



# ComEd Appliance Rebates Program Impact Evaluation Report

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

Presented to  
ComEd

**FINAL**

April 17, 2020

***Prepared by:***

Andy Erickson  
Guidehouse

Jennifer Ma  
Guidehouse

Michael Freed  
Guidehouse

[www.guidehouse.com](http://www.guidehouse.com)



**Submitted to:**

ComEd  
2011 Swift Drive  
Oak Brook, IL 60523

**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	Nishant Mehta, Managing Consultant 608.497.2345 nishant.mehta@guidehouse.com
--	---	--

Disclaimer: This report was prepared by Guidehouse for ComEd. 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. Program Description .....	1
3. Program Savings Detail .....	2
4. Cumulative Persisting Annual Savings .....	3
5. Program Savings by Measure .....	10
6. Impact Analysis Findings and Recommendations .....	14
6.1 Impact Parameter Estimates .....	14
6.2 Other Impact Findings and Recommendations .....	15
7. Appendix 1. Total Resource Cost Detail .....	16

## LIST OF TABLES AND FIGURES

Figure 2-1. Number of Measures Installed by Type .....	2
Figure 4-1. Cumulative Persisting Annual Savings .....	10
Figure 5-1. Verified Net Savings by Measure – Electric .....	11
Table 2-1. CY2019 Volumetric Findings Detail .....	1
Table 3-1. CY2019 Total Annual Incremental Electric Savings .....	3
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric .....	4
Table 4-2. Cumulative Persisting Annual Savings (CPAS) – Gas .....	6
Table 4-3. Cumulative Persisting Annual Savings (CPAS) – Total .....	8
Table 5-1. CY2019 Energy Savings by Measure – Electric .....	11
Table 5-2. CY2019 Non-Coincident Demand Savings by Measure .....	12
Table 5-3. CY2019 Summer Peak Demand Savings by Measure .....	12
Table 5-4. CY2019 Energy Savings by Measure – Gas .....	13
Table 5-5. CY2019 Energy Savings by Measure – Total Combining Electricity and Gas .....	13
Table 5-6. Secondary Energy Savings from Water Reduction by Measure – Electric .....	14
Table 6-1. Savings Parameters .....	15
Table 7-1. Total Resource Cost Savings Summary .....	16

## 1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2019 Appliance Rebates Program. It includes a summary of the energy and demand impacts for the total program broken out by relevant measure and program structure details. The appendix provides the impact analysis methodology and details of the Total Resource Cost inputs. CY2019 covers January 1, 2019 through December 31, 2019.

## 2. PROGRAM DESCRIPTION

The Appliance Rebates Program is designed to increase the market share of ENERGY STAR® appliances sold through retail (in-store or online) sales channels by providing rebates to decrease customer costs, as well as information and education to increase customer awareness and acceptance of energy efficient appliances. The program targets residential customers who purchase new or replacement ENERGY STAR® appliances including air purifiers, clothes washers, clothes dryers, dehumidifiers, freezers, refrigerators, room air conditioners, water coolers, tier 1 advanced power strips, advanced thermostats, bathroom exhaust fans, and pool pumps.

**Table 2-1. CY2019 Volumetric Findings Detail**

Participation	Total
Participants*	146,626
Total Measures	181,974
Number of Units/Projects	1.05
Installed Projects†	172,888
Air Purifier	7,703
Clothes Washer	28,040
Dehumidifier	18,785
Freezer	1,275
Refrigerator	26,237
Room AC	11,308
Clothes Dryer	1,656
Water Cooler	41
Advanced Power Strip - Tier 1	9,567
Bathroom Exhaust Fan ‡	169
Advanced Thermostat	76,821
Pool Pump	372

