195,057	10.0
Lighting	LED Specialty Lamp	56,098	1.00	56,098	1.00	56,098	10.0
Lighting	LED Specialty Lamp - Track and Recessed	20,842	1.00	20,842	1.00	20,842	15.0
Shell	Air Sealing	91,896	1.00	91,842	1.00	91,842	15.0
Shell	Attic Insulation	33,213	1.00	33,185	1.00	33,185	25.0
Shell	Basement Sidewall Insulation	39,313	1.02	40,012	1.00	40,012	25.0
Shell	Floor Insulation	1,491	1.00	1,490	1.00	1,490	25.0
Shell	Wall Insulation	12,059	1.00	12,059	1.00	12,059	25.0
Total		980,385	1.00	979,707		979,707	

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

Table 3-7. CY2018 IHWAP 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)
Appliance	Freezer	NA	NA	0.29	1.00	0.29
Appliance	Refrigerator - ER	NA	NA	7.11	1.00	7.11
Appliance	Refrigerator - TOS	NA	NA	0.02	1.00	0.02
Appliance	Room AC - ER	NA	NA	26.42	1.00	26.42
Appliance	Room AC - TOS	NA	NA	0.33	1.00	0.33
Hot Water	Gas Water Heater - ER	NA	NA	0.00	1.00	0.00
Hot Water	Gas Water Heater - TOS	NA	NA	0.00	1.00	0.00
Hot Water	HW Pipe Insulation	NA	NA	3.17	1.00	3.17
Hot Water	Low Flow Faucet Aerator - Bathroom	NA	NA	18.48	1.00	18.48
Hot Water	Low Flow Faucet Aerator - Kitchen	NA	NA	12.52	1.00	12.52
Hot Water	Low Flow Showerhead	NA	NA	11.19	1.00	11.19
Hot Water	Water Heater Wrap	NA	NA	0.03	1.00	0.03
HVAC	Advanced Thermostat	NA	NA	31.66	NA†	31.66
HVAC	Air Source Heat Pump - TOS	NA	NA	-0.08	1.00	-0.08
HVAC	Bathroom Exhaust Fan	NA	NA	3.63	1.00	3.63
HVAC	Central Air Conditioning - ER	NA	NA	193.03	1.00	193.03
HVAC	Central Air Conditioning - TOS	NA	NA	14.28	1.00	14.28
HVAC	Furnace Blower Motor	NA	NA	0.46	1.00	0.46
HVAC	Gas High Efficiency Boiler - ER	NA	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Boiler - TOS	NA	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Furnace - ER	NA	NA	96.00	1.00	96.00
HVAC	Gas High Efficiency Furnace - TOS	NA	NA	32.64	1.00	32.64
HVAC	Programmable Thermostat	NA	NA	0.00	1.00	0.00
Lighting	LED Omnidirectional Bulb - Exterior	NA	NA	16.19	1.00	16.19
Lighting	LED Omnidirectional Bulb - Interior	NA	NA	269.11	1.00	269.11
Lighting	LED Specialty Lamp	NA	NA	91.09	1.00	91.09
Lighting	LED Specialty Lamp - Track and Recessed	NA	NA	22.10	1.00	22.10
Shell	Air Sealing	NA	NA	103.88	1.00	103.88
Shell	Attic Insulation	NA	NA	34.11	1.00	34.11
Shell	Basement Sidewall Insulation	NA	NA	21.88	1.00	21.88
Shell	Floor Insulation	NA	NA	1.25	1.00	1.25
Shell	Wall Insulation	NA	NA	11.54	1.00	11.54
Total		NA	NA	1,022.35		1,022.35

