



Joint Utility Single-Family Retrofits – Income Eligible Impact Evaluation Report

**Energy Efficiency / Demand Response Plan:
Program Year 2019 (CY2019)
(1/1/2019-12/31/2019)**

**Presented to
ComEd
Nicor Gas
Peoples Gas
North Shore Gas**

FINAL

April 24, 2020

Prepared by:

**Jennifer Ma
Guidehouse**

**Julie Barstow
Guidehouse**

**Sophie Gunderson
Guidehouse**

www.guidehouse.com



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Submitted to:

ComEd
2011 Swift Drive
Oak Brook, IL 60523

Peoples Gas and North Shore Gas
200 East Randolph Street
Chicago, IL 60601

Nicor Gas Company
1844 Ferry Road
Naperville, IL 60563

Submitted by:

Guidehouse (which acquired Navigant in 2019)
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Randy Gunn, Partner
312.583.5714
randy.gunn@guidehouse.com

Jeff Erickson, Director
608.616.4962
jeff.erickson@guidehouse.com

Kevin Grabner, Associate Director
608.616.5805
kevin.grabner@guidehouse.com

Patricia Plympton, Associate Director
202.253.9356
patricia.plymptom@guidehouse.com

Disclaimer: This report was prepared by Guidehouse for ComEd, Peoples Gas, and North Shore Gas. The work presented in this report represents Guidehouse's professional judgment based on the information available at the time this report was prepared. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Guidehouse nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

TABLE OF CONTENTS

1. Introduction	1
2. Single Family Retrofits – CBA Program	1
2.1 Program Description	1
2.2 Program Savings Detail	3
2.3 Cumulative Persisting Annual Savings	5
2.4 Program Savings by Measure	15
2.5 Impact Analysis Findings and Recommendations	23
2.5.1 Impact Parameter Estimates	23
2.5.1 ComEd Findings and Recommendations	24
2.5.2 Peoples Gas Findings and Recommendations	28
2.6 Appendix 1. Total Resource Cost Detail	30
3. Single Family Retrofits – IHWAP	32
3.1 Program Description	32
3.2 Program Savings Detail	33
3.3 Cumulative Persisting Annual Savings	35
3.4 Program Savings by Measure	42
3.5 Impact Analysis Findings and Recommendations	53
3.5.1 Impact Parameter Estimates	53
3.5.2 ComEd Findings and Recommendations	55
3.5.3 Nicor Gas Findings and Recommendations	57
3.5.4 Peoples Gas Findings and Recommendations	58
3.5.5 North Shore Gas Findings and Recommendations	61
3.6 Appendix 2. Total Resource Cost Detail	62

LIST OF TABLES AND FIGURES

Figure 2-1. Distribution of ComEd Measures Installed by End Use	3
Figure 2-2. Cumulative Persisting Annual Savings	15
Figure 2-3. ComEd Verified Net Savings by End Use – Combined Electricity and Gas	16
Figure 2-4. Peoples Gas Verified Net Therm Savings by End Use	16
Figure 3-1. Distribution of ComEd Measures Installed by Type	33
Figure 3-2. Cumulative Persisting Annual Savings	42
Figure 3-3. ComEd Verified Net Savings by End Use – Combined Electricity and Gas	42
Figure 3-4. Nicor Gas IHWAP Therm Savings by End Use	43
Figure 3-5. Peoples Gas Verified Net Therm Savings by End Use	43
Figure 3-6. North Shore Gas Verified Net Therm Savings by End Use	44
Table 2-1. CY2019 Volumetric Findings Detail	2
Table 2-2. CY2019 Total Annual Incremental Electric Savings	4
Table 2-3. CY2019 Total Annual Incremental Therm Savings	4
Table 2-4. Cumulative Persisting Annual Savings (CPAS) – Electric	6
Table 2-5. Cumulative Persisting Annual Savings (CPAS) – Gas	9
Table 2-6. Cumulative Persisting Annual Savings (CPAS) – Total	12
Table 2-7. CY2019 Energy Savings by Measure – Electric	17
Table 2-8. CY2019 Non-Coincident Demand Savings by Measure	18
Table 2-9. CY2019 Summer Peak Demand Savings by Measure	19
Table 2-10. CY2019 Energy Savings by Measure – Gas – ComEd	20

Table 2-11. CY2019 Energy Savings by Measure – Total Combining Electricity and Gas	21
Table 2-12. Secondary Energy Savings from Water Reduction by Measure – Electric	22
Table 2-13. CY2019 Natural Gas Energy Savings by Measure – Peoples Gas.....	22
Table 2-14. Savings Parameters	23
Table 2-15. Pipe Insulation Variable Inputs	25
Table 2-16. Gas Boiler Loads By Climate Zone.....	26
Table 2-17. Pipe Insulation Variable Inputs	29
Table 2-18. Total Resource Cost Savings Summary for ComEd	30
Table 2-19. Total Resource Cost Savings Summary for Peoples Gas.....	31
Table 3-1. CY2019 IHWAP Volumetric Findings Detail	32
Table 3-2. CY2019 Total Annual Incremental Electric Savings	34
Table 3-3. CY2019 Total Annual Incremental Therm Savings	34
Table 3-4. Cumulative Persisting Annual Savings (CPAS) – Electric.....	36
Table 3-5. Cumulative Persisting Annual Savings (CPAS) – Gas	38
Table 3-6. Cumulative Persisting Annual Savings (CPAS) – Total.....	40
Table 3-7. CY2019 Energy Savings by Measure – Electric.....	45
Table 3-8. CY2019 Non-Coincident Demand Savings by Measure	46
Table 3-9. CY2019 Summer Peak Demand Savings by Measure.....	47
Table 3-10. CY2019 Energy Savings by Measure – Gas – ComEd.....	48
Table 3-11. CY2019 Energy Savings by Measure – Total Combining Electricity and Gas	49
Table 3-12. Secondary Energy Savings from Water Reduction by Measure – Electric	50
Table 3-13. CY2019 Natural Gas Energy Savings by Measure – Nicor Gas	51
Table 3-14. CY2019 Natural Gas Energy Savings by Measure – Peoples Gas.....	52
Table 3-15. CY2019 Natural Gas Energy Savings by Measure – North Shore Gas	52
Table 3-16. Savings Parameters	54
Table 3-17. Gas High Efficiency Furnace and CAC Projects	55
Table 3-18. Peoples Gas Water Heater Discrepancy.....	59
Table 3-19. Total Resource Cost Savings Summary for ComEd	63
Table 3-20. Total Resource Cost Savings Summary for Nicor Gas	64
Table 3-21. Total Resource Cost Savings Summary for Peoples Gas.....	65
Table 3-22. Total Resource Cost Savings Summary for North Shore Gas	66

1. INTRODUCTION

This report presents the results of the impact evaluation of the joint utility CY2019 Single-Family Retrofits – Income Eligible (SFR) Program. It includes a summary of the energy and demand impacts for the total program broken out by relevant measure and program structure details for all utilities involved, ComEd, Nicor Gas, Peoples Gas, and North Shore Gas. The appendix provides the impact analysis methodology and details of the Total Resource Cost inputs. CY2019 covers January 1, 2019 through December 31, 2019.

The SFR Program provides retrofits to single-family households in ComEd service areas with incomes at or below 80% 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. Franklin Energy Services (Franklin) implements one program component with the Chicago Bungalow Association (CBA) and this component is offered jointly with ComEd and Peoples Gas. Chicagoland Vintage Home Association (CVHA), an extension of CBA, delivers a portion of the program offered outside of the City of Chicago and this portion is solely offered with 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 Peoples Gas, North Shore Gas, and Nicor Gas and delivered through Community Action Agencies.

The CBA and IHWAP components of the program are offered in separate sections of this report.

2. SINGLE FAMILY RETROFITS – CBA PROGRAM

2.1 Program Description

The program had 1,518 ComEd participants and 998 Peoples Gas participants in CY2019 and distributed 27,128 measures that yielded energy savings to ComEd and 4,411 measures that yielded energy savings to Peoples Gas as shown in the following table and graph.

Table 2-1. CY2019 Volumetric Findings Detail

Participation	ComEd Total	Peoples Gas Total
Participants*	1,518	998
Total Measures	27,128	4,411
Installed Projects†	2,748	1,343
Advanced Power Strip - Tier 1	836	
Bathroom Exhaust Fan	1,511	
Programmable Thermostat	49	25
Reprogramming Thermostat	2	
Advanced Thermostat	290	158
HW Pipe Insulation	705	589
Low Flow Faucet Aerator - Bathroom	177	33
Low Flow Faucet Aerator - Kitchen	92	42
Low Flow Showerhead	587	341
LED Specialty Lamp - Exterior	211	
LED Specialty Lamp - Interior	8,926	
LED Omnidirectional Bulb - Exterior	130	
LED Omnidirectional Bulb - Interior	8,784	
Air Sealing (Projects)	1,409	930
Floor Insulation (Projects)	92	79
Wall Insulation (Projects)	1,817	1,263
Attic Insulation (Projects)	1,406	929
Rim Insulation (Projects)	1,511	22

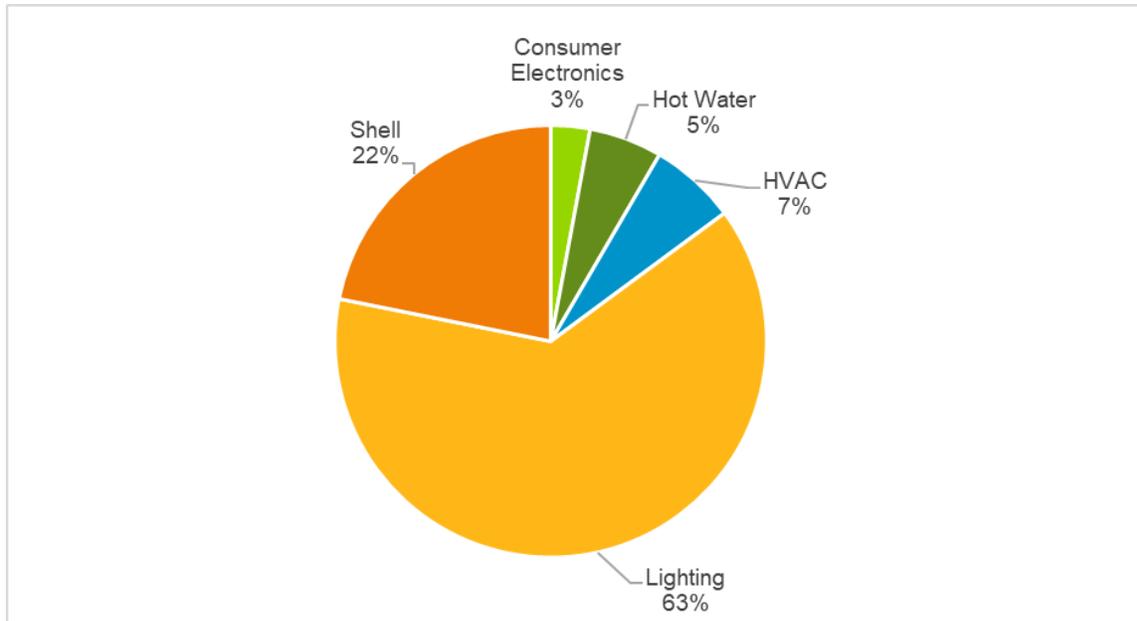
Note: Quantities and project counts in this table may overlap between ComEd's and Peoples Gas's tracking databases.

* Participants are defined as unique ComEd or Peoples Gas account numbers.

† Installed projects are defined as unique Project IDs within each utility's tracking database.

Source: ComEd and Peoples Gas tracking data and evaluation team analysis

Figure 2-1. Distribution of ComEd Measures Installed by End Use



Source: ComEd tracking data and evaluation team analysis

2.2 Program Savings Detail

Table 2-2 and Table 2-3 summarize the incremental energy and demand savings the SFR-CBA Program achieved in CY2019 for ComEd and Peoples Gas, respectively. The gas savings converted to kWh in Table 2-2 are only those that ComEd may be able to claim, which excludes savings the gas utilities claim, either via joint or non-joint programs.¹

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

Table 2-2. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	2,488,909	NR	995
Program Gross Realization Rate	0.89	NA	0.83
Verified Gross Savings	2,217,921	2,403	821
Program Net-to-Gross (NTG) Ratio	1.00	1.00	1.00
Verified Net Savings	2,217,921	2,403	821
Converted from Gas†			
Ex Ante Gross Savings	6,701,233	NA	NA
Program Gross Realization Rate	1.03	NA	NA
Verified Gross Savings	6,903,642	NA	NA
Program Net-to-Gross (NTG) Ratio	1.00	NA	NA
Verified Net Savings	6,903,642	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	9,190,142	NR	995
Program Gross Realization Rate	0.99	NA	0.83
Verified Gross Savings	9,121,562	2,403	821
Program Net-to-Gross (NTG) Ratio	1.00	1.00	1.00
Verified Net Savings	9,121,562	2,403	821

NR = Not reported (refers a piece of data that was not reported, i.e., non-coincident demand savings)

NA = Not applicable (refers a piece of data cannot be produced or does not apply)

* The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.

† Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh). The evaluation will determine which gas savings will be converted to kWh and counted toward ComEd's electric savings goal while producing the ComEd portfolio-wide Summary Report. According to Section 8-103B(b-25) of the Illinois Public Utilities Act, "In no event shall more than 10% of each year's applicable annual incremental goal as defined in paragraph (7) of subsection (g) of this Section be met through savings of fuels other than electricity."

Source: ComEd tracking data and evaluation team analysis

Table 2-3. CY2019 Total Annual Incremental Therm Savings

Savings Category	Peoples Gas (Therm)
Natural Gas*	
Ex Ante Gross Savings	356,427
Program Gross Realization Rate	1.01
Verified Gross Savings	360,147
Program Net-to-Gross Ratio (NTG)	1.00
Verified Net Savings	360,147

* Natural gas savings with electric interactive effects removed.

Source: Peoples Gas tracking data and Guidehouse team analysis

2.3 Cumulative Persisting Annual Savings

Table 2-4 to Table 2-6 and Figure 2-2 show the measure-specific and total verified gross savings for the SFR-CBA Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 2,217,921 kWh (Table 2-4). The CY2019 gas contribution to ComEd's CPAS (converted to equivalent electricity) is 6,903,642 kWh (Table 2-5). Adding the gas and electric contributions produces 9,121,562 kWh of total CY2019 contribution to CPAS (Table 2-6). The "historic" rows in each table are the CPAS contribution back to CY2018. The "Program Total Electric CPAS" and the "Program Total Gas CPAS" are the sum of the CY2019 contribution and the historic contribution.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

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

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	59,415	1.00	415,902		59,415	59,415	59,415	59,415	59,415	59,415	59,415	59,415	
HVAC	Bathroom Exhaust Fan - Bathroom	19.0	44,627	1.00	847,921		44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	
HVAC	Programmable Thermostat	8.0	2,637	1.00	21,096		2,637	2,637	2,637	2,637	2,637	2,637	2,637	2,637	
HVAC	Reprogramming Thermostat	2.0	115	1.00	229		115	115							
HVAC	Advanced Thermostat	11.0	62,833	1.00	691,167		62,833	62,833	62,833	62,833	62,833	62,833	62,833	62,833	
Hot Water	HW Pipe Insulation	15.0		1.00											
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	179	1.00	1,786		179	179	179	179	179	179	179	179	
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	255	1.00	2,550		255	255	255	255	255	255	255	255	
Hot Water	Low Flow Showerhead	10.0	6,020	1.00	60,198		6,020	6,020	6,020	6,020	6,020	6,020	6,020	6,020	
Lighting	LED Specialty Lamp - Exterior	6.1	21,294	1.00	109,972		21,294	21,294	21,294	21,294	21,294	3,183	318		
Lighting	LED Specialty Lamp - Interior	10.0	303,688	1.00	1,744,637		303,688	303,688	303,688	303,688	303,688	45,240	45,240	45,240	
Lighting	LED Omnidirectional Bulb - Exterior	6.1	11,234	1.00	38,664		11,234	11,234	3,950	3,950	3,950	3,950	395		
Lighting	LED Omnidirectional Bulb - Interior	10.0	341,608	1.00	1,606,608		341,608	341,608	115,424	115,424	115,424	115,424	115,424	115,424	
Shell	Air Sealing	20.0	692,501	1.00	12,439,498		692,501	692,501	692,501	692,501	692,501	692,501	692,501	692,501	
Shell	Floor Insulation	20.0	2,511	1.00	46,164		2,511	2,511	2,511	2,511	2,511	2,511	2,511	2,511	
Shell	Wall Insulation	20.0	368,370	1.00	6,690,091		368,370	368,370	368,370	368,370	368,370	368,370	368,370	368,370	
Shell	Attic Insulation	20.0	298,361	1.00	5,425,964		298,361	298,361	298,361	298,361	298,361	298,361	298,361	298,361	
Shell	Rim Insulation	20.0	2,274	1.00	40,543		2,274	2,274	2,274	2,274	2,274	2,274	2,274	2,274	
CY2019 Program Total Electric Contribution to CPAS			2,217,921		30,182,989		2,217,921	2,217,921	1,984,339	1,984,339	1,984,339	1,707,779	1,701,360	1,641,232	
Historic Program Total Electric Contribution to CPAS †						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	
Program Total Electric CPAS						2,041,077	4,258,997	4,257,133	3,841,134	3,841,134	3,831,385	3,548,210	3,486,118	3,425,990	
CY2019 Program Incremental Expiring Electric Savings§									233,581		276,560	6,420	60,128		
Historic Program Incremental Expiring Electric Savings †§										9,749	6,615	55,672			
Program Total Incremental Expiring Electric Savings§									1,864	415,999		9,749	283,175	62,092	



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat	62,833	62,833	62,833									
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom	179	179										
Hot Water	Low Flow Faucet Aerator - Kitchen	255	255										
Hot Water	Low Flow Showerhead	6,020	6,020										
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior	45,240	45,240										
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	115,424	115,424										
Shell	Air Sealing	692,501	692,501	556,044	556,044	556,044	549,479	549,479	549,479	549,479	549,479	549,479	549,479
Shell	Floor Insulation	2,511	2,511	2,118	2,118	2,118	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Shell	Wall Insulation	368,370	368,370	302,180	302,180	302,180	299,979	299,979	299,979	299,979	299,979	299,979	299,979
Shell	Attic Insulation	298,361	298,361	245,820	245,820	245,820	243,557	243,557	243,557	243,557	243,557	243,557	243,557
Shell	Rim Insulation	2,274	2,274	1,790	1,790	1,790	1,776	1,776	1,776	1,776	1,776	1,776	1,776
CY2019 Program Total Electric Contribution to CPAS		1,638,595	1,638,595	1,215,413	1,152,580	1,152,580	1,141,518	1,141,518	1,141,518	1,141,518	1,141,518	1,141,518	1,096,890
Historic Program Total Electric Contribution to 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
Program Total Electric CPAS		3,423,185	3,020,760	2,597,578	2,534,744	2,534,744	2,523,683	1,806,806	1,806,806	1,806,806	1,806,806	1,668,799	1,624,171
CY2019 Program Incremental Expiring Electric Savings\$		2,637	-	423,182	62,833	-	11,062	-	-	-	-	-	44,627
Historic Program Incremental Expiring Electric Savings†\$		168	402,425	-	-	-	716,876	-	-	-	-	138,007	-
Program Total Incremental Expiring Electric Savings\$		2,805	402,425	423,182	62,833	-	11,062	716,876	-	-	-	138,007	44,627



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Shell	Air Sealing												
Shell	Floor Insulation												
Shell	Wall Insulation												
Shell	Attic Insulation												
Shell	Rim Insulation												
CY2019 Program Total Electric Contribution to CPAS		-	-	-	-	-	-	-	-	-	-	-	-
Historic Program Total Electric Contribution to CPAS†		527,281	527,281	527,281	527,281	-	-	-	-	-	-	-	-
Program Total Electric CPAS		527,281	527,281	527,281	527,281	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Electric Savings§		1,096,890	-	-	-	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§		-	-	-	-	527,281	-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§		1,096,890	-	-	-	527,281	-	-	-	-	-	-	-

Note: The green highlighted cell shows program total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2019 contribution to CPAS.

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

‡ Historical savings go back to CY2018

§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n

Source: Evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 2-5. Cumulative Persisting Annual Savings (CPAS) – Gas

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (Therms)	NTG*	Lifetime Net Savings (Therms)†	Verified Net Therms Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0		1.00											
HVAC	Bathroom Exhaust Fan - Bathroom	19.0		1.00											
HVAC	Programmable Thermostat	8.0	1,903	1.00	15,226		1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903
HVAC	Reprogramming Thermostat	2.0	125	1.00	249		125	125							
HVAC	Advanced Thermostat	11.0	11,256	1.00	123,816		11,256	11,256	11,256	11,256	11,256	11,256	11,256	11,256	11,256
Hot Water	HW Pipe Insulation	15.0	407	1.00	6,104		407	407	407	407	407	407	407	407	407
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	124	1.00	1,240		124	124	124	124	124	124	124	124	124
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	140	1.00	1,397		140	140	140	140	140	140	140	140	140
Hot Water	Low Flow Showerhead	10.0	2,061	1.00	20,607		2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061
Lighting	LED Specialty Lamp - Exterior	6.1		1.00											
Lighting	LED Specialty Lamp - Interior	10.0		1.00											
Lighting	LED Omnidirectional Bulb - Exterior	6.1		1.00											
Lighting	LED Omnidirectional Bulb - Interior	10.0		1.00											
Shell	Air Sealing	20.0	74,608	1.00	1,418,773		74,608	74,608	74,608	74,608	74,608	74,608	74,608	74,608	74,608
Shell	Floor Insulation	20.0	470	1.00	8,994		470	470	470	470	470	470	470	470	470
Shell	Wall Insulation	20.0	89,938	1.00	1,708,952		89,938	89,938	89,938	89,938	89,938	89,938	89,938	89,938	89,938
Shell	Attic Insulation	20.0	53,609	1.00	1,020,046		53,609	53,609	53,609	53,609	53,609	53,609	53,609	53,609	53,609
Shell	Rim Insulation	20.0	899	1.00	17,183		899	899	899	899	899	899	899	899	899
CY2019 Program Total Gas Contribution to CPAS (Therms)			235,539		4,342,586		235,539	235,539	235,414	235,414	235,414	235,414	235,414	235,414	235,414
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)‡					127,281,208		6,903,642	6,903,642	6,899,989	6,899,989	6,899,989	6,899,989	6,899,989	6,899,989	6,899,989
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§						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
Program Total Gas CPAS (kWh Equivalent)‡						6,797,742	13,701,383	13,690,425	13,686,773	13,686,773	13,582,746	13,582,746	13,582,746	13,582,746	13,582,746
CY2019 Program Incremental Expiring Gas Savings (Therms)								-	125	-	-	-	-	-	
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)‡								-	3,653	-	-	-	-	-	
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§								-	10,958	-	104,027	-	-	-	
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡								-	10,958	3,653	-	104,027	-	-	



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat	11,256	11,256	11,256									
Hot Water	HW Pipe Insulation	407	407	407	407	407	407	407					
Hot Water	Low Flow Faucet Aerator - Bathroom	124	124										
Hot Water	Low Flow Faucet Aerator - Kitchen	140	140										
Hot Water	Low Flow Showerhead	2,061	2,061										
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Shell	Air Sealing	74,608	74,608	65,813	65,813	65,813	67,894	67,894	67,894	67,894	67,894	67,894	67,894
Shell	Floor Insulation	470	470	419	419	419	433	433	433	433	433	433	433
Shell	Wall Insulation	89,938	89,938	79,567	79,567	79,567	81,552	81,552	81,552	81,552	81,552	81,552	81,552
Shell	Attic Insulation	53,609	53,609	47,668	47,668	47,668	48,708	48,708	48,708	48,708	48,708	48,708	48,708
Shell	Rim Insulation	899	899	807	807	807	825	825	825	825	825	825	825
CY2019 Program Total Gas Contribution to CPAS (Therms)		233,511	233,511	205,938	194,682	194,682	199,819	199,819	199,413	199,413	199,413	199,413	199,413
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†		6,844,205	6,844,205	6,036,029	5,706,116	5,706,116	5,856,708	5,856,708	5,844,781	5,844,781	5,844,781	5,844,781	5,844,781
Historic Program Total Gas Contribution to 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
Program Total Gas CPAS (kWh Equivalent)†		13,520,398	13,228,907	12,420,732	12,090,818	12,090,818	12,241,411	9,477,707	9,465,780	9,465,780	9,465,780	9,465,780	9,465,780
CY2019 Program Incremental Expiring Gas Savings (Therms) 		1,903	-	27,573	11,256	-	(5,138)	-	407	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)† 		55,784	-	808,176	329,913	-	(150,592)	-	11,928	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§ 		6,564	291,491	-	-	-	-	2,763,703	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)† 		62,348	291,491	808,176	329,913	-	(150,592)	2,763,703	11,928	-	-	-	-



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Shell	Air Sealing												
Shell	Floor Insulation												
Shell	Wall Insulation												
Shell	Attic Insulation												
Shell	Rim Insulation												
CY2019 Program Total Gas Contribution to CPAS (Therms)		-	-	-	-	-	-	-	-	-	-	-	-
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†		-	-	-	-	-	-	-	-	-	-	-	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§		3,620,999	3,620,999	3,620,999	3,620,999	-	-	-	-	-	-	-	-
Program Total Gas CPAS (kWh Equivalent)†		3,620,999	3,620,999	3,620,999	3,620,999	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (Therms)		199,413	-	-	-	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)†		5,844,781	-	-	-	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§		-	-	-	-	3,620,999	-	-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†		5,844,781	-	-	-	3,620,999	-	-	-	-	-	-	-

Note: The green highlighted cell shows program total first year gas savings in kWh equivalents. The gray cells are blank, indicating no values or do not contribute to calculating CPAS in CY2019.

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

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

§ Historic savings go back to CY2018.

|| Expiring savings are equal to CPAS Yn-1 - CPAS Yn.

Source: Evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 2-6. Cumulative Persisting Annual Savings (CPAS) – Total

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG* Lifetime Net Savings (kWh)†	Verified Net kWh Savings (Including Those Converted from Gas Savings)									
					2018	2019	2020	2021	2022	2023	2024	2025	2026	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	59,415	1.00	415,902		59,415	59,415	59,415	59,415	59,415	59,415	59,415	
HVAC	Bathroom Exhaust Fan - Bathroom	19.0	44,627	1.00	847,921		44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627
HVAC	Programmable Thermostat	8.0	58,421	1.00	467,369		58,421	58,421	58,421	58,421	58,421	58,421	58,421	58,421
HVAC	Reprogramming Thermostat	2.0	3,767	1.00	7,535		3,767	3,767						
HVAC	Advanced Thermostat	11.0	392,747	1.00	4,320,214		392,747	392,747	392,747	392,747	392,747	392,747	392,747	392,747
Hot Water	HW Pipe Insulation	15.0	11,928	1.00	178,913		11,928	11,928	11,928	11,928	11,928	11,928	11,928	11,928
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	3,813	1.00	38,126		3,813	3,813	3,813	3,813	3,813	3,813	3,813	3,813
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	4,349	1.00	43,487		4,349	4,349	4,349	4,349	4,349	4,349	4,349	4,349
Hot Water	Low Flow Showerhead	10.0	66,418	1.00	664,177		66,418	66,418	66,418	66,418	66,418	66,418	66,418	66,418
Lighting	LED Specialty Lamp - Exterior	6.1	21,294	1.00	109,972		21,294	21,294	21,294	21,294	21,294	3,183	318	
Lighting	LED Specialty Lamp - Interior	10.0	303,688	1.00	1,744,637		303,688	303,688	303,688	303,688	303,688	45,240	45,240	45,240
Lighting	LED Omnidirectional Bulb - Exterior	6.1	11,234	1.00	38,664		11,234	11,234	3,950	3,950	3,950	3,950	395	
Lighting	LED Omnidirectional Bulb - Interior	10.0	341,608	1.00	1,606,608		341,608	341,608	115,424	115,424	115,424	115,424	115,424	115,424
Shell	Air Sealing	20.0	2,879,250	1.00	54,023,727		2,879,250	2,879,250	2,879,250	2,879,250	2,879,250	2,879,250	2,879,250	2,879,250
Shell	Floor Insulation	20.0	16,292	1.00	309,781		16,292	16,292	16,292	16,292	16,292	16,292	16,292	16,292
Shell	Wall Insulation	20.0	3,004,464	1.00	56,779,481		3,004,464	3,004,464	3,004,464	3,004,464	3,004,464	3,004,464	3,004,464	3,004,464
Shell	Attic Insulation	20.0	1,869,637	1.00	35,323,499		1,869,637	1,869,637	1,869,637	1,869,637	1,869,637	1,869,637	1,869,637	1,869,637
Shell	Rim Insulation	20.0	28,611	1.00	544,186		28,611	28,611	28,611	28,611	28,611	28,611	28,611	28,611
CY2019 Program Total Contribution to CPAS			9,121,562		157,464,197		9,121,562	9,121,562	8,884,328	8,884,328	8,884,328	8,607,768	8,601,349	8,541,221
Historic Program Total Contribution to CPAS‡						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
Program Total CPAS						8,838,818	17,960,380	17,947,559	17,527,907	17,527,907	17,414,131	17,130,956	17,068,864	17,008,737
CY2019 Program Incremental Expiring Savings§									237,234			276,560	6,420	60,128
Historic Program Incremental Expiring Savings‡§											113,776	6,615	55,672	
Program Total Incremental Expiring Savings§											113,776	283,175	62,092	60,128



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	44,627	
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat	392,747	392,747	392,747									
Hot Water	HW Pipe Insulation	11,928	11,928	11,928	11,928	11,928	11,928	11,928					
Hot Water	Low Flow Faucet Aerator - Bathroom	3,813	3,813										
Hot Water	Low Flow Faucet Aerator - Kitchen	4,349	4,349										
Hot Water	Low Flow Showerhead	66,418	66,418										
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior	45,240	45,240										
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior	115,424	115,424										
Shell	Air Sealing	2,879,250	2,879,250	2,485,037	2,485,037	2,485,037	2,539,445	2,539,445	2,539,445	2,539,445	2,539,445	2,539,445	2,539,445
Shell	Floor Insulation	16,292	16,292	14,413	14,413	14,413	14,803	14,803	14,803	14,803	14,803	14,803	14,803
Shell	Wall Insulation	3,004,464	3,004,464	2,634,297	2,634,297	2,634,297	2,690,278	2,690,278	2,690,278	2,690,278	2,690,278	2,690,278	2,690,278
Shell	Attic Insulation	1,869,637	1,869,637	1,642,961	1,642,961	1,642,961	1,671,178	1,671,178	1,671,178	1,671,178	1,671,178	1,671,178	1,671,178
Shell	Rim Insulation	28,611	28,611	25,433	25,433	25,433	25,967	25,967	25,967	25,967	25,967	25,967	25,967
CY2019 Program Total Contribution to CPAS		8,482,800	8,482,800	7,251,442	6,858,696	6,858,696	6,998,226	6,998,226	6,986,299	6,986,299	6,986,299	6,986,299	6,941,671
Historic Program Total Contribution to 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
Program Total CPAS		16,943,583	16,249,667	15,018,309	14,625,563	14,625,563	14,765,093	11,284,514	11,272,586	11,272,586	11,272,586	11,134,579	11,089,951
CY2019 Program Incremental Expiring Savings§		58,421	-	1,231,357	392,747	-	(139,531)	-	11,928	-	-	-	44,627
Historic Program Incremental Expiring Savings‡§		6,732	693,916	-	-	-	-	3,480,579	-	-	-	138,007	-
Program Total Incremental Expiring Savings§		65,153	693,916	1,231,357	392,747	-	(139,531)	3,480,579	11,928	-	-	138,007	44,627



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan - Bathroom												
HVAC	Programmable Thermostat												
HVAC	Reprogramming Thermostat												
HVAC	Advanced Thermostat												
Hot Water	HW Pipe Insulation												
Hot Water	Low Flow Faucet Aerator - Bathroom												
Hot Water	Low Flow Faucet Aerator - Kitchen												
Hot Water	Low Flow Showerhead												
Lighting	LED Specialty Lamp - Exterior												
Lighting	LED Specialty Lamp - Interior												
Lighting	LED Omnidirectional Bulb - Exterior												
Lighting	LED Omnidirectional Bulb - Interior												
Shell	Air Sealing												
Shell	Floor Insulation												
Shell	Wall Insulation												
Shell	Attic Insulation												
Shell	Rim Insulation												
CY2019 Program Total Contribution to CPAS		-	-	-	-	-	-	-	-	-	-	-	-
Historic Program Total Contribution to CPAS†		4,148,280	4,148,280	4,148,280	4,148,280	-	-	-	-	-	-	-	-
Program Total CPAS		4,148,280	4,148,280	4,148,280	4,148,280	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Savings§		6,941,671	-	-	-	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Savings‡§		-	-	-	-	4,148,280	-	-	-	-	-	-	-
Program Total Incremental Expiring Savings§		6,941,671	-	-	-	4,148,280	-	-	-	-	-	-	-

Note: The green highlighted cell shows program total first year electric savings (including direct electric savings and those converted from gas). The gray cells are blank, indicating no values or do not contribute to calculating CPAS in CY2019.

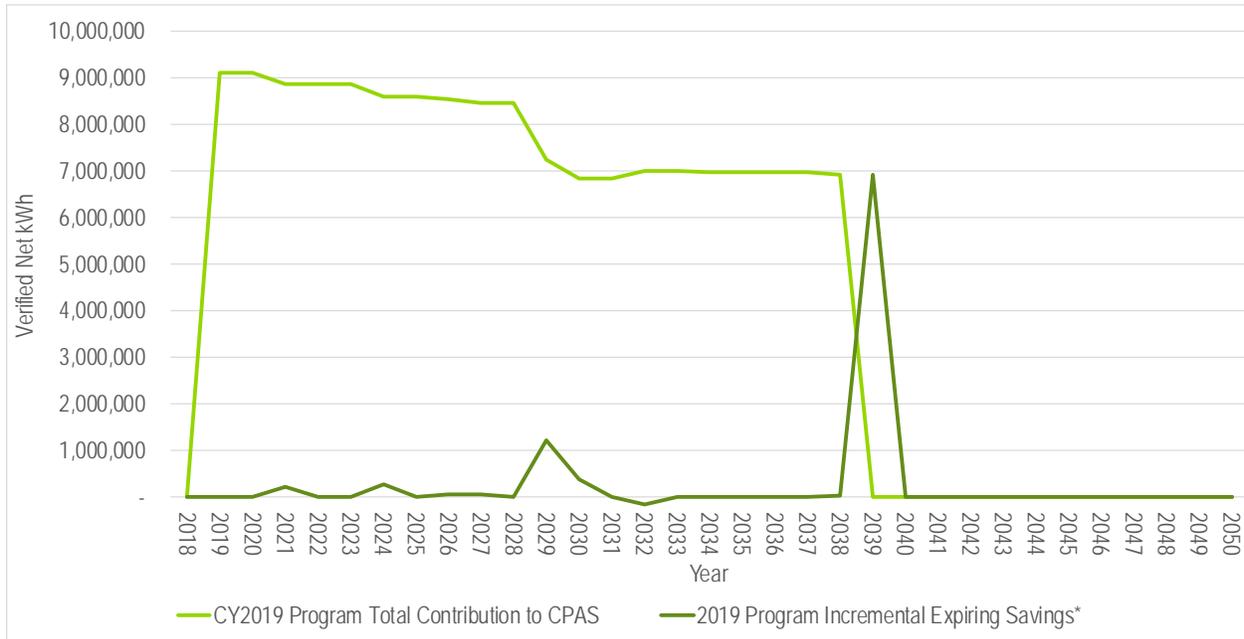
* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

‡ Historic savings go back to CY2018.

§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n

Source: Evaluation team analysis

Figure 2-2. Cumulative Persisting Annual Savings


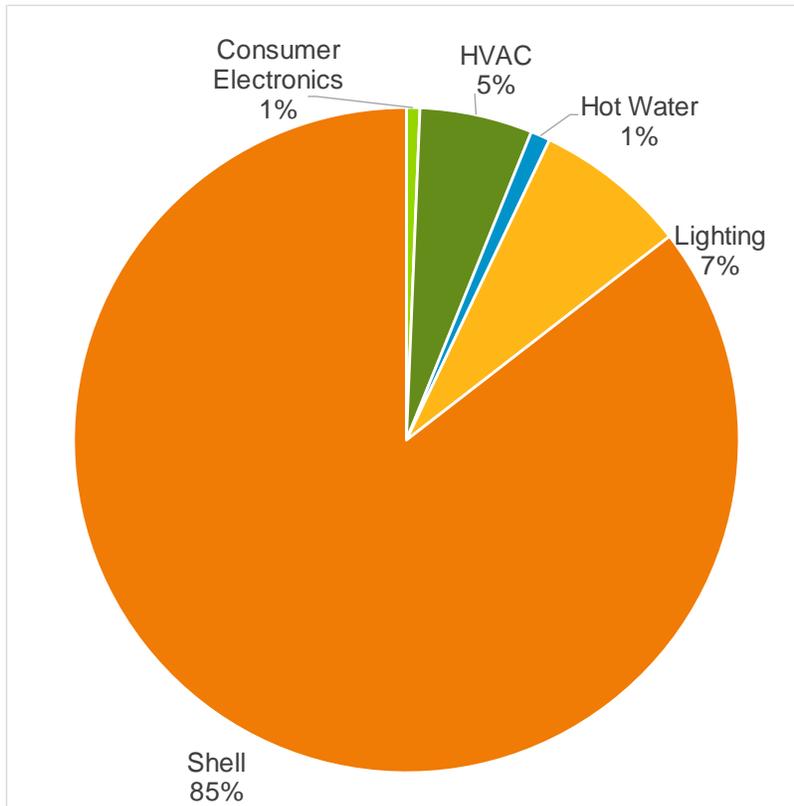
* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n .
 Source: Evaluation team analysis

2.4 Program Savings by Measure

The program includes 18 measures as shown in the following tables, 17 of which contributed to electric savings and 12 of which contributed to gas savings. The shell and lighting measures contributed the most savings (see Figure 2-3) at 85% and 7% of combined electric and gas savings, respectively. For ComEd, the program realization rates for electric only, gas only, and combined electric and gas savings are 89, 103, and 99%, respectively.

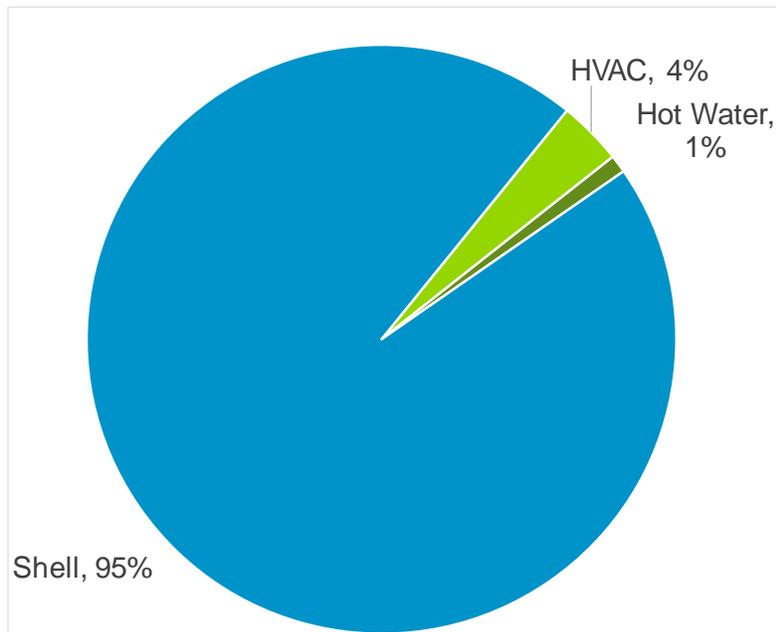
The shell measures contributed the most savings for Peoples Gas at 95% of gas savings. The program realization rate for gas savings is 101%.

Figure 2-3. ComEd Verified Net Savings by End Use – Combined Electricity and Gas



Source: ComEd tracking data and evaluation team analysis

Figure 2-4. Peoples Gas Verified Net Therm Savings by End Use



Source: Peoples Gas tracking data and evaluation team analysis

Table 2-7. CY2019 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	Effective Useful Life
Consumer Electronics	Advanced Power Strip - Tier 1	59,415	1.00	59,415	1.00	59,415	7.0
HVAC	Bathroom Exhaust Fan - Bathroom	44,587	1.00	44,627	1.00	44,627	19.0
HVAC	Programmable Thermostat	2,617	1.01	2,637	1.00	2,637	8.0
HVAC	Reprogramming Thermostat	113	1.01	115	1.00	115	2.0
HVAC	Advanced Thermostat	65,735	0.96	62,833	NA†	62,833	11.0
Hot Water	HW Pipe Insulation	0	0.00	0	1.00	0	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	41	4.38	179	1.00	179	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	66	3.88	255	1.00	255	10.0
Hot Water	Low Flow Showerhead	2,847	2.11	6,020	1.00	6,020	10.0
Lighting	LED Specialty Lamp - Exterior	21,294	1.00	21,294	1.00	21,294	6.1
Lighting	LED Specialty Lamp - Interior	303,918	1.00	303,688	1.00	303,688	10.0
Lighting	LED Omnidirectional Bulb - Exterior	11,233	1.00	11,234	1.00	11,234	6.1
Lighting	LED Omnidirectional Bulb - Interior	341,731	1.00	341,608	1.00	341,608	10.0
Shell	Air Sealing	825,353	0.84	692,501	1.00	692,501	20.0
Shell	Floor Insulation	2,696	0.93	2,511	1.00	2,511	20.0
Shell	Wall Insulation	478,865	0.77	368,370	1.00	368,370	20.0
Shell	Attic Insulation	325,998	0.92	298,361	1.00	298,361	20.0
Shell	Rim Insulation	2,402	0.95	2,274	1.00	2,274	20.0
	Total	2,488,909	0.89	2,217,921		2,217,921	

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd.