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

Table 3-8. CY2018 IHWAP 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)
Appliance	Freezer	0.28	1.00	0.28	1.00	0.28
Appliance	Refrigerator - ER	9.40	1.00	9.40	1.00	9.40
Appliance	Refrigerator - TOS	0.03	1.00	0.03	1.00	0.03
Appliance	Room AC - ER	7.93	1.00	7.93	1.00	7.93
Appliance	Room AC - TOS	0.65	0.16	0.10	1.00	0.10
Hot Water	Gas Water Heater - ER	0.00	NA	0.00	1.00	0.00
Hot Water	Gas Water Heater - TOS	0.00	NA	0.00	1.00	0.00
Hot Water	HW Pipe Insulation	0.20	1.00	0.20	1.00	0.20
Hot Water	Low Flow Faucet Aerator - Bathroom	0.41	1.00	0.41	1.00	0.41
Hot Water	Low Flow Faucet Aerator - Kitchen	0.28	1.00	0.28	1.00	0.28
Hot Water	Low Flow Showerhead	0.31	1.00	0.31	1.00	0.31
Hot Water	Water Heater Wrap	0.03	1.25	0.03	1.00	0.03
HVAC	Advanced Thermostat	7.38	1.00	7.38	NA†	7.38
HVAC	Air Source Heat Pump - TOS	-0.04	1.00	-0.04	1.00	-0.04
HVAC	Bathroom Exhaust Fan	3.63	1.00	3.63	1.00	3.63
HVAC	Central Air Conditioning - ER	89.95	1.00	89.95	1.00	89.95
HVAC	Central Air Conditioning - TOS	6.66	1.00	6.66	1.00	6.66
HVAC	Furnace Blower Motor	0.22	1.00	0.22	1.00	0.22
HVAC	Gas High Efficiency Boiler - ER	0.00	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Boiler - TOS	0.00	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Furnace - ER	44.74	1.00	44.74	1.00	44.74
HVAC	Gas High Efficiency Furnace - TOS	15.21	1.00	15.21	1.00	15.21
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
Lighting	LED Omnidirectional Bulb - Exterior	4.42	1.00	4.42	1.00	4.42
Lighting	LED Omnidirectional Bulb - Interior	19.11	1.00	19.11	1.00	19.11
Lighting	LED Specialty Lamp	6.85	1.00	6.85	1.00	6.85
Lighting	LED Specialty Lamp - Track and Recessed	2.31	1.00	2.31	1.00	2.31
Shell	Air Sealing	48.46	1.00	48.41	1.00	48.41
Shell	Attic Insulation	15.92	1.00	15.90	1.00	15.90
Shell	Basement Sidewall Insulation	10.16	1.00	10.20	1.00	10.20
Shell	Floor Insulation	0.58	1.00	0.58	1.00	0.58
Shell	Wall Insulation	5.38	1.00	5.38	1.00	5.38
Total		300.41	1.00	299.84		299.84

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.

Table 3-9. CY2018 IHWAP 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
Appliance	Freezer	0	NA	0	1.00	0	11.0
Appliance	Refrigerator - ER	0	NA	0	1.00	0	12.0
Appliance	Refrigerator - TOS	0	NA	0	1.00	0	12.0
Appliance	Room AC - ER	0	NA	0	1.00	0	12.0
Appliance	Room AC - TOS	0	NA	0	1.00	0	12.0
Hot Water	Gas Water Heater - ER	2,123	1.00	2,123	1.00	2,123	13.0
Hot Water	Gas Water Heater - TOS	56	1.00	56	1.00	56	13.0
Hot Water	HW Pipe Insulation	492	1.00	492	1.00	492	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	42	1.00	42	1.00	42	9.0
Hot Water	Low Flow Faucet Aerator - Kitchen	122	1.00	122	1.00	122	9.0
Hot Water	Low Flow Showerhead	467	1.00	467	1.00	467	10.0
Hot Water	Water Heater Wrap	0	NA	0	1.00	0	5.0
HVAC	Advanced Thermostat	3,132	1.00	3,124	NA†	3,124	10.0
HVAC	Air Source Heat Pump - TOS	0	NA	0	1.00	0	18.0
HVAC	Bathroom Exhaust Fan	0	NA	0	1.00	0	19.0
HVAC	Central Air Conditioning - ER	0	NA	0	1.00	0	18.0
HVAC	Central Air Conditioning - TOS	0	NA	0	1.00	0	18.0
HVAC	Furnace Blower Motor	0	NA	0	1.00	0	20.0
HVAC	Gas High Efficiency Boiler - ER	1,527	1.00	1,527	1.00	1,527	25.0
HVAC	Gas High Efficiency Boiler - TOS	56	1.00	56	1.00	56	25.0
HVAC	Gas High Efficiency Furnace - ER	12,384	1.08	13,343	1.00	13,343	20.0
HVAC	Gas High Efficiency Furnace - TOS	4,473	1.09	4,857	1.00	4,857	20.0
HVAC	Programmable Thermostat	1,054	1.09	1,149	1.00	1,149	5.0
Lighting	LED Omnidirectional Bulb - Exterior	0	NA	0	1.00	0	6.1
Lighting	LED Omnidirectional Bulb - Interior	0	NA	0	1.00	0	10.0
Lighting	LED Specialty Lamp	0	NA	0	1.00	0	10.0
Lighting	LED Specialty Lamp - Track and Recessed	0	NA	0	1.00	0	15.0
Shell	Air Sealing	10,221	1.00	10,221	1.00	10,221	15.0
Shell	Attic Insulation	4,753	1.00	4,753	1.00	4,753	25.0
Shell	Basement Sidewall Insulation	4,694	1.00	4,694	1.00	4,694	25.0
Shell	Floor Insulation	181	1.00	181	1.00	181	25.0
Shell	Wall Insulation	2,712	1.00	2,712	1.00	2,712	25.0
Total Therms		48,489	1.03	49,921		49,921	
Total kWh Converted from Therms‡		1,421,223	1.03	1,463,183		1,463,183	