Source: ComEd tracking data and evaluation team analysis

Table 2-8. CY2019 Non-Coincident Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Consumer Electronics	Advanced Power Strip - Tier 1	NR	NA	8.33	1.00	8.33
HVAC	Bathroom Exhaust Fan - Bathroom	NR	NA	40.98	1.00	40.98
HVAC	Programmable Thermostat	NR	NA	0.00	1.00	0.00
HVAC	Reprogramming Thermostat	NR	NA	0.00	1.00	0.00
HVAC	Advanced Thermostat	NR	NA	80.57	NA†	80.57
Hot Water	HW Pipe Insulation	NR	NA	0.00	1.00	0.00
Hot Water	Low Flow Faucet Aerator - Bathroom	NR	NA	2.91	1.00	2.91
Hot Water	Low Flow Faucet Aerator - Kitchen	NR	NA	0.65	1.00	0.65
Hot Water	Low Flow Showerhead	NR	NA	11.39	1.00	11.39
Lighting	LED Specialty Lamp - Exterior	NR	NA	8.60	1.00	8.60
Lighting	LED Specialty Lamp - Interior	NR	NA	417.10	1.00	417.10
Lighting	LED Omnidirectional Bulb - Exterior	NR	NA	4.54	1.00	4.54
Lighting	LED Omnidirectional Bulb - Interior	NR	NA	328.58	1.00	328.58
Shell	Air Sealing	NR	NA	858.17	1.00	858.17
Shell	Floor Insulation	NR	NA	1.69	1.00	1.69
Shell	Wall Insulation	NR	NA	344.08	1.00	344.08
Shell	Attic Insulation	NR	NA	292.97	1.00	292.97
Shell	Rim Insulation	NR	NA	2.24	1.00	2.24
	Total	NR	NA	2,402.82		2,402.82

NR = Not reported

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 2-9. CY2019 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Consumer Electronics	Advanced Power Strip - Tier 1	6.67	1.00	6.67	1.00	6.67
HVAC	Bathroom Exhaust Fan	5.53	1.00	5.53	1.00	5.53
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
HVAC	Reprogramming Thermostat	0.00	NA	0.00	1.00	0.00
HVAC	Advanced Thermostat	23.55	0.80	18.77	NA†	18.77
Hot Water	HW Pipe Insulation	0.00	NA	0.00	1.00	0.00
Hot Water	Low Flow Faucet Aerator - Bathroom	0.06	1.04	0.06	1.00	0.06
Hot Water	Low Flow Faucet Aerator - Kitchen	0.01	1.01	0.01	1.00	0.01
Hot Water	Low Flow Showerhead	0.40	0.79	0.32	1.00	0.32
Lighting	LED Specialty Lamp - Exterior	2.33	1.01	2.35	1.00	2.35
Lighting	LED Specialty Lamp - Interior	45.46	1.00	45.46	1.00	45.46
Lighting	LED Omnidirectional Bulb - Exterior	1.24	1.00	1.24	1.00	1.24
Lighting	LED Omnidirectional Bulb - Interior	42.06	1.00	42.05	1.00	42.05
Shell	Air Sealing	506.77	0.79	399.91	1.00	399.91
Shell	Floor Insulation	0.55	1.44	0.79	1.00	0.79
Shell	Wall Insulation	209.53	0.77	160.34	1.00	160.34
Shell	Attic Insulation	149.74	0.91	136.53	1.00	136.53
Shell	Rim Insulation	1.14	0.92	1.05	1.00	1.05
	Total	995.04	0.83	821.08		821.08

NA = Not applicable

* A deemed value. Source is to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 2-10. CY2019 Energy Savings by Measure – Gas – ComEd

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
Consumer Electronics	Advanced Power Strip - Tier 1	0	NA	0	1.00	0	7.0
HVAC	Bathroom Exhaust Fan - Bathroom	0	NA	0	1.00	0	19.0
HVAC	Programmable Thermostat	1,897	1.00	1,903	1.00	1,903	8.0
HVAC	Reprogramming Thermostat	125	1.00	125	1.00	125	2.0
HVAC	Advanced Thermostat	11,261	1.00	11,256	NA†	11,256	11.0
Hot Water	HW Pipe Insulation	312	1.30	407	1.00	407	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	124	1.00	124	1.00	124	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	140	1.00	140	1.00	140	10.0
Hot Water	Low Flow Showerhead	2,366	0.87	2,061	1.00	2,061	10.0
Lighting	LED Specialty Lamp - Exterior	0	NA	0	1.00	0	6.1
Lighting	LED Specialty Lamp - Interior	0	NA	0	1.00	0	10.0
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
Shell	Air Sealing	72,655	1.03	74,608	1.00	74,608	20.0
Shell	Floor Insulation	461	1.02	470	1.00	470	20.0
Shell	Wall Insulation	86,727	1.04	89,938	1.00	89,938	20.0
Shell	Attic Insulation	51,741	1.04	53,609	1.00	53,609	20.0
Shell	Rim Insulation	823	1.09	899	1.00	899	20.0
Total Therms		228,633	1.03	235,539		235,539	
Total kWh Converted from Therms‡		6,701,233	1.03	6,903,642		6,903,642	

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The 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 evaluation team analysis

Table 2-11. CY2019 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	59,415	1.00	59,415	1.00	59,415
HVAC	Bathroom Exhaust Fan - Bathroom	44,587	1.00	44,627	1.00	44,627
HVAC	Programmable Thermostat	58,231	1.00	58,421	1.00	58,421
HVAC	Reprogramming Thermostat	3,768	1.00	3,767	1.00	3,767
HVAC	Advanced Thermostat	395,796	0.99	392,747	NA†	392,747
Hot Water	HW Pipe Insulation	9,147	1.30	11,928	1.00	11,928
Hot Water	Low Flow Faucet Aerator - Bathroom	3,670	1.04	3,813	1.00	3,813
Hot Water	Low Flow Faucet Aerator - Kitchen	4,163	1.04	4,349	1.00	4,349
Hot Water	Low Flow Showerhead	72,206	0.92	66,418	1.00	66,418
Lighting	LED Specialty Lamp - Exterior	21,294	1.00	21,294	1.00	21,294
Lighting	LED Specialty Lamp - Interior	303,918	1.00	303,688	1.00	303,688
Lighting	LED Omnidirectional Bulb - Exterior	11,233	1.00	11,234	1.00	11,234
Lighting	LED Omnidirectional Bulb - Interior	341,731	1.00	341,608	1.00	341,608
Shell	Air Sealing	2,954,872	0.97	2,879,250	1.00	2,879,250
Shell	Floor Insulation	16,201	1.01	16,292	1.00	16,292
Shell	Wall Insulation	3,020,843	0.99	3,004,464	1.00	3,004,464
Shell	Attic Insulation	1,842,529	1.01	1,869,637	1.00	1,869,637
Shell	Rim Insulation	26,539	1.08	28,611	1.00	28,611
Total‡		9,190,142	0.99	9,121,562		9,121,562

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

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

Source: ComEd tracking data and evaluation team analysis

The Single-Family Retrofits - CBA Program includes measures that save water. That reduction in water produces secondary kWh savings from water supply and wastewater treatment. Table 2-12 shows the secondary measure level savings. The savings in this table are included within the electricity savings in the previous tables in this section.

Table 2-12. Secondary Energy Savings from Water Reduction by Measure – Electric

End Use Type	Research Category	Ex Ante Annual Water Savings (gallons)	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate (RR _{water})	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Consumer Electronics	Advanced Power Strip - Tier 1	0	0	NA	0	1.00	0
HVAC	Bathroom Exhaust Fan - Bathroom	0	0	NA	0	1.00	0
HVAC	Programmable Thermostat	0	0	NA	0	1.00	0
HVAC	Reprogramming Thermostat	0	0	NA	0	1.00	0
HVAC	Advanced Thermostat	0	0	NA	0	NA†	0
Hot Water	HW Pipe Insulation	0	0	NA	0	1.00	0
Hot Water	Low Flow Faucet Aerator - Bathroom	45,312	138	1.00	138	1.00	138
Hot Water	Low Flow Faucet Aerator - Kitchen	63,204	188	1.00	188	1.00	188
Hot Water	Low Flow Showerhead	1,040,751	3,115	1.00	3,116	1.00	3,116
Lighting	LED Specialty Lamp - Exterior	0	0	NA	0	1.00	0
Lighting	LED Specialty Lamp - Interior	0	0	NA	0	1.00	0
Lighting	LED Omnidirectional Bulb - Exterior	0	0	NA	0	1.00	0
Lighting	LED Omnidirectional Bulb - Interior	0	0	NA	0	1.00	0
Shell	Air Sealing	0	0	NA	0	1.00	0
Shell	Floor Insulation	0	0	NA	0	1.00	0
Shell	Wall Insulation	0	0	NA	0	1.00	0
Shell	Attic Insulation	0	0	NA	0	1.00	0
Shell	Rim Insulation	0	0	NA	0	1.00	0
Total		1,149,267	3,442	1.00	3,442		3,442

NA = Not applicable

Note: The savings in this table reflects secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd and Peoples Gas.

* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: *ComEd tracking data and evaluation team analysis*

Table 2-13. CY2019 Natural Gas Energy Savings by Measure – Peoples Gas

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
HVAC	Programmable Thermostat	1,708	1.00	1,707	1.00	1,707	8
HVAC	Advanced Thermostat	10,987	1.00	10,983	NA†	10,983	11
Hot Water	HW Pipe Insulation	259	1.31	340	1.00	340	15
Hot Water	Low Flow Faucet Aerator - Bathroom	29	1.00	29	1.00	29	10
Hot Water	Low Flow Faucet Aerator - Kitchen	120	1.00	120	1.00	120	10
Hot Water	Low Flow Showerhead	3,478	0.87	3,031	1.00	3,031	10
Shell	Air Sealing	142,362	1.01	143,743	1.00	143,743	20
Shell	Floor Insulation	1,388	1.01	1,402	1.00	1,402	20
Shell	Wall Insulation	112,131	1.01	113,626	1.00	113,626	20
Shell	Attic Insulation	83,733	1.01	84,915	1.00	84,915	20
Shell	Rim Insulation	232	1.09	253	1.00	253	20
Total‡		356,427	1.01	360,147	1.00	360,147	

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

‡ The total excludes the electric interactive effects on the total therms.

Source: *Peoples Gas tracking data and Guidehouse team analysis*.

2.5 Impact Analysis Findings and Recommendations

2.5.1 Impact Parameter Estimates

Guidehouse calculated verified gross energy and demand savings using the algorithms in the Illinois Technical Reference Manual (TRM) v7.0 and v7.0 Errata where applicable. The following table presents the deemed input parameter source that Guidehouse used by measure. The TRM v7.0 allows for custom or actual values to be used for some of the input parameters. Guidehouse based these values on the program tracking database when available.

The lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life for each measure. Guidehouse calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio set by the SAG consensus process.

Table 2-14. Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source*
Quantity	Varies	Number of measures	Evaluated	ComEd Tracking Data and Guidehouse Evaluation
NTG	Varies		Deemed	Illinois SAG Consensus†
Advanced Power Strip – Tier 1	71	Each	Deemed	TRM v7.0 – Section 5.2.01
Bathroom Exhaust Fan	30	Each	Deemed	TRM v7.0 – Section 5.3.09
Programmable Thermostat	Varies	Each	Deemed	TRM v7.0 – Section 5.3.11
Advanced Thermostat	Varies	Each	Deemed	TRM v7.0 – Section 5.3.16
HW Pipe Insulation	Varies	Linear Feet	Deemed	TRM v7.0 – Section 5.4.01
Low Flow Faucet Aerator – Bathroom	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.04
Low Flow Faucet Aerator - Kitchen	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.04
Low Flow Showerhead	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.05
LED Specialty Lamps	Varies	Each	Deemed	TRM v7.0 – Section 5.5.06
LED Omnidirectional Bulbs	Varies	Each	Deemed	TRM v7.0 – Section 5.5.08
Air Sealing	Varies	Projects	Deemed	TRM v7.0 – Section 5.6.01
Floor Insulation	Varies	Square Feet	Deemed	TRM v7.0 Errata – Section 5.6.03
Wall Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.04
Attic Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.05
Rim Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.06

* Deemed Source from the State of Illinois Technical Reference Manual version 7.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† The NTG values can be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

The evaluation team developed several recommendations based on findings from the CY2019 evaluation.

2.5.1 ComEd Findings and Recommendations

2.5.1.1 Water Efficiency

Finding 1. The combined electric and gas energy realization rate for aerators is 104%. The realization rate is greater than 100% because the program did not account for secondary electric energy savings from water supply and wastewater treatment in the ex ante savings column of the tracking data. We included secondary electric savings from water supply for all measures regardless if installed in a home with an electric or gas domestic hot water heating system in our estimation of verified electric savings.

Recommendation 1. In CY2019, ComEd and Guidehouse agreed that water savings would be reported in gallons and Guidehouse would convert water savings to kWh as a part of evaluation. It is our understanding that ComEd and implementer will work together to incorporate necessary calculations and include secondary kWh savings from water in ex ante savings going forward. Table 2-12 shows the secondary kWh savings for these measures.

2.5.1.2 Low Flow Showerhead

Finding 2. The implementer used multifamily inputs to calculate peak demand savings for five electric showerhead projects, assigning them 0.0302 kW/unit savings. The Residential_Building_Type field for these projects listed “Single Family.” The evaluation team calculated peak demand savings using single family inputs for these five projects, assigning them 0.022 kW/unit savings. The five project IDs are 3812111, 3858769, 4267063, 4545059, and 5031533.

Recommendation 2. The implementer should use single family input values to calculate savings for electric showerheads when the Residential_Building_Type is “Single Family.”

Finding 3. The gas realization rate for low flow showerheads is 87%. We believe that the ex ante savings of 10.195 therms per unit for gas showerheads is using the a GPM_base value of 2.35 which applies to retrofit, efficiency kits, new construction, or time of sale programs according to the TRM v7.0. We used a GPM_base of 2.24 which is applied to direct-install programs.

Recommendation 3. The implementer should transition to using a GPM_base of 2.24 for direct install programs.

2.5.1.3 HW Pipe Insulation

Finding 4. The gas realization rate for pipe insulation is 131%. We found that the per unit gas saving therms for hot water pipe insulation is hardcoded in Franklin Energy’s Master Measure Database (MMDB)². We verified larger per unit gas savings and could not determine the source of the discrepancy. Table 2-15 displays the inputs we used to calculate savings:

² MMDB – Master Measure Database, file provided by Franklin Energy: Wx Franklin Residential MMDB 2019.xlsx, June 19, 2019.

Table 2-15. Pipe Insulation Variable Inputs

Variable	Value
Cnew	0.458
Cexist	0.196
Rnew	4.15
Rexist	1.00
L	1.00
ΔT	60.00
η_{DHW_gas}	0.78

Source: ComEd tracking data and evaluation team analysis

Furthermore, the reported per unit gas savings for “Gas Pipe Insulation - (DHW) Outlet” in the tracking database do not match the values in the MMDB.

Recommendation 4. The implementer should clarify the underlying ex ante savings assumptions used to estimate 0.989 therms/unit for “Gas Pipe Insulation - (DHW) Outlet” and 0.410 therms/unit for “Gas Pipe Insulation - (HW Boiler) Outlet” in the MMDB and reconcile them against the above table.

The implementer should also clarify why the tracking data per unit gas savings values differ from the MMDB for “Gas Pipe Insulation - (DHW) Outlet” and report savings in the tracking data consistently with the MMDB.

2.5.1.4 Advanced Thermostat

Finding 5. The electric energy realization rate for advanced thermostat is 99%. The evaluation team conjectures that the implementer used the TRM-default values of 9.3 for the existing cooling system seasonal energy efficiency ratio (SEER), 33,600 Btu/h for the cooling capacity, and 97% for the %AC. The TRM recommends using collected, actual data when available to more accurately estimate savings for each project. The evaluation team used collected data when available and the above defaults when unavailable to calculate verified savings.

Recommendation 5. The implementer should use collected data for the SEER, %AC, and cooling capacity values that reflect the existing cooling system of each project and only use default values when collected data is unavailable.

Finding 6. The demand realization rate of advanced thermostat is 80%. The evaluation team conjectures that the implementer used a default value of 7.5 for Existing_Cooling_System_EER. The evaluation team calculates the existing EER based on the reported existing SEER value. Per the TRM v7.0, the existing EER is calculated as:

$$EER = (-0.02 * SEER_{exist}^2) + (1.12 * SEER_{exist})$$

Recommendation 6. The implementer should calculate the existing EER based on the reported existing SEER and only use the default value of 7.5 when collected data is unavailable.

Finding 7. There were five projects that had ‘None’, ‘Other’, or ‘Window’ and two projects with no information on the existing cooling system. Guidehouse did not calculate savings attributed to

cooling for these projects. The project IDs are 3912347, 3974176, 4009274, 4162735, 4616947, 3780982, and 4360831.

Recommendation 7. The implementer should not claim savings attributable to the cooling system if there is no existing central cooling system.

2.5.1.5 Programmable Thermostat

Finding 8. The impact analysis team found three programmable thermostat projects where gas realization rates are not 100%. This is due to the value of gas heating consumption used for projects with gas boilers. For gas boiler projects, the impact analysis team estimated gas heating consumption using the boiler gas heating loads, shown in Table 2-16, divided by the project’s existing heating system efficiency (AFUE). The evaluation team believes that for these three projects the implementer used a default AFUE value of 0.82 rather than the AFUE value in the tracking data of 0.80. These projects are 4037816, 4123340, and 5025079.

Table 2-16. Gas Boiler Loads By Climate Zone

Climate Zone	Gas Boiler Load (therms)
1 (Rockford)	1,275
2 (Chicago)	1,218
3 (Springfield)	1,043
4 (Belleville)	805
5 (Marion)	819

Source: TRM v7.0, Volume 3, Section 5.3.14, page 153.

Recommendation 8. Guidehouse recommends the implementer use boiler gas heating load divided by the efficiency in the tracking data to estimate gas heating consumption for programmable thermostat projects with gas boilers.

2.5.1.6 Lighting

Finding 9. The evaluation team found that the ex ante demand unit savings values in the tracking data for ‘Exterior LED - 15W PAR38 (120W)’ are different than those in the MMDB. The MMDB demand per unit savings match the verified demand per unit savings. The MMDB has demand unit savings of 0.0278 kW/unit, but the tracking data uses demand unit savings of 0.0267 kW/unit.

Recommendation 9. The implementer should report ex ante savings consistently with the MMDB for the ‘Exterior LED - 15W PAR38 (120W)’ measure.

Finding 10. The implementer calculated savings using SF inputs for two projects that indicated they were MF according to the ‘Residential Building Type’ field in the tracking data. These projects are 5057031 and 5057031.

Recommendation 10. The implementer should use MF inputs for lamps installed in MF buildings.

Finding 11. The evaluation team included electric heating penalties in the verified energy savings for lighting measures that were installed in homes that have electric heating. This inclusion has been introduced in CY2019 to account for the impact that these measures have on electric heating in homes.

Recommendation 11. Guidehouse recommends incorporating electric heating penalties when estimating savings for indoor lighting measures moving forward from CY2019.

2.5.1.7 Air Sealing

Finding 12. The evaluation team found a number of differences between the implementer's MMDB calculator and/or tracking data versus Guidehouse's savings algorithms. Namely, the implementer:

- Calculated peak demand savings using $(\text{total kWh savings}) / (\text{FLH_cooling} * \text{CF})$ instead of $(\text{kWh_cooling}) / (\text{FLH_cooling} * \text{CF})$
- Calculated kWh savings for reduction in fan run time for natural gas boilers
- Assumed 92.9% of homes have central air conditioning instead of using collected data on a project's cooling system type. The implementer's tracking system is incapable of calculating savings on a project by project basis.
- Assumed η_{Cool} is 12.5 and η_{Heat} is 0.72 for all projects instead of using collected data on each project, where available. The implementer's tracking system is incapable of calculating savings on a project by project basis.

Recommendation 12. We understand that the implementer's tracking system cannot remedy all the listed findings. With this in mind, the implementer should:

- Calculate the peak demand savings using the formula $(\text{kWh_cooling}) / (\text{FLH_cooling} * \text{CF})$
- Calculate kWh savings for reduction in fan run time only for natural gas furnaces
- Reconsider using a default value for $\eta_{\text{Heat}} = 0.72$ and use an average AFUE from this year's project data multiplied by the distribution system efficiency if the heating unit is a furnace, per the Illinois TRM (TRM)v7.0. The distribution system efficiency derates furnace efficiencies by a default 15%. The average AFUE for the existing heating system for air sealing projects in 2019 without deration was 0.82

Finding 13. The evaluation team found 125 projects where the home had 'None', 'Other', or 'Window' as the existing cooling type and 'Boiler' as the existing heating type. The TRM v7.0 does not estimate electric energy and demand savings associated with cooling for projects without a central cooling system or electric heating for projects with a boiler system. Guidehouse followed these TRM guidelines when verifying savings on a project basis. Example project IDs include 3855496, 3855652, and 3855810. The implementer claimed electric energy and demand savings attributed to cooling and heating for these projects as the implementer's system cannot currently calculate savings on a per project basis. The implementer applied a 97% adjustment factor for cooling to all projects to account for the estimated 3% of projects that do not have central cooling, but no adjustment factor for heating to account for projects that have gas boilers.

Recommendation 13. The implementer should comply with the TRM v7.0 and not calculate electric energy or demand savings associated with cooling or heating for projects that both do not have a central cooling system and have a boiler as the heating system. Given that the implementer's system cannot calculate project level savings, the implementer should update their cooling adjustment factor to reflect the number of air sealing projects that do not have

central cooling based on current program data. The implementer should also incorporate a similar heating adjustment factor to account for projects with boiler heating systems.

2.5.1.8 Insulation

Finding 14. The evaluation team found a number of differences between the implementer's MMDB calculator and Guidehouse's savings algorithms for all insulation measures. Namely, the implementer:

- Assumed 92.9% of homes have central air conditioning instead of using collected data on a project's cooling system type. The implementer's tracking system is incapable of calculating savings on a project by project basis.
- Assumed η_{Cool} as an assumed value of 11.3, 12, 11.1, and 11.36 for all attic, floor/crawlspace, rim, and wall insulation projects, respectively, instead of using collected data on a project's cooling system efficiency. The implementer's tracking system is incapable of calculating savings on a project by project basis.
- Calculated kWh savings for reduction in fan run time for natural gas boilers

Recommendation 14. We understand that the implementer's tracking system cannot remedy all of the listed findings. With this in mind, the implementer should:

- Calculate kWh savings for reduction in fan run time only for natural gas furnaces.

Finding 15. The evaluation team found 331 projects where the home had no existing cooling system and a boiler was the heating system. However, the TRM does not estimate electric savings for projects with no central cooling system or a boiler. The implementer claimed electric energy and demand savings attributed to cooling and heating for these projects as the implementer's system cannot currently calculate savings on a per project basis. The implementer applied a 97% adjustment factor for cooling to all projects to account for the estimated 3% of projects that do not have central cooling, but no adjustment factor for heating to account for projects that have gas boilers.

Recommendation 15. Guidehouse recommends the implementer comply with the TRM v7.0 and not calculate electric energy or demand savings associated with cooling or heating for projects that do not have a central cooling system or have a boiler as the heating system. Given that the implementer's system cannot calculate project level savings, the implementer should update their cooling adjustment factor to reflect the number of insulation projects that do not have central cooling based on current program data. The implementer should also incorporate a similar heating adjustment factor to account for projects with boiler heating systems.

2.5.2 Peoples Gas Findings and Recommendations

2.5.2.1 HW Pipe Insulation

Finding 16. The gas realization rate for pipe insulation is 131%. The evaluation team determined that the per unit gas saving therms for hot water pipe insulation is hardcoded in Franklin Energy's Master Measure Database (MMDB). The evaluation team verified larger per unit gas savings and could not determine the source of the discrepancy. Table 2-17 displays the inputs we used to calculate savings:

Table 2-17. Pipe Insulation Variable Inputs

Variable	Value
Cnew	0.458
Cexist	0.196
Rnew	4.15
Rexist	1.00
L	1.00
ΔT	60.00
η_{DHW_gas}	0.78

Source: Peoples Gas tracking data and evaluation team analysis

Furthermore, the reported per unit gas savings for “Gas Pipe Insulation - (DHW) Outlet” in the tracking database do not match the values in the MMDB.

Recommendation 16. The implementer should clarify the underlying ex ante savings assumptions used to estimate 0.989 therms/unit for “Gas Pipe Insulation - (DHW) Outlet” and 0.410 therms/unit for “Gas Pipe Insulation - (HW Boiler) Outlet” in the MMDB and reconcile them against the values in Table 2-17.

The implementer should also clarify why the tracking data per unit gas savings values differ from the MMDB for “Gas Pipe Insulation - (DHW) Outlet” and report savings in the tracking data consistently with the MMDB.

2.5.2.2 Low Flow Showerhead

Finding 17. The gas realization rate for low flow showerheads is 87%. The evaluation team believes that the ex ante savings of 10.195 therms/unit for gas showerheads is using a GPM_base value of 2.35 which applies to retrofit, efficiency kits, new construction, or time of sale programs according to the TRM v7.0. We used a GPM_base of 2.24 which is applied to direct-install programs.

Recommendation 17. The implementer should transition to using a GPM_base of 2.24 for direct install programs.

2.5.2.3 Shell End Use Furnace Efficiency

Finding 18. The evaluation team identified one difference between the implementer’s MMDB calculator and/or tracking data versus Guidehouse’s savings algorithms. Namely, the implementer assumed η_{Heat} is 0.72 for all projects instead of using collected data on each project, where available. The implementer’s tracking system is incapable of calculating savings on a project by project basis for this program.

Recommendation 18. We understand that the implementer’s tracking system cannot remedy all of the findings. With this in mind, the implementer should reconsider using a default value for $\eta_{Heat} = 0.72$ and use an average AFUE from this year’s project data multiplied by the distribution system efficiency if the heating unit is a furnace, per the TRM v7.0. The distribution system efficiency derates furnace efficiencies by a default 15%. The average AFUE for the existing heating system for air sealing projects in 2019 was 0.82, resulting in an η_{Heat} of 0.697.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

2.6 Appendix 1. Total Resource Cost Detail

Table 2-18 and Table 2-19 show the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report for ComEd and Peoples Gas. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

Table 2-18. Total Resource Cost Savings Summary for ComEd

End Use Type	Research Category	Units	Quantity	EUL (years)	ER Flag†	Verified Gross Electric Energy Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Gas Savings (Therms)	Gross Heating Penalty (kWh)‡	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Verified Net Electric Energy Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Gas Savings (Therms)	Net Heating Penalty (kWh)‡	Net Heating Penalty (Therms)
Consumer Electronics	Advanced Power Strip - Tier 1	Each	836	7.0	No	59,415	6.67	0	0	0	1.00	1.00	1.00	59,415	6.67	0	0	0
HVAC	Bathroom Exhaust Fan - Bathroom	Each	1,511	19.0	No	44,627	5.53	0	0	0	1.00	1.00	1.00	44,627	5.53	0	0	0
HVAC	Programmable Thermostat	Each	54	8.0	No	2,637	0.00	1,903	0	0	1.00	1.00	1.00	2,637	0.00	1,903	0	0
HVAC	Reprogramming Thermostat	Each	2	2.0	No	115	0.00	125	0	0	1.00	1.00	1.00	115	0.00	125	0	0
HVAC	Advanced Thermostat	Each	290	11.0	No	62,833	18.77	11,256	0	0	1.00	1.00	1.00	62,833	18.77	11,256	0	0
Hot Water	HW Pipe Insulation	Linear Feet	1,294	15.0	No	0	0.00	407	0	0	1.00	1.00	1.00	0	0.00	407	0	0
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	177	10.0	No	41	0.06	124	0	0	1.00	1.00	1.00	41	0.06	124	0	0
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	92	10.0	No	67	0.01	140	0	0	1.00	1.00	1.00	67	0.01	140	0	0
Hot Water	Low Flow Showerhead	Each	587	10.0	No	2,904	0.32	2,061	0	0	1.00	1.00	1.00	2,904	0.32	2,061	0	0
Lighting	LED Specialty Lamp - Exterior§	Each	211	6.1	No	21,294	2.35	0	0	0	1.00	1.00	1.00	21,294	2.35	0	0	0
Lighting	LED Specialty Lamp - Interior§	Each	8,926	10.0	No	303,688	45.46	0	0	-6,827	1.00	1.00	1.00	303,688	45.46	0	0	-6,827
Lighting	LED Omnidirectional Bulb - Exterior§	Each	130	6.1	No	11,234	1.24	0	0	0	1.00	1.00	1.00	11,234	1.24	0	0	0
Lighting	LED Omnidirectional Bulb - Interior§	Each	8,784	10.0	No	341,608	42.05	0	0	-7,690	1.00	1.00	1.00	341,608	42.05	0	0	-7,690
Shell	Air Sealing§	Projects	3,420,307	20.0	No	692,501	399.91	74,608	0	0	1.00	1.00	1.00	692,501	399.91	74,608	0	0
Shell	Floor Insulation§	Square Feet	16,412	20.0	No	2,511	0.79	470	0	0	1.00	1.00	1.00	2,511	0.79	470	0	0
Shell	Wall Insulation§	Square Feet	1,342,303	20.0	No	368,370	160.34	89,938	0	0	1.00	1.00	1.00	368,370	160.34	89,938	0	0
Shell	Attic Insulation§	Square Feet	1,464,071	20.0	No	298,361	136.53	53,609	0	0	1.00	1.00	1.00	298,361	136.53	53,609	0	0
Shell	Rim Insulation§	Square Feet	7,531	20.0	No	2,274	1.05	899	0	0	1.00	1.00	1.00	2,274	1.05	899	0	0
Total			6,273,518	18.6		2,214,478	821.08	235,539	0	-14,516				2,214,478	821.08	235,539	0	-14,516

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis excludes secondary energy savings from water reduction measures. Table 2-18 represents the kWh savings from Table 2-7 minus those shown in Table 2-12

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

‡ The electric heating penalties are included in the verified gross and net savings columns.

§ The annual savings for this measure vary over time. See the CPAS tables (Table 2-4 to Table 2-6).

Source: ComEd tracking data and evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 2-19. Total Resource Cost Savings Summary for Peoples Gas

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	NTG (Therms)	Verified Net Savings (Therms)
HVAC	Programmable Thermostat	Each	25	8.0	No	1,708	1,707	1.00	1,707
HVAC	Advanced Thermostat	Each	158	11.0	No	10,987	10,983	1.00	10,983
Hot Water	HW Pipe Insulation	Linear Feet	589	15.0	No	259	340	1.00	340
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	33	10.0	No	29	29	1.00	29
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	42	10.0	No	120	120	1.00	120
Hot Water	Low Flow Showerhead	Each	341	10.0	No	3,478	3,031	1.00	3,031
Shell	Air Sealing	Projects	930	20.0	No	142,362	143,743	1.00	143,743
Shell	Floor Insulation	Projects	79	20.0	No	1,388	1,402	1.00	1,402
Shell	Wall Insulation	Projects	1,263	20.0	No	112,131	113,626	1.00	113,626
Shell	Attic Insulation	Projects	929	20.0	No	83,733	84,915	1.00	84,915
Shell	Rim Insulation	Projects	22	20.0	No	232	253	1.00	253
Total			4,411	19.6		356,427	360,147		360,147

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

Source: Guidehouse analysis of tracking data.

3. SINGLE FAMILY RETROFITS – IHWAP

3.1 Program Description

The IHWAP program had 665 electric and 628 gas participants in CY2019. The participant count is based on the number of unique utility account numbers. There were 20,487 measures that yielded energy savings to ComEd and 6,873 measures that yielded energy savings to gas utilities, as shown in Table 3-1 and Figure 3-1.

Table 3-1. CY2019 IHWAP Volumetric Findings Detail

Participation	ComEd Total	Nicor Gas Total	Peoples Gas Total	North Shore Gas Total
Participants*	665	528	87	13
Total Measures	20,487	5,428	1,386	59
Installed Projects†	674	3,630	88	13
Freezer	74			
Refrigerator - ER	228			
Refrigerator - TOS	1			
Room AC - ER	92			
Room AC - TOS	3			
Advanced Power Strip - Tier 2	2			
Air Source Heat Pump - ER	1			
Air Source Heat Pump - TOS	4			
Central Air Conditioning - ER	345			
Central Air Conditioning - TOS	59			
Duct Insulation and Sealing	5	5		
Gas High Efficiency Boiler - ER	6	14	12	
Gas High Efficiency Boiler - TOS		5		
Gas High Efficiency Furnace - ER	425	344	56	10
Gas High Efficiency Furnace - TOS	75	73		1
Bathroom Exhaust Fan	783			
Programmable Thermostat	117	117	16	
Advanced Thermostat	297	225	43	11
HW Pipe Insulation (Linear Feet)	376	1,671	757	
Gas Water Heater - ER	27	287	36	8
Gas Water Heater - TOS		14		
Heat Pump Water Heater	1			
Low Flow Faucet Aerator - Bathroom	77	424	67	5
Low Flow Faucet Aerator - Kitchen	22	142	36	
Low Flow Showerhead	33	242	47	5
Water Heater Wrap	2			
LED Specialty Lamp - Exterior	129			
LED Specialty Lamp - Interior	2,420			
LED Omnidirectional Bulb - Exterior	67			
LED Omnidirectional Bulb - Interior	13,119			
Air Sealing (Projects)	599	483	86	9
Basement Sidewall Insulation (Projects)	95	81	8	7
Floor Insulation (Projects)	49	40	15	
Wall Insulation (Projects)	229	152	65	

Participation	ComEd Total	Nicor Gas Total	Peoples Gas Total	North Shore Gas Total
Attic Insulation (Projects)	529	427	73	3
Attic, Wall, Ceiling Insulation (Projects)			46	
Rim Insulation (Projects)	196	172	23	

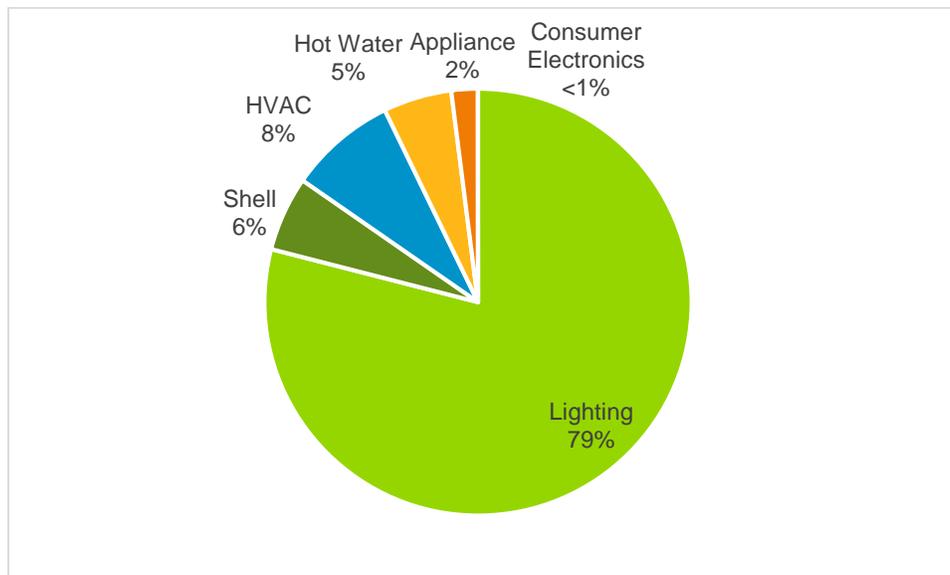
Note: Quantities and project counts in this table may overlap between ComEd's, Nicor Gas's, Peoples Gas's, and North Shore Gas's tracking databases.

* Participants are defined as unique utility account numbers

† Installed projects are defined as unique Project IDs within each utility's tracking database. Project IDs may overlap between ComEd's and the gas utilities' tracking databases.

Source: ComEd, Nicor Gas, Peoples Gas, and North Shore Gas tracking data and Guidehouse team analysis.

Figure 3-1. Distribution of ComEd Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3.2 Program Savings Detail

Table 3-2 and Table 3-3 summarize the incremental energy and demand savings the IHWAP component achieved in CY2019 for ComEd and the gas utilities. The gas savings in Table 3-2 are only those that ComEd may be able to claim, which excludes savings the gas utilities claim, either via joint or non-joint programs.³

³ The evaluation will determine which gas savings will be counted toward ComEd's goal while producing the ComEd portfolio-wide Summary Report.

Table 3-2. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	2,138,464	NR	618
Program Gross Realization Rate	1.00	NA	1.00
Verified Gross Savings	2,148,166	2,048	618
Program Net-to-Gross (NTG) Ratio	1.00	1.00	1.00
Verified Net Savings	2,148,166	2,048	618
Converted from Gas†			
Ex Ante Gross Savings	632,055	NA	NA
Program Gross Realization Rate	1.08	NA	NA
Verified Gross Savings	681,215	NA	NA
Program Net-to-Gross (NTG) Ratio	1.00	NA	NA
Verified Net Savings	681,215	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	2,770,519	NR	618
Program Gross Realization Rate	1.02	NA	1.00
Verified Gross Savings	2,829,382	2,048	618
Program Net-to-Gross (NTG) Ratio	1.00	1.00	1.00
Verified Net Savings	2,829,382	2,048	618

NR = Not reported (refers a piece of data that was not reported, i.e., non-coincident demand savings)

NA = Not applicable (refers a piece of data cannot be produced or does not apply)

* The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.

† Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh). The evaluation will determine which gas savings will be converted to kWh and counted toward ComEd's electric savings goal while producing the portfolio-wide Summary Report. According to Section 8-103B(b-25) of the Illinois Public Utilities Act, "In no event shall more than 10% of each year's applicable annual incremental goal as defined in paragraph (7) of subsection (g) of this Section be met through savings of fuels other than electricity."

Source: ComEd tracking data and evaluation team analysis

Table 3-3. CY2019 Total Annual Incremental Therm Savings

Savings Category	Nicor Gas (Therm)	Peoples Gas (Therm)	North Shore Gas (Therm)
Natural Gas*			
Ex Ante Gross Savings	184,907	39,878	4,298
Program Gross Realization Rate	1.07	1.13	1.10
Verified Gross Savings	198,146	44,903	4,736
Program Net-to-Gross (NTG) Ratio	1.00	1.00	1.00
Verified Net Savings	198,146	44,903	4,736

* Natural gas savings with electric interactive effects removed.

Source: Nicor Gas, Peoples Gas, and North Shore Gas tracking data and Guidehouse team analysis.

3.3 Cumulative Persisting Annual Savings

Table 3-4 to Table 3-6 and Figure 3-2 show the measure-specific and total verified gross savings for the IHWAP component and ComEd's cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 2,148,166 kWh (Table 3-4). The CY2019 gas contribution to CPAS (converted to equivalent electricity) is 681,215 kWh (Table 3-5). Adding the gas and electric contributions produces 2,829,382 kWh of total CY2019 contribution to CPAS (Table 3-6). The "historic" rows in each table are the CPAS contribution back to CY2018. The "Program Total Electric CPAS" and the "Program Total Gas CPAS" are the sum of the CY2019 contribution and the historic contribution.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

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

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings										
						2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Appliance	Freezer	22.0	2,569	1.00	56,527		2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	
Appliance	Refrigerator - ER	17.0	100,175	1.00	710,897		100,175	100,175	100,175	100,175	100,175	100,175	9,986	9,986	9,986	
Appliance	Refrigerator - TOS	17.0	44	1.00	753		44	44	44	44	44	44	44	44	44	
Appliance	Room AC - ER	12.0	5,733	1.00	27,503		5,733	5,733	5,733	5,733	572	572	572	572	572	
Appliance	Room AC - TOS	12.0	86	1.00	1,028		86	86	86	86	86	86	86	86	86	
Consumer Electronics	Advanced Power Strip - Tier 2	7.0	432	1.00	3,024		432	432	432	432	432	432	432			
HVAC	Air Source Heat Pump - ER	16.0	13,970	1.00	88,501		13,970	13,970	13,970	13,970	13,970	13,970	468	468	468	
HVAC	Air Source Heat Pump - TOS	16.0	1,523	1.00	24,372		1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523	
HVAC	Central Air Conditioning - ER	18.0	430,447	1.00	3,469,989		430,447	430,447	430,447	430,447	430,447	430,447	73,942	73,942	73,942	
HVAC	Central Air Conditioning - TOS	18.0	12,411	1.00	223,400		12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411	
HVAC	Duct Insulation and Sealing	20.0	1,974	1.00	34,864		1,974	1,974	1,974	1,974	1,974	1,974	1,974	1,974	1,974	
HVAC	Gas High Efficiency Boiler - ER	25.0	0	1.00	0											
HVAC	Gas High Efficiency Furnace - ER	20.0	203,968	1.00	4,079,353		203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968	
HVAC	Gas High Efficiency Furnace - TOS	20.0	36,735	1.00	734,702		36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	
HVAC	Bathroom Exhaust Fan	19.0	84,905	1.00	1,613,189		84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	
HVAC	Programmable Thermostat	8.0	9,029	1.00	72,231		9,029	9,029	9,029	9,029	9,029	9,029	9,029	9,029	9,029	
HVAC	Advanced Thermostat	11.0	54,609	1.00	600,695		54,609	54,609	54,609	54,609	54,609	54,609	54,609	54,609	54,609	
Hot Water	HW Pipe Insulation	15.0	6,240	1.00	93,604		6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	
Hot Water	Gas Water Heater - ER	13.0	0	1.00	0											
Hot Water	Heat Pump Water Heater	15.0	1,835	1.00	27,526		1,835	1,835	1,835	1,835	1,835	1,835	1,835	1,835	1,835	
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	1,143	1.00	11,426		1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	3,180	1.00	31,795		3,180	3,180	3,180	3,180	3,180	3,180	3,180	3,180	3,180	
Hot Water	Low Flow Showerhead	10.0	1,120	1.00	11,202		1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	
Hot Water	Water Heater Wrap	5.0	287	1.00	1,434		287	287	287	287	287	287				
Lighting	LED Specialty Lamp - Exterior	6.1	20,265	1.00	104,639		20,265	20,265	20,265	20,265	20,265	3,011	301			
Lighting	LED Specialty Lamp - Interior	10.0	93,293	1.00	532,638		93,293	93,293	93,293	93,293	93,293	13,234	13,234	13,234	13,234	
Lighting	LED Omnidirectional Bulb - Exterior	6.1	8,058	1.00	19,094		8,058	8,058	726	726	726	726	73			
Lighting	LED Omnidirectional Bulb - Interior	10.0	710,706	1.00	2,020,193		710,706	710,706	74,847	74,847	74,847	74,847	74,847	74,847	74,847	
Shell	Air Sealing	20.0	170,085	1.00	3,065,515		170,085	170,085	170,085	170,085	170,085	170,085	170,085	170,085	170,085	
Shell	Basement Sidewall Insulation	20.0	25,346	1.00	462,326		25,346	25,346	25,346	25,346	25,346	25,346	25,346	25,346	25,346	
Shell	Floor Insulation	20.0	3,124	1.00	58,293		3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124	3,124	
Shell	Wall Insulation	20.0	28,856	1.00	530,995		28,856	28,856	28,856	28,856	28,856	28,856	28,856	28,856	28,856	
Shell	Attic Insulation	20.0	109,452	1.00	2,008,553		109,452	109,452	109,452	109,452	109,452	109,452	109,452	109,452	109,452	
Shell	Rim Insulation	20.0	6,569	1.00	122,445		6,569	6,569	6,569	6,569	6,569	6,569	6,569	6,569	6,569	
CY2019 Program Total Electric Contribution to CPAS			2,148,166		20,842,705		2,148,166	2,148,166	1,504,975	1,504,975	1,499,814	1,402,214	938,656	937,850	928,822	
Historic Program Total Electric Contribution to CPAS‡						979,006	979,006	770,771	709,563	707,199	591,453	590,942	590,942	589,507		
Program Total Electric CPAS						979,006	3,127,173	3,127,173	2,275,747	2,214,538	2,207,013	1,993,667	1,529,598	1,528,792	1,518,328	
CY2019 Program Incremental Expiring Electric Savings§								-	643,191	-	5,161	97,600	463,558	806	9,029	
Historic Program Incremental Expiring Electric Savings‡§								-	208,235	61,208	2,364	115,746	511	-	1,435	
Program Total Incremental Expiring Electric Savings§								-	-	851,426	61,208	7,525	213,346	464,069	806	10,464