* 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 IL TRM algorithm calculates net savings for advanced thermostats.

‡ 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 3-10. CY2018 IHWAP 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)
Appliance	Freezer	1,720	1.00	1,720	1.00	1,720
Appliance	Refrigerator - ER	62,366	1.00	62,366	1.00	62,366
Appliance	Refrigerator - TOS	177	1.00	177	1.00	177
Appliance	Room AC - ER	5,795	1.00	5,795	1.00	5,795
Appliance	Room AC - TOS	478	0.16	74	1.00	74
Hot Water	Gas Water Heater - ER	62,224	1.00	62,224	1.00	62,224
Hot Water	Gas Water Heater - TOS	1,653	1.00	1,653	1.00	1,653
Hot Water	HW Pipe Insulation	16,180	1.00	16,180	1.00	16,180
Hot Water	Low Flow Faucet Aerator - Bathroom	1,497	1.00	1,497	1.00	1,497
Hot Water	Low Flow Faucet Aerator - Kitchen	4,752	1.00	4,752	1.00	4,752
Hot Water	Low Flow Showerhead	17,073	1.00	17,073	1.00	17,073
Hot Water	Water Heater Wrap	287	1.00	287	1.00	287
HVAC	Advanced Thermostat	116,410	0.99	115,288	NA†	115,288
HVAC	Air Source Heat Pump - TOS	335	1.00	335	1.00	335
HVAC	Bathroom Exhaust Fan	31,800	1.00	31,800	1.00	31,800
HVAC	Central Air Conditioning - ER	141,270	1.00	141,270	1.00	141,270
HVAC	Central Air Conditioning - TOS	10,117	1.00	10,117	1.00	10,117
HVAC	Furnace Blower Motor	732	1.00	732	1.00	732
HVAC	Gas High Efficiency Boiler - ER	44,743	1.00	44,743	1.00	44,743
HVAC	Gas High Efficiency Boiler - TOS	1,637	1.00	1,637	1.00	1,637
HVAC	Gas High Efficiency Furnace - ER	514,514	1.05	542,628	1.00	542,628
HVAC	Gas High Efficiency Furnace - TOS	181,566	1.06	192,840	1.00	192,840
HVAC	Programmable Thermostat	32,962	1.08	35,764	1.00	35,764
Lighting	LED Omnidirectional Bulb - Exterior	40,068	1.00	40,068	1.00	40,068
Lighting	LED Omnidirectional Bulb - Interior	195,057	1.00	195,057	1.00	195,057
Lighting	LED Specialty Lamp	56,098	1.00	56,098	1.00	56,098
Lighting	LED Specialty Lamp - Track and Recessed	20,842	1.00	20,842	1.00	20,842
Shell	Air Sealing	391,480	1.00	391,426	1.00	391,426
Shell	Attic Insulation	172,529	1.00	172,501	1.00	172,501
Shell	Basement Sidewall Insulation	176,908	1.00	177,607	1.00	177,607
Shell	Floor Insulation	6,800	1.00	6,799	1.00	6,799
Shell	Wall Insulation	91,540	1.00	91,540	1.00	91,540
Total‡		2,401,608	1.02	2,442,890		2,442,890

* 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 IL TRM algorithm calculates net savings for advanced thermostats.