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Appliance	Freezer	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569				
Appliance	Refrigerator - ER	9,986	9,986	9,986	9,986	9,986	9,986	9,986	9,986									
Appliance	Refrigerator - TOS	44	44	44	44	44	44	44	44									
Appliance	Room AC - ER	572	572	572														
Appliance	Room AC - TOS	86	86	86														
Consumer Electronics	Advanced Power Strip - Tier 2																	
HVAC	Air Source Heat Pump - ER	468	468	468	468	468	468	468										
HVAC	Air Source Heat Pump - TOS	1,523	1,523	1,523	1,523	1,523	1,523	1,523										
HVAC	Central Air Conditioning - ER	73,942	73,942	73,942	73,942	73,942	73,942	73,942	73,942	73,942								
HVAC	Central Air Conditioning - TOS	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411								
HVAC	Duct Insulation and Sealing	1,974	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513						
HVAC	Gas High Efficiency Boiler - ER																	
HVAC	Gas High Efficiency Furnace - ER	203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968	203,968						
HVAC	Gas High Efficiency Furnace - TOS	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735	36,735					
HVAC	Bathroom Exhaust Fan	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905							
HVAC	Programmable Thermostat																	
HVAC	Advanced Thermostat	54,609	54,609															
Hot Water	HW Pipe Insulation	6,240	6,240	6,240	6,240	6,240	6,240											
Hot Water	Gas Water Heater - ER																	
Hot Water	Heat Pump Water Heater	1,835	1,835	1,835	1,835	1,835	1,835											
Hot Water	Low Flow Faucet Aerator - Bathroom	1,143																
Hot Water	Low Flow Faucet Aerator - Kitchen	3,180																
Hot Water	Low Flow Showerhead	1,120																
Hot Water	Water Heater Wrap																	
Lighting	LED Specialty Lamp - Exterior																	
Lighting	LED Specialty Lamp - Interior	13,234																
Lighting	LED Omnidirectional Bulb - Exterior																	
Lighting	LED Omnidirectional Bulb - Interior	74,847																
Shell	Air Sealing	170,085	137,021	137,021	137,021	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229	136,229
Shell	Basement Sidewall Insulation	25,346	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887	20,887
Shell	Floor Insulation	3,124	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705	2,705
Shell	Wall Insulation	28,856	24,382	24,382	24,382	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185	24,185
Shell	Attic Insulation	109,452	91,877	91,877	91,877	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201	91,201
Shell	Rim Insulation	6,569	5,682	5,682	5,682	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673	5,673
CY2019 Program Total Electric Contribution to CPAS		928,822	773,960	719,351	718,694	717,021	717,021	708,946	706,954	696,924	610,570	525,665	2,569	2,569	-	-	-	-
Historic Program Total Electric Contribution to CPAS†		484,571	482,851	475,647	475,647	475,647	361,217	361,217	361,217	320,640	288,840	86,088	86,088	86,088	86,088	86,088	86,088	86,088
Program Total Electric CPAS		1,413,392	1,256,811	1,194,998	1,194,341	1,192,668	1,078,238	1,070,162	1,068,171	1,017,564	899,410	611,753	88,657	88,657	86,088	86,088	-	-
CY2019 Program Incremental Expiring Electric Savings§		-	154,862	54,609	657	1,673	-	8,075	1,992	10,030	86,354	84,905	523,096	-	2,569	-	-	-
Historic Program Incremental Expiring Electric Savings‡		104,936	1,720	7,204	-	-	114,430	-	-	40,577	31,800	202,752	-	-	-	-	86,088	-
Program Total Incremental Expiring Electric Savings§		104,936	156,582	61,813	657	1,673	114,430	8,075	1,992	50,607	118,154	287,657	523,096	-	2,569	-	86,088	-

Note: The green highlighted cell shows program total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2019 contribution to CPAS.

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

‡ Historical savings go back to CY2018

§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n

Source: Evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-5. Cumulative Persisting Annual Savings (CPAS) – Gas

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (Therms)	Lifetime Net Savings NTG*	Verified Net Therms Savings											
					2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
Appliance	Freezer	22.0		1.00												
Appliance	Refrigerator - ER	17.0		1.00												
Appliance	Refrigerator - TOS	17.0		1.00												
Appliance	Room AC - ER	12.0		1.00												
Appliance	Room AC - TOS	12.0		1.00												
Consumer Electronics	Advanced Power Strip - Tier 2	7.0		1.00												
HVAC	Air Source Heat Pump - ER	16.0		1.00												
HVAC	Air Source Heat Pump - TOS	16.0		1.00												
HVAC	Central Air Conditioning - ER	18.0		1.00												
HVAC	Central Air Conditioning - TOS	18.0		1.00												
HVAC	Duct Insulation and Sealing	20.0		1.00												
HVAC	Gas High Efficiency Boiler - ER	25.0	910	1.00	19,846		910	910	910	910	910	910	910	910	910	739
HVAC	Gas High Efficiency Furnace - ER	20.0	4,179	1.00	44,658		4,179	4,179	4,179	4,179	4,179	4,179	1,399	1,399	1,399	1,399
HVAC	Gas High Efficiency Furnace - TOS	20.0	297	1.00	5,949		297	297	297	297	297	297	297	297	297	297
HVAC	Bathroom Exhaust Fan	19.0		1.00												
HVAC	Programmable Thermostat	8.0	221	1.00	1,766		221	221	221	221	221	221	221	221	221	
HVAC	Advanced Thermostat	11.0	2,252	1.00	24,777		2,252	2,252	2,252	2,252	2,252	2,252	2,252	2,252	2,252	2,252
Hot Water	HW Pipe Insulation	15.0	63	1.00	950		63	63	63	63	63	63	63	63	63	63
Hot Water	Gas Water Heater - ER	13.0	1,414	1.00	14,757		1,414	1,414	1,414	1,414	1,011	1,011	1,011	1,011	1,011	1,011
Hot Water	Heat Pump Water Heater	15.0		1.00												
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	38	1.00	378		38	38	38	38	38	38	38	38	38	38
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	77	1.00	771		77	77	77	77	77	77	77	77	77	77
Hot Water	Low Flow Showerhead	10.0	91	1.00	906		91	91	91	91	91	91	91	91	91	91
Hot Water	Water Heater Wrap	5.0		1.00												
Lighting	LED Specialty Lamp - Exterior	6.1		1.00												
Lighting	LED Specialty Lamp - Interior	10.0		1.00												
Lighting	LED Omnidirectional Bulb - Exterior	6.1		1.00												
Lighting	LED Omnidirectional Bulb - Interior	10.0		1.00												
Shell	Air Sealing	20.0	6,419	1.00	123,091		6,419	6,419	6,419	6,419	6,419	6,419	6,419	6,419	6,419	6,419
Shell	Basement Sidewall Insulation	20.0	717	1.00	13,628		717	717	717	717	717	717	717	717	717	717
Shell	Floor Insulation	20.0	62	1.00	1,178		62	62	62	62	62	62	62	62	62	62
Shell	Wall Insulation	20.0	1,909	1.00	36,361		1,909	1,909	1,909	1,909	1,909	1,909	1,909	1,909	1,909	1,909
Shell	Attic Insulation	20.0	4,539	1.00	87,008		4,539	4,539	4,539	4,539	4,539	4,539	4,539	4,539	4,539	4,539
Shell	Rim Insulation	20.0	52	1.00	1,001		52	52	52	52	52	52	52	52	52	52
CY2019 Program Total Gas Contribution to CPAS (Therms)			23,242		377,025		23,242	23,242	23,242	23,242	22,839	22,839	20,058	20,058	19,666	
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†					11,050,601		681,215	681,215	681,215	681,215	669,408	669,408	587,913	587,913	576,423	
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)†§						1,463,579	1,463,579	1,463,579	1,463,579	1,420,580	1,386,894	1,113,516	1,113,516	1,093,731	1,088,916	
Program Total Gas CPAS (kWh Equivalent)†						1,463,579	2,144,794	2,144,794	2,144,794	2,101,795	2,056,301	1,782,924	1,701,429	1,681,643	1,665,339	
CY2019 Program Incremental Expiring Gas Savings (Therms)											403		2,780		392	
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)†											11,808		81,495		11,490	
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§										42,999	33,686	273,378		19,785	4,814	
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†										42,999	45,494	273,378	81,495	19,785	16,304	



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	
Appliance	Freezer																		
Appliance	Refrigerator - ER																		
Appliance	Refrigerator - TOS																		
Appliance	Room AC - ER																		
Appliance	Room AC - TOS																		
Consumer Electronics	Advanced Power Strip - Tier 2																		
HVAC	Air Source Heat Pump - ER																		
HVAC	Air Source Heat Pump - TOS																		
HVAC	Central Air Conditioning - ER																		
HVAC	Central Air Conditioning - TOS																		
HVAC	Duct Insulation and Sealing																		
HVAC	Gas High Efficiency Boiler - ER	739	739	739	739	739	739	739	739	739	739	739	739	739	739	739	739	739	
HVAC	Gas High Efficiency Furnace - ER	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399	
HVAC	Gas High Efficiency Furnace - TOS	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	
HVAC	Bathroom Exhaust Fan																		
HVAC	Programmable Thermostat																		
HVAC	Advanced Thermostat	2,252	2,252																
Hot Water	HW Pipe Insulation	63	63	63	63	63	63												
Hot Water	Gas Water Heater - ER	1,011	1,011	1,011	1,011														
Hot Water	Heat Pump Water Heater																		
Hot Water	Low Flow Faucet Aerator - Bathroom	38																	
Hot Water	Low Flow Faucet Aerator - Kitchen	77																	
Hot Water	Low Flow Showerhead	91																	
Hot Water	Water Heater Wrap																		
Lighting	LED Specialty Lamp - Exterior																		
Lighting	LED Specialty Lamp - Interior																		
Lighting	LED Omnidirectional Bulb - Exterior																		
Lighting	LED Omnidirectional Bulb - Interior																		
Shell	Air Sealing	6,419	5,549	5,549	5,549	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	6,036	
Shell	Basement Sidewall Insulation	717	542	542	542	691	691	691	691	691	691	691	691	691	691	691	691	691	
Shell	Floor Insulation	62	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	
Shell	Wall Insulation	1,909	1,540	1,540	1,540	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	1,807	
Shell	Attic Insulation	4,539	3,976	3,976	3,976	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	
Shell	Rim Insulation	52	46	46	46	49	49	49	49	49	49	49	49	49	49	49	49	49	
CY2019 Program Total Gas Contribution to CPAS (Therms)		19,666	17,470	15,217	15,217	15,378	15,378	15,315	15,315	15,315	15,315	15,315	15,315	15,315	739	739	739	739	-
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†		576,423	512,039	446,019	446,019	450,737	450,737	448,880	448,880	448,880	448,880	448,880	448,880	448,880	21,661	21,661	21,661	21,661	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)†§		983,262	983,262	983,262	962,385	962,385	648,367	648,367	648,367	648,367	648,367	648,367	388,296	388,296	388,296	388,296	388,296	388,296	-
Program Total Gas CPAS (kWh Equivalent)†		1,559,685	1,495,301	1,429,281	1,408,404	1,413,122	1,099,104	1,097,247	1,097,247	1,097,247	1,097,247	1,097,247	837,176	409,957	409,957	409,957	409,957	21,661	-
CY2019 Program Incremental Expiring Gas Savings (Therms)		-	2,197	2,252	-	(161)	-	63	-	-	-	-	14,576	-	-	-	-	739	-
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)†		-	64,384	66,020	-	(4,718)	-	1,857	-	-	-	-	427,219	-	-	-	-	21,661	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§		105,654	-	-	20,877	-	314,018	-	-	-	-	-	260,071	-	-	-	-	388,296	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†		105,654	64,384	66,020	20,877	(4,718)	314,018	1,857	-	-	-	-	260,071	427,219	-	-	-	388,296	21,661

Note: The green highlighted cell shows program total first year gas savings in kWh equivalents. The gray cells are blank, indicating no values or do not contribute to calculating CPAS in CY2019.

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

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

§ Historic savings go back to CY2018.

|| Expiring savings are equal to CPAS Yn-1 - CPAS Yn.

Source: Evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-6. Cumulative Persisting Annual Savings (CPAS) – Total

End Use Type	Research Category	CY2019 Verified Gross			Verified Net kWh Savings (including Those Converted from Gas Savings)										
		EUL	Savings (kWh)	NTG* Savings (kWh)†	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Appliance	Freezer	22.0	2,569	1.00	56,527		2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569
Appliance	Refrigerator - ER	17.0	100,175	1.00	710,897		100,175	100,175	100,175	100,175	100,175	100,175	9,986	9,986	9,986
Appliance	Refrigerator - TOS	17.0	44	1.00	753		44	44	44	44	44	44	44	44	44
Appliance	Room AC - ER	12.0	5,733	1.00	27,503		5,733	5,733	5,733	5,733	572	572	572	572	572
Appliance	Room AC - TOS	12.0	86	1.00	1,028		86	86	86	86	86	86	86	86	86
Consumer Electronics	Advanced Power Strip - Tier 2	7.0	432	1.00	3,024		432	432	432	432	432	432	432	-	-
HVAC	Air Source Heat Pum p - ER	16.0	13,970	1.00	88,501		13,970	13,970	13,970	13,970	13,970	13,970	468	468	468
HVAC	Air Source Heat Pum p - TOS	16.0	1,523	1.00	24,372		1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523
HVAC	Central Air Conditioning - ER	18.0	430,447	1.00	3,469,989		430,447	430,447	430,447	430,447	430,447	430,447	73,942	73,942	73,942
HVAC	Central Air Conditioning - TOS	18.0	12,411	1.00	223,400		12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411
HVAC	Duct Insulation and Sealing	20.0	1,974	1.00	34,864		1,974	1,974	1,974	1,974	1,974	1,974	1,974	1,974	1,974
HVAC	Gas High Efficiency Boiler - ER	25.0	26,682	1.00	581,691		26,682	26,682	26,682	26,682	26,682	26,682	26,682	26,682	21,661
HVAC	Gas High Efficiency Furnace - ER	20.0	326,460	1.00	5,388,265		326,460	326,460	326,460	326,460	326,460	326,460	244,965	244,965	244,965
HVAC	Gas High Efficiency Furnace - TOS	20.0	45,453	1.00	909,061		45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453
HVAC	Bathroom Exhaust Fan	19.0	84,905	1.00	1,613,189		84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905
HVAC	Programmable Thermostat	8.0	15,497	1.00	123,980		15,497	15,497	15,497	15,497	15,497	15,497	15,497	15,497	-
HVAC	Advanced Thermostat	11.0	120,628	1.00	1,326,912		120,628	120,628	120,628	120,628	120,628	120,628	120,628	120,628	120,628
Hot Water	HW Pipe Insulation	15.0	8,097	1.00	121,459		8,097	8,097	8,097	8,097	8,097	8,097	8,097	8,097	8,097
Hot Water	Gas Water Heater - ER	13.0	41,446	1.00	432,531		41,446	41,446	41,446	41,446	29,638	29,638	29,638	29,638	29,638
Hot Water	Heat Pum p Water Heater	15.0	1,835	1.00	27,526		1,835	1,835	1,835	1,835	1,835	1,835	1,835	1,835	1,835
Hot Water	Low Flow Faucet Aerator - Bathroom	10.0	2,251	1.00	22,507		2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251
Hot Water	Low Flow Faucet Aerator - Kitchen	10.0	5,440	1.00	54,401		5,440	5,440	5,440	5,440	5,440	5,440	5,440	5,440	5,440
Hot Water	Low Flow Showerhead	10.0	3,776	1.00	37,760		3,776	3,776	3,776	3,776	3,776	3,776	3,776	3,776	3,776
Hot Water	Water Heater Wrap	5.0	287	1.00	1,434		287	287	287	287	-	-	-	-	-
Lighting	LED Specialty Lam p - Exterior	6.1	20,265	1.00	104,639		20,265	20,265	20,265	20,265	20,265	3,011	301	-	-
Lighting	LED Specialty Lam p - Interior	10.0	93,293	1.00	532,638		93,293	93,293	93,293	93,293	93,293	13,234	13,234	13,234	13,234
Lighting	LED Omnidirectional Bulb - Exterior	6.1	8,058	1.00	19,094		8,058	8,058	726	726	726	73	-	-	-
Lighting	LED Omnidirectional Bulb - Interior	10.0	710,706	1.00	2,020,193		710,706	710,706	74,847	74,847	74,847	74,847	74,847	74,847	74,847
Shell	Air Sealing	20.0	358,231	1.00	6,673,326		358,231	358,231	358,231	358,231	358,231	358,231	358,231	358,231	358,231
Shell	Basement Sidewall Insulation	20.0	46,350	1.00	861,752		46,350	46,350	46,350	46,350	46,350	46,350	46,350	46,350	46,350
Shell	Floor Insulation	20.0	4,952	1.00	92,812		4,952	4,952	4,952	4,952	4,952	4,952	4,952	4,952	4,952
Shell	Wall Insulation	20.0	84,821	1.00	1,596,745		84,821	84,821	84,821	84,821	84,821	84,821	84,821	84,821	84,821
Shell	Attic Insulation	20.0	242,484	1.00	4,558,747		242,484	242,484	242,484	242,484	242,484	242,484	242,484	242,484	242,484
Shell	Rm Insulation	20.0	8,100	1.00	151,787		8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100
CY2019 Program Total Contribution to CPAS			2,829,382		31,893,306		2,829,382	2,829,382	2,188,191	2,188,191	2,189,222	2,071,622	1,526,569	1,525,763	1,505,244
Historic Program Total Contribution to CPAS†						2,442,585	2,442,585	2,442,585	2,234,350	2,130,143	2,094,092	1,704,999	1,704,458	1,684,673	1,678,423
Program Total CPAS						2,442,585	5,271,967	5,271,967	4,420,541	4,318,334	4,283,314	3,776,591	3,231,027	3,210,436	3,183,667
CY2019 Program Incremental Expiring Savings§									643,191	-	10,969	97,600	545,053	806	20,519
Historic Program Incremental Expiring Savings§									208,235	104,207	36,050	389,123	511	19,785	6,249
Program Total Incremental Expiring Savings§									851,426	104,207	53,019	486,724	545,564	20,591	26,768



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Appliance	Freezer	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569				
Appliance	Refrigerator - ER	9,986	9,986	9,986	9,986	9,986	9,986	9,986	9,986									
Appliance	Refrigerator - TOS	44	44	44	44	44	44	44	44									
Appliance	Room AC - ER	572	572	572														
Appliance	Room AC - TOS	86	86	86														
Consumer Electronics	Advanced Power Strip - Tier 2																	
HVAC	Air Source Heat Pump - ER	468	468	468	468	468	468											
HVAC	Air Source Heat Pump - TOS	1,523	1,523	1,523	1,523	1,523	1,523	1,523										
HVAC	Central Air Conditioning - ER	73,942	73,942	73,942	73,942	73,942	73,942	73,942	73,942	73,942								
HVAC	Central Air Conditioning - TOS	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411	12,411								
HVAC	Duct Insulation and Sealing	1,974	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513	1,513						
HVAC	Gas High Efficiency Boiler - ER	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661	21,661
HVAC	Gas High Efficiency Furnace - ER	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965	244,965
HVAC	Gas High Efficiency Furnace - TOS	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453	45,453
HVAC	Bathroom Exhaust Fan	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905	84,905						
HVAC	Programmable Thermostat																	
HVAC	Advanced Thermostat	120,628	120,628															
Hot Water	HWP Pipe Insulation	8,097	8,097	8,097	8,097	8,097	8,097											
Hot Water	Gas Water Heater - ER	29,638	29,638	29,638	29,638													
Hot Water	Heat Pump Water Heater	1,835	1,835	1,835	1,835	1,835	1,835											
Hot Water	Low Flow Faucet Aerator - Bathroom	2,251																
Hot Water	Low Flow Faucet Aerator - Kitchen	5,440																
Hot Water	Low Flow Showerhead	3,776																
Hot Water	Water Heater Wrap																	
Lighting	LED Specialty Lamp - Exterior																	
Lighting	LED Specialty Lamp - Interior	13,234																
Lighting	LED Omnidirectional Bulb - Exterior																	
Lighting	LED Omnidirectional Bulb - Interior	74,847																
Shell	Air Sealing	358,231	299,657	299,657	299,657	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149	313,149
Shell	Basement Sidewall Insulation	46,350	36,769	36,769	36,769	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135	41,135
Shell	Floor Insulation	4,952	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329	4,329
Shell	Wall Insulation	84,821	69,507	69,507	69,507	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144	77,144
Shell	Attic Insulation	242,484	208,421	208,421	208,421	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521	215,521
Shell	Rm Insulation	8,100	7,017	7,017	7,017	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105	7,105
CY2019 Program Total Contribution to CPAS		1,505,244	1,285,998	1,185,370	1,184,712	1,187,758	1,187,758	1,157,826	1,155,834	1,145,804	1,059,450	974,545	24,230	24,230	21,661	21,661	21,661	21,661
Historic Program Total Contribution to CPAS†		1,467,833	1,466,114	1,458,910	1,438,032	1,438,032	1,009,584	1,009,584	1,009,584	969,007	937,207	474,384	474,384	474,384	474,384	474,384	-	-
Program Total CPAS		2,973,078	2,752,112	2,624,279	2,602,745	2,605,790	2,177,342	2,167,410	2,165,418	2,114,811	1,996,657	1,448,929	498,614	498,614	496,045	496,045	21,661	-
CY2019 Program Incremental Expiring Savings§		-	219,246	120,628	857	(3,045)	-	9,932	1,992	10,030	88,354	84,905	950,315	-	2,500	-	-	21,661
Historic Program Incremental Expiring Savings‡		210,590	1,720	7,204	20,877	-	428,448	-	-	40,577	31,800	462,823	-	-	-	-	474,384	-
Program Total Incremental Expiring Savings§		210,590	220,966	127,832	21,535	(3,045)	428,448	9,932	1,992	50,607	118,154	547,728	950,315	-	2,500	-	474,384	21,661

Note: The green highlighted cell shows program total first year electric savings (including direct electric savings and those converted from gas). The gray cells are blank, indicating no values or do not contribute to calculating CPAS in CY2019.