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

Source: ComEd tracking data and Navigant team analysis.

3.5 Impact Analysis Findings and Recommendations

3.5.1 Impact Parameter Estimates

Navigant calculated verified gross and net program impacts for all 32 IHWAP measures. These measures account for all quantifiable CY2018 electric savings. Navigant calculated verified gross energy and demand savings using the algorithms in the IL TRM v6. The following table presents the deemed input parameter source that Navigant used by measure. The IL TRM v6.0 allows for custom or actual values to be used for some of the input parameters. Navigant based these values on the program tracking database when available.

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 IL SAG defined NTG estimates used to calculate net verified savings⁷.

⁷ 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>.

Table 3-11. IHWAP Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	Number of measures	Evaluated	ComEd Tracking Data and Navigant Evaluation
NTG	Varies		Deemed	IL SAG Consensus†
Freezer	Varies	Each	Deemed	IL TRM v6.0 – Section 5.1.05
Refrigerator	Varies	Each	Deemed	IL TRM v6.0 – Section 5.1.06
Room AC	Varies	Each	Deemed	IL TRM v6.0 – Section 5.1.07
Gas Water Heater	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.02
HW Pipe Insulation	26	Linear Feet	Deemed	IL TRM v6.0 – Section 5.4.01
Low Flow Faucet Aerator – Bathroom	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.04
Low Flow Faucet Aerator - Kitchen	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.04
Low Flow Showerhead	Varies	Each	Deemed	IL TRM v6.0 – Section 5.4.05
Water Heater Wrap	143	Each	Deemed	IL TRM v6.0 – Section 5.4.07
Advanced Thermostat	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.16
Air Source Heat Pump	335	Each	Deemed	IL TRM v6.0 – Section 5.3.01
Bathroom Exhaust Fan	89	Each	Deemed	IL TRM v6.0 – Section 5.3.09
Central Air Conditioning	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.03
Furnace Blower Motor	732	Each	Deemed	IL TRM v6.0 – Section 5.3.05
Gas High Efficiency Boiler	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.06
Gas High Efficiency Furnace	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.07
Programmable Thermostat	Varies	Each	Deemed	IL TRM v6.0 – Section 5.3.11
LED Omnidirectional Bulbs	Varies	Each	Deemed	IL TRM v6.0 Errata – Section 5.5.08
LED Specialty Lamps	Varies	Each	Deemed	IL TRM v6.0 Errata – Section 5.5.06
Air Sealing	Varies	Projects	Deemed	IL TRM v6.0 – Section 5.6.01
Attic Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.04
Basement Sidewall Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.02
Floor Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.03
Wall Insulation	Varies	Square Feet	Deemed	IL TRM v6.0 – Section 5.6.04

* 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>.

3.5.2 Other Impact Findings and Recommendations

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

3.5.2.1 Room Air Conditioner – Time of Sale Finding

Finding 1. The evaluation team found that the implementer calculated time of sale room air conditioner (AC) savings using the SEER of the replaced unit as the baseline. The existing units were not functioning at the time of the projects, indicating that savings should be based

on TRM-deemed baseline values of combined energy efficiency ratio (CEER). We calculated verified savings using TRM baselines assuming the “Federal Standard with louvered sides” product. The following table shows the four time of sale room air conditioner projects and the difference between the tracking data baseline and the TRM-deemed baseline:

Table 3-12. Room AC Baseline Discrepancy

Record ID	System Replacement Type	Existing System Condition	Installed Unit Size (Btu/h)	Existing Cooling System SEER	TRM-Deemed Baseline CEER
MEA-2018.05.29-8893	Time of Sale	No, not functioning (failed)	5000	8.0	11.0
MEA-2018.05.17-5683	Time of Sale	No, not functioning (failed)	4800	6.0	11.0
MEA-2018.10.30-32004	Time of Sale	No, not functioning (failed)	10000	6.8	10.9
MEA-2018.05.18-5983	Time of Sale	No, not functioning (failed)	5000	7.7	11.0

Source: ComEd tracking data and Navigant team analysis.

The TRM-deemed baseline CEER values are higher than the SEER values of the existing units, reducing the energy and demand savings for time of sale room air conditioners by 84 percent.

Recommendation 1. Navigant recommends the implementer use TRM-deemed baseline CEER values to calculate ex ante savings for time of sale room air conditioners.

3.5.2.2 Advanced Thermostat Findings

Finding 2. The evaluation team found that the implementer had collected data for the cooling system SEER of each advanced thermostat project but calculated ex ante savings using TRM-default values. The TRM recommends using actual SEER values to calculate savings when available. Navigant used collected existing cooling system SEER values to estimate advanced thermostat savings with more accuracy, which reduced the combined electric and gas savings for advanced thermostats by one percent.

Recommendation 2. Navigant recommends the implementer calculate advanced thermostat ex ante savings using collected data for cooling system SEER where possible.

Finding 3. The evaluation team noted that for six percent of advanced thermostat projects, the baseline thermostat indicated in the measure name differed from the baseline indicated in the “Existing_Thermostat_Type” field. Examples of this finding are shown in the following table:

Table 3-13. Advanced Thermostat Baseline Discrepancy

Record ID	Measure Name	Existing_Thermostat_Type	Ex Ante Savings (kWh)
MEA-2018.07.26-15417	Advanced Thermostat - Programmable	Existing Manual Thermostat (Non-Programmable)	211.808
MEA-2018.12.27-44379	Advanced Thermostat - Manual	Existing Programmable Thermostat	259.524
MEA-2018.06.21-11584	Advanced Thermostat - Blended	Existing Manual Thermostat (Non-Programmable)	68.421
MEA-2018.07.23-15369	Advanced Thermostat - Programmable	Existing Manual Thermostat (Non-Programmable)	229.936

Source: ComEd tracking data and Navigant team analysis.

In these cases, we found that the baseline thermostat indicated in the measure name more closely matched ex ante savings calculations. We used the measure name to calculate verified savings and noted the discrepancy.

Recommendation 3. Navigant recommends the implementer clarify which field, measure name or “Existing_Thermostat_Type,” more accurately represents the baseline thermostat of advanced thermostat projects.

3.5.2.3 Air Source Heat Pump Finding

Finding 4. For the one air source heat pump project with record ID MEA-2018.11.30-36997, the evaluation team found that the installed unit had a lower energy efficiency ratio (EER) than the TRM-deemed baseline. This suggested that the project received a less-efficient unit than a baseline unit and resulted in negative ex ante demand savings. We confirmed the negative demand savings and observed that ComEd does not have requirements for minimum EER values when qualifying air source heat pump measures.

Recommendation 4. Navigant recommends that ComEd add requirements for minimum EER values to qualify air source heat pump measures to ensure that measures have higher EER values than the TRM-deemed baseline.

3.5.2.4 Gas High Efficiency Boiler Finding

Finding 5. The evaluation team found two gas high efficiency boiler projects with no claimed ex ante savings. These two projects have record IDs MEA-2018.08.28-19961 and MEA-2018.12.12-39822. We noted that the projects did not yield energy savings because the installed unit was the same efficiency as the baseline or existing unit. We confirmed the zero savings.

Recommendation 5. Navigant recommends the implementer review the installed units and does not incentivize units that are less efficient or no more efficient than a baseline.

3.5.2.5 Gas High Efficiency Furnace Finding

Finding 6. The gas realization rates for early replacement and time of sale gas high efficiency furnace are 108 and 109 percent, respectively. The evaluation team found that the implementer included gas penalties from the furnace blower motor in their calculation of ex ante gas savings. In the evaluation process, Navigant refrains from calculating gas penalties to avoid punishing gas utilities for energy efficiency measures implemented by electric utilities.