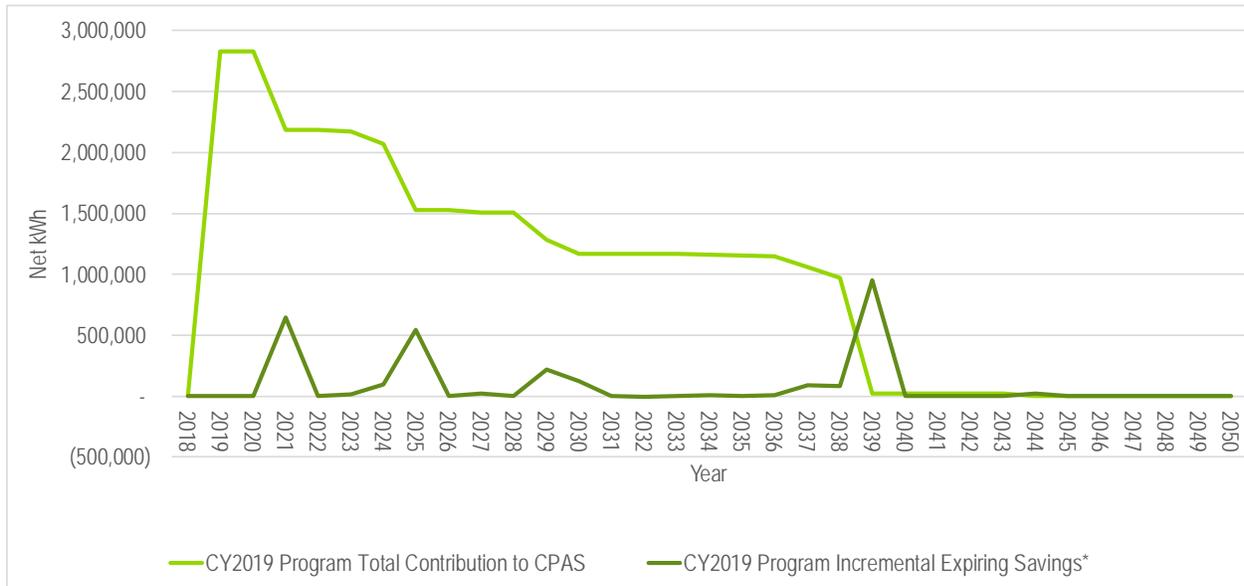
* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

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

‡ Historic savings go back to CY2018.

§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n

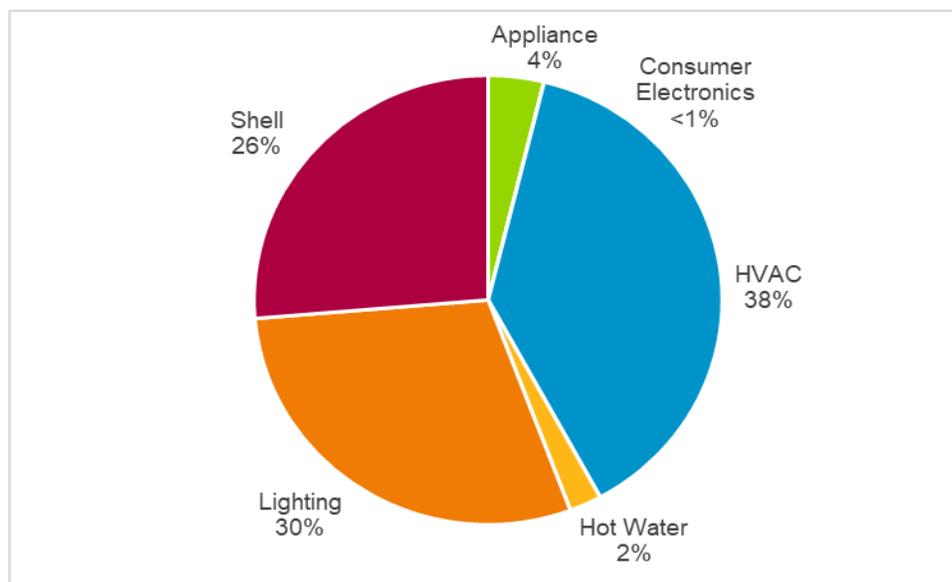
Source: Evaluation team analysis

Figure 3-2. Cumulative Persisting Annual Savings


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

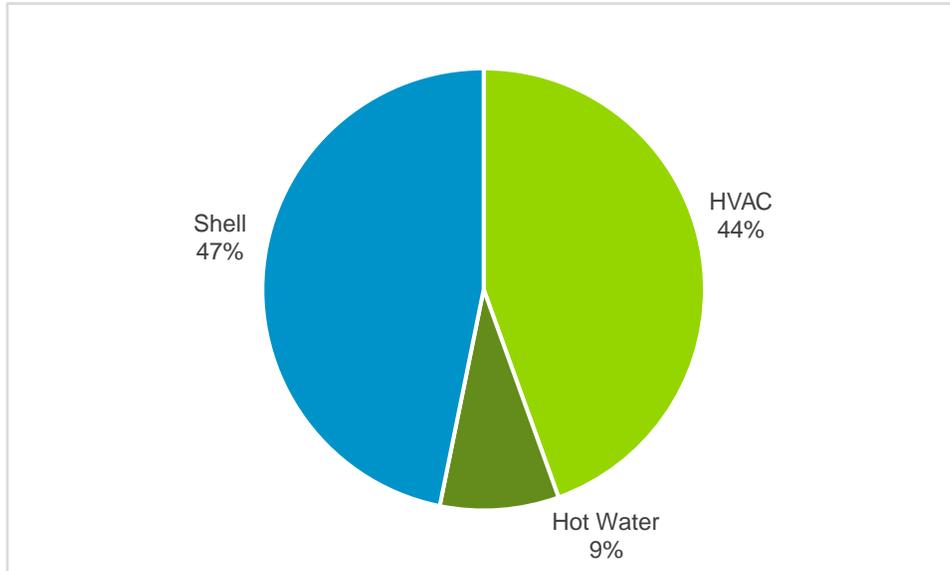
3.4 Program Savings by Measure

The program includes 36 measures of which 34 of the measures contributed to electric savings and 20 of the measures contributed to gas savings, as shown in the following tables. The HVAC and lighting measures contributed the most savings for ComEd at 38% and 30% of total combined savings, respectively.

Figure 3-3. ComEd Verified Net Savings by End Use – Combined Electricity and Gas


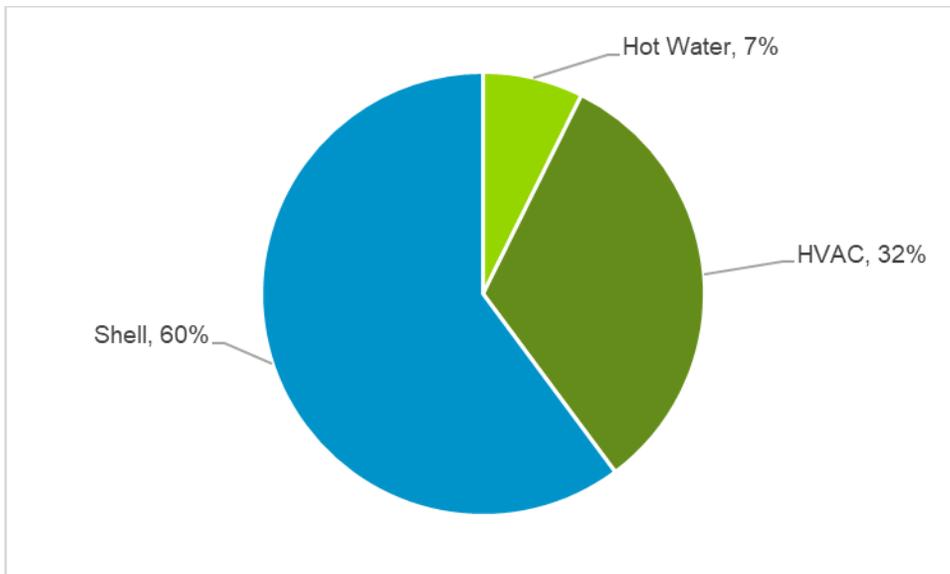
Source: ComEd tracking data and evaluation team analysis

Figure 3-4. Nicor Gas IHWAP Therm Savings by End Use



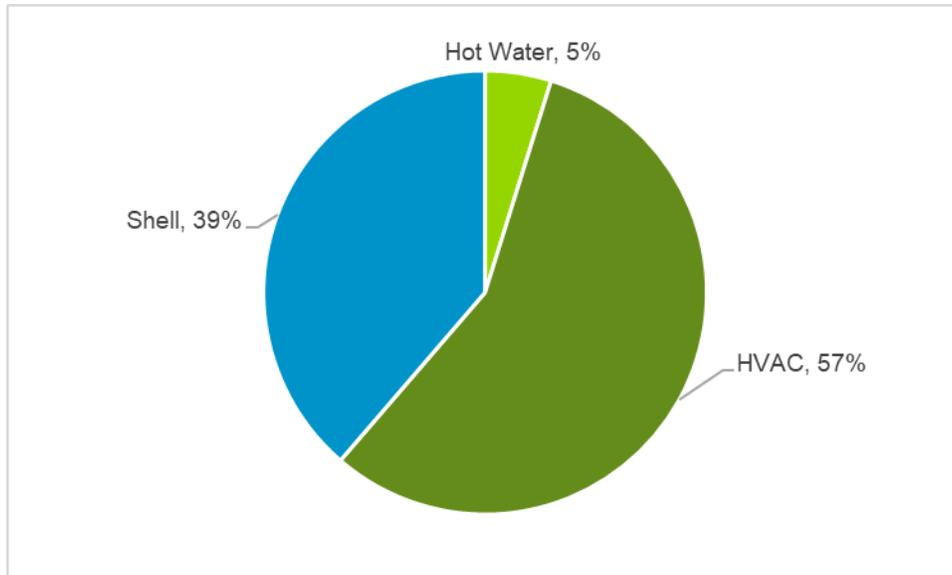
Source: Nicor Gas tracking data and evaluation team analysis

Figure 3-5. Peoples Gas Verified Net Therm Savings by End Use



Source: Peoples Gas tracking data and evaluation team analysis

Figure 3-6. North Shore Gas Verified Net Therm Savings by End Use



Source: North Shore Gas tracking data and evaluation team analysis

Table 3-7. CY2019 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	EUL (years)
Appliance	Freezer	2,569	1.00	2,569	1.00	2,569	22.0
Appliance	Refrigerator - ER	100,175	1.00	100,175	1.00	100,175	17.0
Appliance	Refrigerator - TOS	44	1.00	44	1.00	44	17.0
Appliance	Room AC - ER	5,733	1.00	5,733	1.00	5,733	12.0
Appliance	Room AC - TOS	86	1.00	86	1.00	86	12.0
Consumer Electronics	Advanced Power Strip - Tier 2	432	1.00	432	1.00	432	7.0
HVAC	Air Source Heat Pump - ER	13,970	1.00	13,970	1.00	13,970	16.0
HVAC	Air Source Heat Pump - TOS	1,523	1.00	1,523	1.00	1,523	16.0
HVAC	Central Air Conditioning - ER	430,447	1.00	430,447	1.00	430,447	18.0
HVAC	Central Air Conditioning - TOS	12,268	1.01	12,411	1.00	12,411	18.0
HVAC	Duct Insulation and Sealing	1,974	1.00	1,974	1.00	1,974	20.0
HVAC	Gas High Efficiency Boiler - ER	0	NA	0	1.00	0	25.0
HVAC	Gas High Efficiency Furnace - ER	206,307	0.99	203,968	1.00	203,968	20.0
HVAC	Gas High Efficiency Furnace - TOS	36,732	1.00	36,735	1.00	36,735	20.0
HVAC	Bathroom Exhaust Fan	84,905	1.00	84,905	1.00	84,905	19.0
HVAC	Programmable Thermostat	9,029	1.00	9,029	1.00	9,029	8.0
HVAC	Advanced Thermostat	54,609	1.00	54,609	NA†	54,609	11.0
Hot Water	HW Pipe Insulation	6,240	1.00	6,240	1.00	6,240	15.0
Hot Water	Gas Water Heater - ER	0	NA	0	1.00	0	13.0
Hot Water	Heat Pump Water Heater	2,334	0.79	1,835	1.00	1,835	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	1,027	1.11	1,143	1.00	1,143	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	2,931	1.08	3,180	1.00	3,180	10.0
Hot Water	Low Flow Showerhead	980	1.14	1,120	1.00	1,120	10.0
Hot Water	Water Heater Wrap	287	1.00	287	1.00	287	5.0
Lighting	LED Specialty Lamp - Exterior	20,265	1.00	20,265	1.00	20,265	6.1
Lighting	LED Specialty Lamp - Interior	93,871	0.99	93,293	1.00	93,293	10.0
Lighting	LED Omnidirectional Bulb - Exterior	8,058	1.00	8,058	1.00	8,058	6.1
Lighting	LED Omnidirectional Bulb - Interior	714,739	0.99	710,706	1.00	710,706	10.0
Shell	Air Sealing	163,183	1.04	170,085	1.00	170,085	20.0
Shell	Basement Sidewall Insulation	23,898	1.06	25,346	1.00	25,346	20.0
Shell	Floor Insulation	2,885	1.08	3,124	1.00	3,124	20.0
Shell	Wall Insulation	26,856	1.07	28,856	1.00	28,856	20.0
Shell	Attic Insulation	103,693	1.06	109,452	1.00	109,452	20.0
Shell	Rim Insulation	6,416	1.02	6,569	1.00	6,569	20.0
Total		2,138,464	1.00	2,148,166		2,148,166	

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd.

Source: ComEd tracking data and evaluation team analysis

Table 3-8. CY2019 Non-Coincident Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Appliance	Freezer	NR	NA	0.44	1.00	0.44
Appliance	Refrigerator - ER	NR	NA	11.43	1.00	11.43
Appliance	Refrigerator - TOS	NR	NA	0.01	1.00	0.01
Appliance	Room AC - ER	NR	NA	26.64	1.00	26.64
Appliance	Room AC - TOS	NR	NA	0.39	1.00	0.39
Consumer Electronics	Advanced Power Strip - Tier 2	NR	NA	0.10	1.00	0.10
HVAC	Air Source Heat Pump - ER	NR	NA	3.02	1.00	3.02
HVAC	Air Source Heat Pump - TOS	NR	NA	1.09	1.00	1.09
HVAC	Central Air Conditioning - ER	NR	NA	576.02	1.00	576.02
HVAC	Central Air Conditioning - TOS	NR	NA	25.18	1.00	25.18
HVAC	Duct Insulation and Sealing	NR	NA	2.47	1.00	2.47
HVAC	Gas High Efficiency Boiler - ER	NR	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Furnace - ER	NR	NA	41.90	1.00	41.90
HVAC	Gas High Efficiency Furnace - TOS	NR	NA	9.18	1.00	9.18
HVAC	Bathroom Exhaust Fan	NR	NA	17.98	1.00	17.98
HVAC	Programmable Thermostat	NR	NA	0.00	1.00	0.00
HVAC	Advanced Thermostat	NR	NA	67.16	NA†	67.16
Hot Water	HW Pipe Insulation	NR	NA	0.71	1.00	0.71
Hot Water	Gas Water Heater - ER	NR	NA	0.00	1.00	0.00
Hot Water	Heat Pump Water Heater	NR	NA	0.72	1.00	0.72
Hot Water	Low Flow Faucet Aerator - Bathroom	NR	NA	73.04	1.00	73.04
Hot Water	Low Flow Faucet Aerator - Kitchen	NR	NA	28.77	1.00	28.77
Hot Water	Low Flow Showerhead	NR	NA	3.87	1.00	3.87
Hot Water	Water Heater Wrap	NR	NA	0.03	1.00	0.03
Lighting	LED Specialty Lamp - Exterior	NR	NA	8.19	1.00	8.19
Lighting	LED Specialty Lamp - Interior	NR	NA	128.83	1.00	128.83
Lighting	LED Omnidirectional Bulb - Exterior	NR	NA	3.26	1.00	3.26
Lighting	LED Omnidirectional Bulb - Interior	NR	NA	687.28	1.00	687.28
Shell	Air Sealing	NR	NA	186.35	1.00	186.35
Shell	Basement Sidewall Insulation	NR	NA	19.90	1.00	19.90
Shell	Floor Insulation	NR	NA	1.85	1.00	1.85
Shell	Wall Insulation	NR	NA	23.99	1.00	23.99
Shell	Attic Insulation	NR	NA	93.71	1.00	93.71
Shell	Rim Insulation	NR	NA	4.20	1.00	4.20
	Total	NR	NA	2,047.70		2,047.70

NR = Not reported

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 3-9. CY2019 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Appliance	Freezer	0.41	1.00	0.41	1.00	0.41
Appliance	Refrigerator - ER	15.10	1.00	15.10	1.00	15.10
Appliance	Refrigerator - TOS	0.01	1.00	0.01	1.00	0.01
Appliance	Room AC - ER	7.99	1.00	7.99	1.00	7.99
Appliance	Room AC - TOS	0.12	1.00	0.12	1.00	0.12
Consumer Electronics	Advanced Power Strip - Tier 2	0.08	1.00	0.08	1.00	0.08
HVAC	Air Source Heat Pump - ER	1.41	1.00	1.41	1.00	1.41
HVAC	Air Source Heat Pump - TOS	0.51	1.00	0.51	1.00	0.51
HVAC	Central Air Conditioning - ER	268.43	1.00	268.43	1.00	268.43
HVAC	Central Air Conditioning - TOS	11.62	1.01	11.73	1.00	11.73
HVAC	Duct Insulation and Sealing	1.15	1.00	1.15	1.00	1.15
HVAC	Gas High Efficiency Boiler - ER	0.00	NA	0.00	1.00	0.00
HVAC	Gas High Efficiency Furnace - ER	19.65	0.99	19.53	1.00	19.53
HVAC	Gas High Efficiency Furnace - TOS	4.28	1.00	4.28	1.00	4.28
HVAC	Bathroom Exhaust Fan	9.79	1.00	9.79	1.00	9.79
HVAC	Programmable Thermostat	0.00	NA	0.00	1.00	0.00
HVAC	Advanced Thermostat	15.65	1.00	15.65	NA†	15.65
Hot Water	HW Pipe Insulation	0.71	1.00	0.71	1.00	0.71
Hot Water	Gas Water Heater - ER	0.00	NA	0.00	1.00	0.00
Hot Water	Heat Pump Water Heater	0.11	0.79	0.09	1.00	0.09
Hot Water	Low Flow Faucet Aerator - Bathroom	1.35	1.19	1.61	1.00	1.61
Hot Water	Low Flow Faucet Aerator - Kitchen	0.68	0.93	0.63	1.00	0.63
Hot Water	Low Flow Showerhead	0.11	1.02	0.11	1.00	0.11
Hot Water	Water Heater Wrap	0.03	1.00	0.03	1.00	0.03
Lighting	LED Specialty Lamp - Exterior	2.24	1.00	2.24	1.00	2.24
Lighting	LED Specialty Lamp - Interior	14.04	1.00	14.04	1.00	14.04
Lighting	LED Omnidirectional Bulb - Exterior	0.89	1.00	0.89	1.00	0.89
Lighting	LED Omnidirectional Bulb - Interior	87.97	1.00	87.97	1.00	87.97
Shell	Air Sealing	86.84	1.00	86.84	1.00	86.84
Shell	Basement Sidewall Insulation	9.27	1.00	9.27	1.00	9.27
Shell	Floor Insulation	0.86	1.00	0.86	1.00	0.86
Shell	Wall Insulation	11.18	1.00	11.18	1.00	11.18
Shell	Attic Insulation	43.67	1.00	43.67	1.00	43.67
Shell	Rim Insulation	1.95	1.01	1.96	1.00	1.96
Total		618.08	1.00	618.27		618.27

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 3-10. CY2019 Energy Savings by Measure – Gas – ComEd

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
Appliance	Freezer	0	NA	0	1.00	0	22.0
Appliance	Refrigerator - ER	0	NA	0	1.00	0	17.0
Appliance	Refrigerator - TOS	0	NA	0	1.00	0	17.0
Appliance	Room AC - ER	0	NA	0	1.00	0	12.0
Appliance	Room AC - TOS	0	NA	0	1.00	0	12.0
Consumer Electronics	Advanced Power Strip - Tier 2	0	NA	0	1.00	0	7.0
HVAC	Air Source Heat Pump - ER	0	NA	0	1.00	0	16.0
HVAC	Air Source Heat Pump - TOS	0	NA	0	1.00	0	16.0
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	Duct Insulation and Sealing	0	NA	0	1.00	0	20.0
HVAC	Gas High Efficiency Boiler - ER	910	1.00	910	1.00	910	25.0
HVAC	Gas High Efficiency Furnace - ER	4,179	1.00	4,179	1.00	4,179	20.0
HVAC	Gas High Efficiency Furnace - TOS	297	1.00	297	1.00	297	20.0
HVAC	Bathroom Exhaust Fan	0	NA	0	1.00	0	19.0
HVAC	Programmable Thermostat	221	1.00	221	1.00	221	8.0
HVAC	Advanced Thermostat	2,252	1.00	2,252	NA†	2,252	11.0
Hot Water	HW Pipe Insulation	63	1.00	63	1.00	63	15.0
Hot Water	Gas Water Heater - ER	1,414	1.00	1,414	1.00	1,414	13.0
Hot Water	Heat Pump Water Heater	0	NA	0	1.00	0	15.0
Hot Water	Low Flow Faucet Aerator - Bathroom	38	1.00	38	1.00	38	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	77	1.00	77	1.00	77	10.0
Hot Water	Low Flow Showerhead	90	1.00	91	1.00	91	10.0
Hot Water	Water Heater Wrap	0	NA	0	1.00	0	5.0
Lighting	LED Specialty Lamp - Exterior	0	NA	0	1.00	0	6.1
Lighting	LED Specialty Lamp - Interior	0	NA	0	1.00	0	10.0
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
Shell	Air Sealing	5,624	1.14	6,419	1.00	6,419	20.0
Shell	Basement Sidewall Insulation	654	1.10	717	1.00	717	20.0
Shell	Floor Insulation	53	1.18	62	1.00	62	20.0
Shell	Wall Insulation	1,707	1.12	1,909	1.00	1,909	20.0
Shell	Attic Insulation	3,942	1.15	4,539	1.00	4,539	20.0
Shell	Rim Insulation	43	1.23	52	1.00	52	20.0
	Total Therms	21,564	1.08	23,242		23,242	
	Total kWh Converted from Therms‡	632,055	1.08	681,215		681,215	