Recommendation 6. Navigant recommends that the implementer does not include gas penalties from furnace blower motors when estimating gas high efficiency furnace savings.

3.5.2.6 Programmable Thermostat Finding

Finding 7. The realization rate of gas programmable thermostat savings is 109 percent. This is due to the value of gas heating consumption used for projects with gas boilers. The implementer used TRM-deemed values of gas heating consumption from the table in Section 5.3.11 Programmable Thermostat. However, these values are specifically for furnaces. The footnote 396 indicates that those TRM values came from furnace gas heating load divided by furnace efficiency. For gas boiler projects, the evaluation team estimated gas heating consumption using boiler gas heating loads from Section 5.3.7 Gas High Efficiency Boiler divided by the projects' existing heating system efficiency. This increased the programmable thermostat gas savings realization rate by nine percent.

Recommendation 7. Navigant recommends the implementer use boiler gas heating load divided by efficiency to estimate gas heating consumption for programmable thermostat projects with gas boilers.

3.5.2.7 Water Heater Wrap Finding

Finding 8. The evaluation team found that the implementer calculated ex ante energy and demand savings based on different measure inputs. The implementer based ex ante energy savings on a 40-gallon tank with pre-existing insulation R value of 10 and post-install insulation R value of 18 but ex ante demand savings on a 50-gallon tank with pre-existing insulation R value of 12 and post-install insulation R value of 20. Navigant calculated verified savings using the energy savings measure inputs, resulting in a 125 percent realization rate for peak demand savings.

Recommendation 8. Navigant recommends the implementer provide supplementary information on each project’s water heater tank size and pre-existing and post-installation R values.

3.5.2.8 LED Specialty Lamp: Specialty – Other Finding

Finding 9. The evaluation team found that implementer used the interior coincidence factor (CF), 0.081, to calculate verified peak demand savings for exterior “specialty – other” lamps instead of the exterior CF, 0.273. We found this in only one “specialty – other” LED project.

Recommendation 9. Navigant recommends the implementer verify that the CF values for LED candelabra bulbs match the installation locations to prevent the use of interior CF values for bulbs installed in exterior locations.

3.5.2.9 Basement Sidewall Insulation Finding

Finding 10. The basement sidewall insulation realization rate is 102 percent due to two projects. The record IDs of these projects are MEA-2018.11.01-32138 and MEA-2018.05.29-8945, and have 131 and 104 realization rates, respectively. For the project at MEA-2018.11.01-32138, the type of insulation installed was spray foam or external rigid foam. We suspect that the implementer used the framing factor for studs and cavity insulation rather than the framing factor for spray foam. For the other project MEA-2018.05.29-8945, the evaluation team could not isolate the cause for the realization rate above 100 percent. The following table lists the inputs Navigant used to calculate savings:

Table 3-14. Basement Sidewall Insulation Discrepancies and Associated Input Values

Record ID	R old	R added	Area	FLH cooling	nCool	nHeat	CDD	HDD	Framing factor
MEA-2018.11.01-32138	10.53	14	140	512	8	0.721	820	5113	0
MEA-2018.05.29-8945	17.46	12	864	512	8	1	820	5113	0.25

Source: ComEd tracking data and Navigant team analysis.

Recommendation 10. Navigant recommends the implementer provide additional information to clarify how they calculated ex ante energy savings for projects MEA-2018.11.01-32138 and MEA-2018.05.29-8945.

3.6 Total Resource Cost Detail

Table 3-15, 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. Energy savings displayed in Table 3-15 are electric savings only and do not include electric savings converted from gas.

Table 3-15. IHWAP 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)	NTG*	Verified Net Savings (kWh)	Verified Net Peak Demand Reduction (kW)
Appliance	Freezer	Each	49	11.0	1,720	0.28	1,720	0.28	1.00	1,720	0.28
Appliance	Refrigerator - ER	Each	140	12.0	62,366	9.40	62,366	9.40	1.00	62,366	9.40
Appliance	Refrigerator - TOS	Each	4	12.0	177	0.03	177	0.03	1.00	177	0.03
Appliance	Room AC - ER	Each	74	12.0	5,795	7.93	5,795	7.93	1.00	5,795	7.93
Appliance	Room AC - TOS	Each	5	12.0	478	0.65	74	0.10	1.00	74	0.10
Hot Water	Gas Water Heater - ER	Each	126	13.0	0	0.00	0	0.00	1.00	0	0.00
Hot Water	Gas Water Heater - TOS	Each	11	13.0	0	0.00	0	0.00	1.00	0	0.00
Hot Water	HW Pipe Insulation	Linear Feet	1,081	15.0	1,747	0.20	1,747	0.20	1.00	1,747	0.20
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	182	9.0	259	0.41	259	0.41	1.00	259	0.41
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	67	9.0	1,177	0.28	1,177	0.28	1.00	1,177	0.28
Hot Water	Low Flow Showerhead	Each	162	10.0	3,381	0.31	3,381	0.31	1.00	3,381	0.31
Hot Water	Water Heater Wrap	Each	2	5.0	287	0.03	287	0.03	1.00	287	0.03
HVAC	Advanced Thermostat	Each	132	10.0	24,614	7.38	23,722	7.38	NA†	23,722	7.38
HVAC	Air Source Heat Pump - TOS	Each	1	18.0	335	-0.04	335	-0.04	1.00	335	-0.04
HVAC	Bathroom Exhaust Fan	Each	359	19.0	31,800	3.63	31,800	3.63	1.00	31,800	3.63
HVAC	Central Air Conditioning - ER	Each	165	18.0	141,270	89.95	141,270	89.95	1.00	141,270	89.95
HVAC	Central Air Conditioning - TOS	Each	56	18.0	10,117	6.66	10,117	6.66	1.00	10,117	6.66
HVAC	Furnace Blower Motor	Each	1	20.0	732	0.22	732	0.22	1.00	732	0.22
HVAC	Gas High Efficiency Boiler - ER	Each	11	25.0	0	0.00	0	0.00	1.00	0	0.00
HVAC	Gas High Efficiency Boiler - TOS	Each	5	25.0	0	0.00	0	0.00	1.00	0	0.00
HVAC	Gas High Efficiency Furnace - ER	Each	214	20.0	151,544	44.74	151,544	44.74	1.00	151,544	44.74
HVAC	Gas High Efficiency Furnace - TOS	Each	71	20.0	50,476	15.21	50,476	15.21	1.00	50,476	15.21
HVAC	Programmable Thermostat	Each	44	5.0	2,077	0.00	2,077	0.00	1.00	2,077	0.00
Lighting	LED Omnidirectional Bulb - Exterior	Each	309	6.1	40,068	4.42	40,068	4.42	1.00	40,068	4.42
Lighting	LED Omnidirectional Bulb - Interior	Each	5,140	10.0	195,057	19.11	195,057	19.11	1.00	195,057	19.11
Lighting	LED Specialty Lamp	Each	1,723	10.0	56,098	6.85	56,098	6.85	1.00	56,098	6.85
Lighting	LED Specialty Lamp - Track and Recessed	Each	340	15.0	20,842	2.31	20,842	2.31	1.00	20,842	2.31
Shell	Air Sealing	Projects	336	15.0	91,896	48.46	91,842	48.41	1.00	91,842	48.41
Shell	Attic Insulation	Square Feet	259,255	25.0	33,213	15.92	33,185	15.90	1.00	33,185	15.90
Shell	Basement Sidewall Insulation	Square Feet	57,623	25.0	39,313	10.16	40,012	10.20	1.00	40,012	10.20
Shell	Floor Insulation	Square Feet	12,605	25.0	1,491	0.58	1,490	0.58	1.00	1,490	0.58
Shell	Wall Insulation	Square Feet	87,121	25.0	12,059	5.38	12,059	5.38	1.00	12,059	5.38

* 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 IL TRM algorithm calculates net savings for advanced thermostats. Source: ComEd tracking data and Navigant team analysis.