NA = Not applicable

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The 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 evaluation team analysis

Table 3-11. CY2019 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	2,569	1.00	2,569	1.00	2,569
Appliance	Refrigerator - ER	100,175	1.00	100,175	1.00	100,175
Appliance	Refrigerator - TOS	44	1.00	44	1.00	44
Appliance	Room AC - ER	5,733	1.00	5,733	1.00	5,733
Appliance	Room AC - TOS	86	1.00	86	1.00	86
Consumer Electronics	Advanced Power Strip - Tier 2	432	1.00	432	1.00	432
HVAC	Air Source Heat Pump - ER	13,970	1.00	13,970	1.00	13,970
HVAC	Air Source Heat Pump - TOS	1,523	1.00	1,523	1.00	1,523
HVAC	Central Air Conditioning - ER	430,447	1.00	430,447	1.00	430,447
HVAC	Central Air Conditioning - TOS	12,268	1.01	12,411	1.00	12,411
HVAC	Duct Insulation and Sealing	1,974	1.00	1,974	1.00	1,974
HVAC	Gas High Efficiency Boiler - ER	26,682	1.00	26,682	1.00	26,682
HVAC	Gas High Efficiency Furnace - ER	328,799	0.99	326,460	1.00	326,460
HVAC	Gas High Efficiency Furnace - TOS	45,450	1.00	45,453	1.00	45,453
HVAC	Bathroom Exhaust Fan	84,905	1.00	84,905	1.00	84,905
HVAC	Programmable Thermostat	15,497	1.00	15,497	1.00	15,497
HVAC	Advanced Thermostat	120,628	1.00	120,628	NA†	120,628
Hot Water	HW Pipe Insulation	8,097	1.00	8,097	1.00	8,097
Hot Water	Gas Water Heater - ER	41,446	1.00	41,446	1.00	41,446
Hot Water	Heat Pump Water Heater	2,334	0.79	1,835	1.00	1,835
Hot Water	Low Flow Faucet Aerator - Bathroom	2,133	1.06	2,251	1.00	2,251
Hot Water	Low Flow Faucet Aerator - Kitchen	5,191	1.05	5,440	1.00	5,440
Hot Water	Low Flow Showerhead	3,627	1.04	3,776	1.00	3,776
Hot Water	Water Heater Wrap	287	1.00	287	1.00	287
Lighting	LED Specialty Lamp - Exterior	20,265	1.00	20,265	1.00	20,265
Lighting	LED Specialty Lamp - Interior	93,871	0.99	93,293	1.00	93,293
Lighting	LED Omnidirectional Bulb - Exterior	8,058	1.00	8,058	1.00	8,058
Lighting	LED Omnidirectional Bulb - Interior	714,739	0.99	710,706	1.00	710,706
Shell	Air Sealing	328,012	1.09	358,231	1.00	358,231
Shell	Basement Sidewall Insulation	43,052	1.08	46,350	1.00	46,350
Shell	Floor Insulation	4,438	1.12	4,952	1.00	4,952
Shell	Wall Insulation	76,897	1.10	84,821	1.00	84,821
Shell	Attic Insulation	219,222	1.11	242,484	1.00	242,484
Shell	Rim Insulation	7,665	1.06	8,100	1.00	8,100
	Total‡	2,770,519	1.02	2,829,382		2,829,382

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

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

Source: ComEd tracking data and evaluation team analysis

The IHWAP component includes measures that save water. That reduction in water produces secondary kWh savings from water supply and wastewater treatment. Table 3-12 shows the secondary measure level savings. The savings in this table are included within the electricity savings in the previous tables in this section.

Table 3-12. Secondary Energy Savings from Water Reduction by Measure – Electric

End Use Type	Research Category	Ex Ante Annual Water Savings (gallons)	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate (RR _{water})	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Appliance	Freezer	0	0	NA	0	1.00	0
Appliance	Refrigerator - ER	674	0	NA	0	1.00	0
Appliance	Refrigerator - TOS	0	0	NA	0	1.00	0
Appliance	Room AC - ER	0	0	NA	0	1.00	0
Appliance	Room AC - TOS	0	0	NA	0	1.00	0
Consumer Electronics	Advanced Power Strip - Tier 2	0	0	NA	0	1.00	0
HVAC	Air Source Heat Pump - ER	0	0	NA	0	1.00	0
HVAC	Air Source Heat Pump - TOS	0	0	NA	0	1.00	0
HVAC	Central Air Conditioning - ER	0	0	NA	0	1.00	0
HVAC	Central Air Conditioning - TOS	0	0	NA	0	1.00	0
HVAC	Duct Insulation and Sealing	0	0	NA	0	1.00	0
HVAC	Gas High Efficiency Boiler - ER	0	0	NA	0	1.00	0
HVAC	Gas High Efficiency Furnace - ER	0	0	NA	0	1.00	0
HVAC	Gas High Efficiency Furnace - TOS	0	0	NA	0	1.00	0
HVAC	Bathroom Exhaust Fan	0	0	NA	0	1.00	0
HVAC	Programmable Thermostat	0	0	NA	0	1.00	0
HVAC	Advanced Thermostat	674	0	NA	0	NA†	0
Hot Water	HW Pipe Insulation	0	0	NA	0	1.00	0
Hot Water	Gas Water Heater - ER	0	0	NA	0	1.00	0
Hot Water	Heat Pump Water Heater	0	0	NA	0	1.00	0
Hot Water	Low Flow Faucet Aerator - Bathroom	23,918	120	1.00	120	1.00	120
Hot Water	Low Flow Faucet Aerator - Kitchen	48,831	245	1.00	245	1.00	245
Hot Water	Low Flow Showerhead	26,298	132	1.01	133	1.00	133
Hot Water	Water Heater Wrap	0	0	NA	0	1.00	0
Lighting	LED Specialty Lamp - Exterior	0	0	NA	0	1.00	0
Lighting	LED Specialty Lamp - Interior	0	0	NA	0	1.00	0
Lighting	LED Omnidirectional Bulb - Exterior	0	0	NA	0	1.00	0
Lighting	LED Omnidirectional Bulb - Interior	0	0	NA	0	1.00	0
Shell	Air Sealing	0	0	NA	0	1.00	0
Shell	Basement Sidewall Insulation	0	0	NA	0	1.00	0
Shell	Floor Insulation	0	0	NA	0	1.00	0
Shell	Wall Insulation	0	0	NA	0	1.00	0
Shell	Attic Insulation	0	0	NA	0	1.00	0
Shell	Rim Insulation	0	0	NA	0	1.00	0
Total		100,394	496	1.00	498		498

NA = Not applicable

Note: The savings in this table reflects only secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd, not those claimed by gas utilities.

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 3-13. CY2019 Natural Gas Energy Savings by Measure – Nicor Gas

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
HVAC	Duct Insulation and Sealing	2,137	1.00	2,137	1.00	2,137	20.0
HVAC	Gas High Efficiency Boiler - ER	3,295	1.12	3,694	1.00	3,694	25.0
HVAC	Gas High Efficiency Boiler - TOS	724	1.00	724	1.00	724	25.0
HVAC	Gas High Efficiency Furnace - ER	47,950	1.00	47,950	1.00	47,950	20.0
HVAC	Gas High Efficiency Furnace - TOS	9,657	1.00	9,657	1.00	9,657	20.0
HVAC	Programmable Thermostat	7,225	1.00	7,225	1.00	7,225	8.0
HVAC	Advanced Thermostat	15,161	1.00	15,161	NA†	15,161	11.0
Hot Water	HW Pipe Insulation	1,470	1.00	1,470	1.00	1,470	15.0
Hot Water	Gas Water Heater - ER	13,136	1.00	13,139	1.00	13,139	13.0
Hot Water	Gas Water Heater - TOS	417	1.00	417	1.00	417	13.0
Hot Water	Low Flow Faucet Aerator - Bathroom	393	1.00	393	1.00	393	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	1,192	1.01	1,201	1.00	1,201	10.0
Hot Water	Low Flow Showerhead	836	1.00	836	1.00	836	10.0
Shell	Air Sealing	32,431	1.16	37,575	1.00	37,575	20.0
Shell	Basement Sidewall Insulation	9,058	1.15	10,412	1.00	10,412	20.0
Shell	Floor Insulation	1,399	1.17	1,638	1.00	1,638	20.0
Shell	Wall Insulation	8,532	1.15	9,832	1.00	9,832	20.0
Shell	Attic Insulation	27,831	1.16	32,362	1.00	32,362	20.0
Shell	Rim Insulation	2,062	1.13	2,323	1.00	2,323	20.0
Total‡		184,907	1.07	198,146		198,146	

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

‡ The total excludes the electric interactive effects on the total therms.

Source: Nicor Gas tracking data and Guidehouse team analysis.

Table 3-14. CY2019 Natural Gas Energy Savings by Measure – Peoples Gas

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
HVAC	Gas High Efficiency Boiler - ER	2,813	1.00	2,813	1.00	2,813	25.0
HVAC	Gas High Efficiency Furnace - ER	7,644	1.00	7,644	1.00	7,644	20.0
HVAC	Programmable Thermostat	1,126	1.00	1,126	1.00	1,126	8.0
HVAC	Advanced Thermostat	3,009	1.00	3,009	1.00	3,009	11.0
Hot Water	HW Pipe Insulation	666	1.00	666	1.00	666	15.0
Hot Water	Gas Water Heater - ER	2,064	0.97	1,994	1.00	1,994	13.0
Hot Water	Low Flow Faucet Aerator - Bathroom	76	1.00	76	1.00	76	10.0
Hot Water	Low Flow Faucet Aerator - Kitchen	403	1.00	403	1.00	403	10.0
Hot Water	Low Flow Showerhead	149	1.00	149	1.00	149	10.0
Shell	Air Sealing	9,094	1.20	10,951	1.00	10,951	20.0
Shell	Basement Sidewall Insulation	698	1.23	857	1.00	857	20.0
Shell	Floor Insulation	150	1.31	196	1.00	196	20.0
Shell	Wall Insulation	4,122	1.17	4,829	1.00	4,829	20.0
Shell	Attic Insulation	4,562	1.17	5,336	1.00	5,336	20.0
Shell	Rim Insulation	168	1.14	191	1.00	191	20.0
Shell	Attic, Wall, Ceiling Insulation	3,132	1.49	4,662	1.00	4,662	20.0
Total†		39,878	1.13	44,903		44,903	

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

‡ The total excludes the electric interactive effects on the total therms.

Source: Peoples Gas tracking data and Guidehouse team analysis.

Table 3-15. CY2019 Natural Gas Energy Savings by Measure – North Shore Gas

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTG*	Verified Net Savings (Therms)	EUL (years)
HVAC	Gas High Efficiency Furnace - ER	1,873	1.00	1,873	1.00	1,873	20.0
HVAC	Gas High Efficiency Furnace - TOS	153	1.00	153	1.00	153	20.0
HVAC	Advanced Thermostat	651	1.00	651	NA+	651	11.0
Hot Water	Gas Water Heater - ER	216	1.00	216	1.00	216	13.0
Hot Water	Low Flow Faucet Aerator - Bathroom	5	1.00	5	1.00	5	10.0
Hot Water	Low Flow Showerhead	8	1.00	8	1.00	8	10.0
Shell	Air Sealing	605	1.18	711	1.00	711	20.0
Shell	Basement Sidewall Insulation	621	1.49	923	1.00	923	20.0
Shell	Attic Insulation	168	1.18	198	1.00	198	20.0
Total‡		4,298	1.10	4,736		4,736	

* A deemed value. Source is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

† The TRM algorithm calculates net savings for advanced thermostats.

‡ The total excludes the electric interactive effects on the total therms.

Source: North Shore Gas tracking data and Guidehouse team analysis.

3.5 Impact Analysis Findings and Recommendations

3.5.1 Impact Parameter Estimates

Guidehouse calculated verified gross energy and demand savings using the algorithms in the TRM v7.0 and v7.0 Errata where applicable. The following table presents the deemed input parameter source that Guidehouse used by measure. The TRM v7.0 allows for custom or actual values to be used for some of the input parameters. Guidehouse based these values on the program tracking database when available.

The lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life for each measure. Guidehouse calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio set by the SAG consensus process.

Table 3-16. Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source*
Quantity	Varies	Number of measures	Evaluated	ComEd Tracking Data and Guidehouse Evaluation
NTG	Varies		Deemed	Illinois SAG Consensus†
Freezer	Varies	Each	Deemed	TRM v7.0 – Section 5.1.05
Refrigerator	Varies	Each	Deemed	TRM v7.0 – Section 5.1.06
Room AC	Varies	Each	Deemed	TRM v7.0 – Section 5.1.07
Advanced Power Strip – Tier 2	216	Each	Deemed	TRM v7.0 – Section 5.2.02
Air Source Heat Pump	Varies	Each	Deemed	TRM v7.0 – Section 5.3.01
Central Air Conditioning	Varies	Each	Deemed	TRM v7.0 – Section 5.3.03
Duct Insulation and Sealing	Varies	Each	Deemed	TRM v7.0 – Section 5.3.04
Gas High Efficiency Boiler	Varies	Each	Deemed	TRM v7.0 – Section 5.3.06
Gas High Efficiency Furnace	Varies	Each	Deemed	TRM v7.0 – Section 5.3.07
Bathroom Exhaust Fan	Varies	Each	Deemed	TRM v7.0 – Section 5.3.09
Programmable Thermostat	Varies	Each	Deemed	TRM v7.0 – Section 5.3.11
Advanced Thermostat	Varies	Each	Deemed	TRM v7.0 – Section 5.3.16
HW Pipe Insulation	21	Linear Feet	Deemed	TRM v7.0 – Section 5.4.01
Gas Water Heater	Varies	Each	Deemed	TRM v7.0 – Section 5.4.02
Heat Pump Water Heater	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.03
Low Flow Faucet Aerator – Bathroom	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.04
Low Flow Faucet Aerator - Kitchen	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.04
Low Flow Showerhead	Varies	Each	Deemed	TRM v7.0 Errata – Section 5.4.05
Water Heater Wrap	143	Each	Deemed	TRM v7.0 – Section 5.4.07
LED Specialty Lamps	Varies	Each	Deemed	TRM v7.0 – Section 5.5.06
LED Omnidirectional Bulbs	Varies	Each	Deemed	TRM v7.0 – Section 5.5.08
Air Sealing	Varies	Projects	Deemed	TRM v7.0 – Section 5.6.01
Basement Sidewall Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.02
Floor Insulation	Varies	Square Feet	Deemed	TRM v7.0 Errata – Section 5.6.03
Wall Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.04
Attic Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.05
Rim Insulation	Varies	Square Feet	Deemed	TRM v7.0 – Section 5.6.06

* Deemed Source from the State of Illinois Technical Reference Manual version 7.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† The NTG values can be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.

The evaluation team developed several recommendations based on findings from the CY2019 evaluation, as follows:

3.5.2 ComEd Findings and Recommendations

3.5.2.1 Tracking Data

Finding 1. Two measures in the tracking data (MEA-2019.07.10-88071 and MEA-2019.10.17-103900) contained values in the “Calculated Total_Gross_Gallons” column but are not Hot Water measures and do not result in water savings. These measures are a refrigerator and an advanced thermostat, respectively.

Recommendation 1. Guidehouse recommends updating the tracking data to reflect no gallon savings for measures that do not yield water savings.

3.5.2.2 Central Air Conditioner

Finding 2. The evaluation team determined that the ex ante calculations used a value of “18” instead of “18000” for the installed measure capacity of central air conditioner measure with record ID MEA-2019.12.03-123872. This resulted in a realization rate of 99968% for the record.

Recommendation 2. Guidehouse recommends the implementer ensure that tracking data accurately reflects installed measure capacities of central air conditioners for future evaluations.

3.5.2.3 Gas High Efficiency Furnace

Finding 3. The evaluation team found 18 furnace records where the project also installed a central air conditioner and provided data for the installed cooling system efficiency. Despite the tracking data recording an installed cooling system efficiency, the ex ante calculations include furnace energy and demand savings using the TRM guidance for “Furnace, No Cooling System” instead of “CAC Receiving Rebate” for the cooling capacity value. The following table shows the discrepancy in the calculations:

Table 3-17. Gas High Efficiency Furnace and CAC Projects

Record ID	Central AC Installed Capacity for Project	Ex Ante Capacity Cool (Tons)	Verified Capacity Cool (Tons)	kWh Savings Per Ton	Ex Ante Savings (kWh)	Verified Savings (kWh)	Realization Rate
MEA-2018.12.17-43419	18,000	2	1.5	195	390	292.5	0.75
MEA-2019.01.24-56005	30,000	4	2.5	198	792	495	0.62
MEA-2019.11.05-110391	30,000	2	2.5	195	390	487.5	1.25

Source: ComEd tracking data and evaluation team analysis

Recommendation 3. Guidehouse recommends the ex ante calculations use the cooling capacity associated with “CAC Receiving Rebates” for those projects that installed central air conditioners and gas high efficiency furnaces, as deemed by the TRM v7.0.

3.5.2.4 Duct Insulation and Sealing

Finding 4. The evaluation team used the information provided in the tracking data and the Distributed Efficiency Look Up Table in the TRM v7.0 to assign distributed efficiency values to each project. The ComEd tracking data did not provide the location of the duct insulation installation.

Recommendation 4. Guidehouse recommends that the ex ante tracking data provides duct insulation installation location for future evaluations.

3.5.2.5 Low Flow Showerhead

Finding 5. The evaluation team found that the ex ante energy savings did not incorporate energy savings from water. We included secondary electric savings from water supply for all measures regardless if installed in a home with an electric or gas domestic hot water heating system in our estimation of verified electric savings.

Recommendation 5. Guidehouse recommends that the implementer continue tracking gallons of water saved from these measures. ComEd informed that the implementer will only be reporting gallons of water saved in CY2019. It is our understanding that ComEd and implementer will work together to incorporate necessary calculations and include secondary kWh savings from water in ex ante savings going forward. Table 3-12 shows the secondary kWh savings for these measures.

3.5.2.6 Low Flow Aerator

Finding 6. The evaluation team found that the ex ante energy savings did not incorporate energy savings from water. We included secondary electric savings from water supply for all measures regardless if installed in a home with an electric or gas domestic hot water heating system in our estimation of verified electric savings.

Recommendation 6. Guidehouse recommends that the implementer continue tracking gallons of water saved from these measures. ComEd informed that the implementer will only be reporting gallons of water saved in CY2019. It is our understanding that ComEd and implementer will work together to incorporate necessary calculations and include secondary kWh savings from water in ex ante savings going forward. Table 3-12 shows the secondary kWh savings for these measures.

3.5.2.7 Lighting Electric Heating Penalty

Finding 7. The evaluation team included electric heating penalties in the verified energy savings for lighting measures that were installed in homes that have electric heating. This inclusion has been introduced in CY2019 to account for the impact that these measures have on electric heating in homes.

Recommendation 7. Guidehouse recommends incorporating electric heating penalties when estimating savings for indoor lighting measures.

3.5.2.8 Rim Insulation

Finding 8. The tracking data provided did not specify old and new R values for rim insulation. For projects that were present in the Nicor Gas data set, the evaluation team was able to calculate verified savings using the custom R values provided in the Nicor Gas data set. For measures that were not part of the Nicor Gas data set, the team used an average value of

14.43 for R_new. The Peoples Gas and North Shore Gas data set did not provide any values of R_old or R_new.

Recommendation 8. Guidehouse recommends providing the old and new R values for all rim insulation measures.

3.5.2.9 Shell End Use Furnace Efficiency

Finding 9. The evaluation team calculated verified savings for measures in the Shell End Use using the existing heating system efficiency value and derating it by 15%, as deemed by the TRM v7.0. We performed this deration under the assumption that the existing heating system value provided had not been previously derated.

Recommendation 9. Guidehouse recommends using a derated furnace efficiency value when evaluating savings for air sealing and insulation measures.

3.5.2.10 Heat Pump Water Heater – Custom Measure

Finding 10. The evaluation team found that ex ante savings estimates for the heat pump water heater custom measure did not account for the heating cost from the conversion of heat in the home to water heat. This value is estimated as kWh_heating and subtracted as part of the energy savings equation for heat pump water heaters, as deemed in the IL TRM v7.0. Verified savings incorporated this estimate which resulted in a 79 percent realization rate for the measure.

Recommendation 10. Guidehouse recommends incorporating the heating cost by subtracting the kWh_heating value when evaluating energy savings for heat pump water heater measures.

3.5.3 Nicor Gas Findings and Recommendations

3.5.3.1 Gas High Efficiency Furnace

Finding 11. The evaluation team classified the furnaces that had Level of Repairs = "No - Fully Functional" or "Yes - Minor" as early retirement and the rest as time of sale. One measure that we classified as early retirement had an installed furnace efficiency equal to the existing furnace efficiency. The evaluation team compared the Record ID to ComEd tracking data and was able to calculate verified savings using the efficiency provided in the ComEd tracking data. The implementer confirmed the value in the ComEd tracking data was correct.

Recommendation 11. Guidehouse recommends the implementer ensure Nicor Gas tracking data accurately reflects installed efficiency values for gas high efficiency furnaces and matches ComEd tracking data for joint projects.

3.5.3.2 Gas High Efficiency Boiler

Finding 12. The evaluation team classified the furnaces that had Level of Repairs = "No - Fully Functional" or "Yes - Minor" as early retirement and the rest as time of sale. Ten projects that we classified as early retirement did not provide values for the pre installation system efficiency in the tracking data. The implementer provided these values for CY2019 in response to our finding. **Recommendation 12.** Guidehouse recommends the implementer ensure Nicor Gas tracking data contains all pre installation system efficiency values for early retirement gas high efficiency boilers for future evaluations.

3.5.3.3 Low Flow Faucet Aerator

Finding 13. For measures that did not have assigned household types, the evaluation team assumed that the household type was single family. There were four kitchen aerator measures that did not have an assigned household type but had used TRM deemed values for the manufactured homes to calculate ex ante savings. The implementer calculated savings for these measures using a household factor instead of 2.1 (multi-family) instead of the deemed single family value of 2.56, but we believe the household factor for mobile homes should align with the single family household type for the Single Family Retrofits program. This resulted in 121% realization rates for these projects with record IDs MEA-2019.02.25-57252, MEA-2019.04.04-71009, MEA-2019.05.16-78079, MEA-2019.05.01-75677.

Recommendation 13. Guidehouse recommends using the single family household factor of 2.56 for all measures that do not have custom values, as deemed by the TRM v7.0.

3.5.3.4 Basement Sidewall Insulation

Finding 14. The evaluation team found two projects that had 1 for the added R value of insulation according to the Nicor Gas tracking data. The evaluation team compared these projects' Record IDs to the ComEd tracking data and found more realistic R_added values in the ComEd tracking data, which we then used to verify savings for these two projects. The implementer confirmed the values in the ComEd tracking data were correct.

Recommendation 14. Guidehouse recommends the implementer ensure Nicor Gas tracking data accurately reflects R values of insulation and matches ComEd tracking data for joint projects.

3.5.3.5 Shell End Use Furnace Efficiency

Finding 15. The evaluation team calculated verified savings for measures in the Shell End Use using the existing heating system efficiency value and derating it by 15% for distribution losses, as deemed by the TRM v7.0. We performed this deration under the assumption that the existing heating system value provided had not been previously derated.

Recommendation 15. Guidehouse recommends using a furnace efficiency derated by distribution losses when evaluating savings for air sealing and insulation measures.

3.5.4 Peoples Gas Findings and Recommendations

3.5.4.1 Tracking Data

Finding 16. The Peoples Gas data set did not include all of the necessary inputs to verify savings. We understand that the Peoples Gas tracking system is not capable of providing all of the necessary data and used data from the 2019 ComEd tracking data and Guidehouse analysis to aid our Peoples Gas evaluation.

Recommendation 16. We recommend the implementer include as many measure inputs as possible in the Peoples Gas tracking data or send a supplementary file along with tracking data for future evaluations.

3.5.4.2 Advanced Thermostats

Finding 17. The original tracking data did not explicitly identify the existing thermostat type for advanced thermostat measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 17. If possible, we request the implementer provide existing thermostat type in future tracking data sets or in a supplementary file.

3.5.4.3 Gas Water Heater

Finding 18. The evaluation team used the default TRM value for UEF_exist and the data-provided furnace_water_heater_efficiency field for UEF_eff to estimate savings. We found six projects where the ex ante savings did not follow the above assumptions. The records are as follows:

Table 3-18. Peoples Gas Water Heater Discrepancy

Record ID	UEF_exist	UEF_eff	Ex Ante Savings (Therm)	Verified Savings (Therm)	Realization Rate
MEA-2019.06.11-83035	0.52	0.70	86.90	48.13	0.55
MEA-2019.06.08-83003	0.52	0.70	65.18	48.13	0.74
MEA-2019.06.10-83028	0.52	0.70	86.90	48.13	0.55
MEA-2019.06.27-86244	0.52	0.72	92.94	51.99	0.56
MEA-2019.07.31-88897	0.52	0.70	86.90	48.13	0.55
MEA-2019.07.12-88202	0.52	0.70	65.18	48.13	0.74

Source: Peoples Gas tracking data and evaluation team analysis

Recommendation 18. Guidehouse recommends the implementer use gathered data for UEF_exist and UEF_eff to calculate savings for early replacement gas water heaters or default to TRM assumptions.

3.5.4.4 Low Flow Aerator

Finding 19. The Peoples Gas tracking data omitted specification of faucet type as kitchen or bathroom. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 19. If possible, we request the implementer provide specific faucet type data for the low flow faucet aerator measure in future tracking data sets or in a supplementary file.

Finding 20. The implementer used custom values of household occupancy to calculate savings for aerators but did not include them in the data set. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 20. Guidehouse recommends the implementer provide custom household occupancy data for future evaluations or in a supplementary file.

3.5.4.5 Low Flow Showerhead

Finding 21. The implementer used custom values of household occupancy to calculate savings for showerheads but did not include them in the data set. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 21. Guidehouse recommends the implementer provide custom household occupancy data for future evaluations or in a supplementary file.

3.5.4.6 Air Sealing

Finding 22. The Peoples Gas data set did not provide the necessary inputs for pre-installation and post-installation infiltration (CFM50_existing and CFM50_new) to calculate savings for air sealing measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 22. If possible, we recommend the implementer provide the necessary pre-installation and post-installation infiltration (CFM50_existing and CFM50_new) for air insulation projects in future data sets or in a supplementary file.

3.5.4.7 Insulation

Finding 23. The Peoples Gas data set did not provide the necessary inputs for insulation pre-installation and post-installation R values to calculate savings for insulation measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 23. If possible, we recommend the implementer provide the necessary pre-installation and post-installation R values for insulation projects.

Finding 24. The implementer labelled all attic insulation and wall insulation measures as “Wall and Ceiling/Attic Insulation.” This measure was separated into attic insulation and wall insulation in TRM v7.0. Using the ComEd data set, we were able to distinguish the two measures for all projects except 16 projects that did not have counterparts in the ComEd data set.

Recommendation 24. Guidehouse recommends the implementer separate “Wall and Ceiling/Attic Insulation” measures as either “Wall Insulation” or “Attic Insulation” in future tracking data sets to comply with the TRM v7.0 change.

3.5.4.8 Shell End Use Furnace Efficiency

Finding 25. The evaluation team calculated verified savings for measures in the Shell End Use using the existing heating system efficiency value and derating it by 15% for distribution losses, as deemed by the TRM v7.0. We performed this deration under the assumption that the existing heating system value provided had not been previously derated.

Recommendation 25. Guidehouse recommends using a furnace efficiency derated by distribution losses when evaluating savings for air sealing and insulation measures.

3.5.5 North Shore Gas Findings and Recommendations

3.5.5.1 Tracking Data

Finding 26. The North Shore Gas data set did not include all of the necessary inputs to verify savings. We understand that the North Shore Gas tracking system is not capable of providing all of the necessary data and used data from the 2019 ComEd tracking data and Guidehouse analysis to aid our North Shore Gas evaluation.

Recommendation 26. We recommend the implementer include as many measure inputs as possible in the North Shore Gas tracking data or send a supplementary file along with tracking data for future evaluations.

3.5.5.2 Advanced Thermostats

Finding 27. The tracking data did not explicitly identify the existing thermostat type for advanced thermostat measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 27. If possible, we request the implementer provide existing thermostat type in future tracking data sets or in a supplementary file.

3.5.5.3 Low Flow Aerator

Finding 28. The North Shore Gas tracking data omitted specification of faucet type as kitchen or bathroom. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 28. If possible, we request the implementer provide specific faucet type data for the low flow faucet aerator measure in future tracking data sets or in a supplementary file.

Finding 29. The implementer used custom values of household occupancy to calculate savings for aerators but did not include them in the data set. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 29. Guidehouse recommends the implementer provide custom household occupancy data for future evaluations or in a supplementary file.

3.5.5.4 Low Flow Showerhead

Finding 30. The implementer used custom values of household occupancy to calculate savings for showerheads but did not include them in the data set. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 30. Guidehouse recommends the implementer provide custom household occupancy data for future evaluations or in a supplementary file.

3.5.5.5 Air Sealing

Finding 31. The North Shore Gas data set did not provide the necessary inputs for pre-installation and post-installation infiltration (CFM50_existing and CFM50_new) to calculate savings for air sealing measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 31. If possible, we recommend the implementer provide the necessary pre-installation and post-installation infiltration (CFM50_existing and CFM50_new) for air insulation projects in future data sets or in a supplementary file.

3.5.5.6 Insulation

Finding 32. The North Shore Gas data set did not provide the necessary inputs for insulation pre-installation and post-installation R values to calculate savings for insulation measures. The implementer provided this data for CY2019 in a supplementary file in response to our finding.

Recommendation 32. If possible, we recommend the implementer provide the necessary pre-installation and post-installation R values for insulation projects or in a supplementary file.

3.5.5.7 Shell End Use Furnace Efficiency

Finding 33. The evaluation team calculated verified savings for measures in the Shell End Use using the existing heating system efficiency value and derating it by 15% for distribution losses, as deemed by the TRM v7.0. We performed this deration under the assumption that the existing heating system value provided had not been previously derated.

Recommendation 33. Guidehouse recommends using a furnace efficiency derated by distribution losses when evaluating savings for air sealing and insulation measures.

3.6 Appendix 2. Total Resource Cost Detail

Table 3-19, Table 3-20, Table 3-21, and Table 3-22 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report for ComEd, Nicor Gas, Peoples Gas, and North Shore Gas, respectively. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-19. Total Resource Cost Savings Summary for ComEd

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Verified Gross Electric Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Gas Savings (Therms)	Gross Heating Penalty (kWh)‡	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	Verified Net NTG (Therms)	Verified Net Electric Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Gas Savings (Therms)	Net Heating Penalty (kWh)‡	Net Heating Penalty (Therms)
Appliance	Freezer	Each	74	22.0	No	2,569	0.41	0	0	0	1.00	1.00	1.00	2,569	0.41	0	0	0
Appliance	Refrigerator - ER§	Each	228	17.0	Yes	100,175	15.10	0	0	0	1.00	1.00	1.00	100,175	15.10	0	0	0
Appliance	Refrigerator - TOS	Each	1	17.0	No	44	0.01	0	0	0	1.00	1.00	1.00	44	0.01	0	0	0
Appliance	Room AC - ER§	Each	92	12.0	Yes	5,733	7.99	0	0	0	1.00	1.00	1.00	5,733	7.99	0	0	0
Appliance	Room AC - TOS	Each	3	12.0	No	86	0.12	0	0	0	1.00	1.00	1.00	86	0.12	0	0	0
Consumer Electronics	Advanced Power Strip - Tier 2	Each	2	7.0	No	432	0.08	0	0	0	1.00	1.00	1.00	432	0.08	0	0	0
HVAC	Air Source Heat Pump - ER§	Each	1	16.0	Yes	13,970	1.41	0	0	0	1.00	1.00	1.00	13,970	1.41	0	0	0
HVAC	Air Source Heat Pump - TOS	Each	4	16.0	No	1,523	0.51	0	0	0	1.00	1.00	1.00	1,523	0.51	0	0	0
HVAC	Central Air Conditioning - ER§	Each	345	18.0	Yes	430,447	268.43	0	0	0	1.00	1.00	1.00	430,447	268.43	0	0	0
HVAC	Central Air Conditioning - TOS	Each	59	18.0	No	12,411	11.73	0	0	0	1.00	1.00	1.00	12,411	11.73	0	0	0
HVAC	Duct Insulation and Sealing§	Each	5	20.0	No	1,974	1.15	0	0	0	1.00	1.00	1.00	1,974	1.15	0	0	0
HVAC	Gas High Efficiency Boiler - ER§	Each	6	25.0	Yes	0	0.00	910	0	0	1.00	1.00	1.00	0	0.00	910	0	0
HVAC	Gas High Efficiency Furnace - ER§	Each	425	20.0	Yes	203,968	19.53	4,179	0	-2,114	1.00	1.00	1.00	203,968	19.53	4,179	0	-2,114
HVAC	Gas High Efficiency Furnace - TOS	Each	75	20.0	No	36,735	4.28	297	0	-375	1.00	1.00	1.00	36,735	4.28	297	0	-375
HVAC	Bathroom Exhaust Fan	Each	783	19.0	No	84,905	9.79	0	0	0	1.00	1.00	1.00	84,905	9.79	0	0	0
HVAC	Programmable Thermostat	Each	118	8.0	No	9,029	0.00	221	0	0	1.00	1.00	1.00	9,029	0.00	221	0	0
HVAC	Advanced Thermostat	Each	302	11.0	No	54,609	15.65	2,252	0	0	1.00	1.00	1.00	54,609	15.65	2,252	0	0
Hot Water	HW Pipe Insulation	Linear Feet	376	15.0	No	6,240	0.71	63	0	0	1.00	1.00	1.00	6,240	0.71	63	0	0
Hot Water	Gas Water Heater - ER§	Each	27	13.0	Yes	0	0.00	1,414	0	0	1.00	1.00	1.00	0	0.00	1,414	0	0
Hot Water	Heat Pump Water Heater	Each	1	15.0	No	1,835	0.09	0	0	0	1.00	1.00	1.00	1,835	0.09	0	0	0
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	77	10.0	No	1,023	1.61	38	0	0	1.00	1.00	1.00	1,023	1.61	38	0	0
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	22	10.0	No	2,935	0.63	77	0	0	1.00	1.00	1.00	2,935	0.63	77	0	0
Hot Water	Low Flow Showerhead	Each	33	10.0	No	987	0.11	91	0	0	1.00	1.00	1.00	987	0.11	91	0	0
Hot Water	Water Heater Wrap	Each	2	5.0	No	287	0.03	0	0	0	1.00	1.00	1.00	287	0.03	0	0	0
Lighting	LED Specialty Lamp - Exterior§	Each	129	6.1	No	20,265	2.24	0	0	0	1.00	1.00	1.00	20,265	2.24	0	0	0
Lighting	LED Specialty Lamp - Interior§	Each	2,420	10.0	No	93,293	14.04	0	0	-2,061	1.00	1.00	1.00	93,293	14.04	0	0	-2,061
Lighting	LED Omnidirectional Bulb - Exterior§	Each	67	6.1	No	8,058	0.89	0	0	0	1.00	1.00	1.00	8,058	0.89	0	0	0
Lighting	LED Omnidirectional Bulb - Interior§	Each	13,119	10.0	No	710,706	87.97	0	0	-15,727	1.00	1.00	1.00	710,706	87.97	0	0	-15,727
Shell	Air Sealing§	Projects	599	20.0	No	170,085	86.84	6,419	0	0	1.00	1.00	1.00	170,085	86.84	6,419	0	0
Shell	Basement Sidewall Insulation§	Square Feet	29,839	20.0	No	25,346	9.27	717	0	0	1.00	1.00	1.00	25,346	9.27	717	0	0
Shell	Floor Insulation§	Square Feet	19,960	20.0	No	3,124	0.86	62	0	0	1.00	1.00	1.00	3,124	0.86	62	0	0
Shell	Wall Insulation§	Square Feet	163,647	20.0	No	28,856	11.18	1,909	0	0	1.00	1.00	1.00	28,856	11.18	1,909	0	0
Shell	Attic Insulation§	Square Feet	465,764	20.0	No	109,452	43.67	4,539	0	0	1.00	1.00	1.00	109,452	43.67	4,539	0	0
Shell	Rim Insulation§	Square Feet	21,298	20.0	No	6,569	1.96	52	0	0	1.00	1.00	1.00	6,569	1.96	52	0	0
Total			719,903	16.0		2,147,669	618.27	23,242	0	-20,277				2,147,669	618.27	23,242	0	-20,277

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis excludes secondary energy savings from water reduction measures. Table 3-19 represents the kWh savings from Table 3-7 minus those shown in Table 3-12.

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

‡ The electric heating penalties are included in the verified gross and net savings columns.

§ The annual savings for this measure vary over time. See the CPAS tables (Table 3-4 to Table 3-6).

Source: ComEd tracking data and evaluation team analysis



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-20. Total Resource Cost Savings Summary for Nicor Gas

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Ex Ante Gross Savings (Therms)	Verified Gross Gas Savings (Therms)	NTG (Therms)	Verified Net Gas Savings (Therms)
HVAC	Duct Insulation and Sealing	Each	5	20.0	No	2,137	2,137	1.00	2,137
HVAC	Gas High Efficiency Boiler - ER	Each	14	25.0	Yes	3,295	3,694	1.00	3,694
HVAC	Gas High Efficiency Boiler - TOS	Each	5	25.0	No	724	724	1.00	724
HVAC	Gas High Efficiency Furnace - ER	Each	344	20.0	Yes	47,950	47,950	1.00	47,950
HVAC	Gas High Efficiency Furnace - TOS	Each	73	20.0	No	9,657	9,657	1.00	9,657
HVAC	Programmable Thermostat	Each	117	8.0	No	7,225	7,225	1.00	7,225
HVAC	Advanced Thermostat	Each	225	11.0	No	15,161	15,161	1.00	15,161
Hot Water	HW Pipe Insulation	Linear Feet	1,671	15.0	No	1,470	1,470	1.00	1,470
Hot Water	Gas Water Heater - ER	Each	287	13.0	Yes	13,136	13,139	1.00	13,139
Hot Water	Gas Water Heater - TOS	Each	14	13.0	No	417	417	1.00	417
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	424	10.0	No	393	393	1.00	393
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	142	10.0	No	1,192	1,201	1.00	1,201
Hot Water	Low Flow Showerhead	Each	242	10.0	No	836	836	1.00	836
Shell	Air Sealing	Projects	483	20.0	No	32,431	37,575	1.00	37,575
Shell	Basement Sidewall Insulation	Square Feet	27,735	20.0	No	9,058	10,412	1.00	10,412
Shell	Floor Insulation	Square Feet	18,534	20.0	No	1,399	1,638	1.00	1,638
Shell	Wall Insulation	Square Feet	96,619	20.0	No	8,532	9,832	1.00	9,832
Shell	Attic Insulation	Square Feet	386,718	20.0	No	27,831	32,362	1.00	32,362
Shell	Rim Insulation	Square Feet	19,292	20.0	No	2,062	2,323	1.00	2,323
Total			552,944	18.3		184,907	198,146		198,146

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

Source: Guidehouse analysis of tracking data.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-21. Total Resource Cost Savings Summary for Peoples Gas

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	NTG (Therms)	Verified Net Savings (Therms)
HVAC	Gas High Efficiency Boiler - ER	Each	12	25.0	Yes	2,813	2,813	1.00	2,813
HVAC	Gas High Efficiency Furnace - ER	Each	56	20.0	Yes	7,644	7,644	1.00	7,644
HVAC	Programmable Thermostat	Each	17	8.0	No	1,126	1,126	1.00	1,126
HVAC	Advanced Thermostat	Each	44	11.0	No	3,009	3,009	1.00	3,009
Hot Water	HW Pipe Insulation	Linear Feet	757	15.0	No	666	666	1.00	666
Hot Water	Gas Water Heater - ER	Each	36	13.0	Yes	2,064	1,994	1.00	1,994
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	67	10.0	No	76	76	1.00	76
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	36	10.0	No	403	403	1.00	403
Hot Water	Low Flow Showerhead	Each	47	10.0	No	149	149	1.00	149
Shell	Air Sealing	Projects	86	20.0	No	9,094	10,951	1.00	10,951
Shell	Basement Sidewall Insulation	Square Feet	1,622	20.0	No	698	857	1.00	857
Shell	Floor Insulation	Square Feet	1,548	20.0	No	150	196	1.00	196
Shell	Wall Insulation	Square Feet	56,642	20.0	No	4,122	4,829	1.00	4,829
Shell	Attic Insulation	Square Feet	49,461	20.0	No	4,562	5,336	1.00	5,336
Shell	Rim Insulation	Square Feet	1,700	20.0	No	168	191	1.00	191
Shell	Attic, Wall, Ceiling Insulation	Square Feet	31,583	20.0	No	3,132	4,662	1.00	4,662
Total			143,714	18.9		39,878	44,903		44,903

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

Source: Guidehouse analysis of tracking data.



Joint Utility Single-Family Retrofits - Income Eligible Impact Evaluation Report

Table 3-22. Total Resource Cost Savings Summary for North Shore Gas

End Use Type	Research Category	Units	Quantity	EUL (years)* ER Flag†	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	NTG (Therms)	Verified Net Savings (Therms)
HVAC	Gas High Efficiency Furnace - ER	Each	10	20.0 Yes	1,873	1,873	1.00	1,873
HVAC	Gas High Efficiency Furnace - TOS	Each	1	20.0 No	153	153	1.00	153
HVAC	Advanced Thermostat	Each	11	11.0 No	651	651	NA†	651
Hot Water	Gas Water Heater - ER	Each	8	13.0 Yes	216	216	1.00	216
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	5	10.0 No	5	5	1.00	5
Hot Water	Low Flow Showerhead	Each	5	10.0 No	8	8	1.00	8
Shell	Air Sealing	Projects	9	20.0 No	605	711	1.00	711
Shell	Basement Sidewall Insulation	Square Feet	2,628	20.0 No	621	923	1.00	923
Shell	Attic Insulation	Square Feet	2,346	20.0 No	168	198	1.00	198
Total			5,023	18.4	4,298	4,736		4,736

* The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

Source: Guidehouse analysis of tracking data.