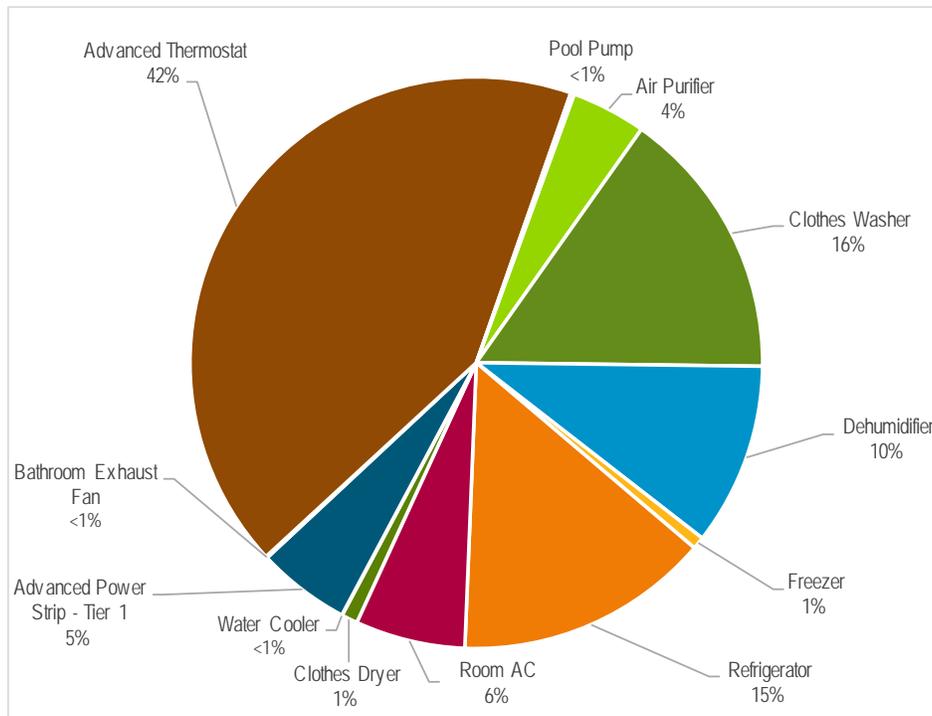
\* Participants are defined as unique account numbers

† Projects are defined as unique Rebate IDs

‡ Bathroom Exhaust Fan was reported in tracking data as "Ventilation Fan"

Source: ComEd tracking data and Guidehouse team analysis.

**Figure 2-1. Number of Measures Installed by Type**



Source: Evaluation team analysis

### 3. PROGRAM SAVINGS DETAIL

Table 3-1 summarizes the incremental energy and demand savings the Appliance Rebates Program achieved in CY2019. The gas savings are only those that ComEd may be able to claim, which excludes savings the gas utilities claim, either via joint or non-joint programs.<sup>1</sup>

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

**Table 3-1. CY2019 Total Annual Incremental Electric Savings**

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
<b>Electricity</b>			
Ex Ante Gross Savings	41,084,634	NR	9,502
Program Gross Realization Rate	0.95	NA	0.97
Verified Gross Savings	38,951,334	42,126	9,221
Program Net-to-Gross (NTG) Ratio	Varies	Varies	Varies
Verified Net Savings	34,542,134	36,895	8,429
<b>Converted from Gas†</b>			
Ex Ante Gross Savings	129,494,632	NA	NA
Program Gross Realization Rate	0.90	NA	NA
Verified Gross Savings	116,782,256	NA	NA
Program Net-to-Gross (NTG) Ratio	Varies	NA	NA
Verified Net Savings	115,648,808	NA	NA
<b>Total Electric Plus Gas</b>			
Ex Ante Gross Savings	170,579,266	NR	9,502
Program Gross Realization Rate	0.91	NA	0.97
Verified Gross Savings	155,733,590	42,126	9,221
Program Net-to-Gross (NTG) Ratio	Varies	Varies	Varies
Verified Net Savings	150,190,942	36,895	8,429

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

## 4. CUMULATIVE PERSISTING ANNUAL SAVINGS

Table 4-1 to Table 4-3 and Figure 4-1 show the measure-specific and total verified gross savings for the Appliance Rebates Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The electric CPAS across all measures installed in 2019 is 34,542,134 kWh (Table 4-1). The CY2019 gas contribution to CPAS (converted to equivalent electricity) is 115,648,808 kWh (Table 4-2). Adding the gas and electric contributions produces 150,190,942 kWh of total CY2019 contribution to CPAS (Table 4-3). 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.



# ComEd Appliance Rebates Impact Evaluation Report

**Table 4-1. 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	Air Purifier	9.0	5,998,518	0.78	42,109,596		4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844
Appliance	Clothes Dryer	16.0	266,267	0.66	2,811,781		175,736	175,736	175,736	175,736	175,736	175,736	175,736	175,736	175,736
Appliance	Clothes Washer	14.0	2,814,403	0.62	24,429,022		1,744,930	1,744,930	1,744,930	1,744,930	1,744,930	1,744,930	1,744,930	1,744,930	1,744,930
Appliance	Dehumidifier	12.0	4,254,792	0.78	39,824,857		3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738
Appliance	Freezer	22.0	66,606	0.58	849,893		38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631
Appliance	Refrigerator	17.0	1,624,631	0.61	16,847,423		991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025
Appliance	Room AC	12.0	141,350	0.67	1,136,454		94,705	94,705	94,705	94,705	94,705	94,705	94,705	94,705	94,705
Appliance	Water Cooler	10.0	5,137	0.87	44,688		4,469	4,469	4,469	4,469	4,469	4,469	4,469	4,469	4,469
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	985,401	0.86	5,932,114		847,445	847,445	847,445	847,445	847,445	847,445	847,445	847,445	847,445
HVAC	Advanced Thermostat	11.0	22,063,454	NA**	242,697,993		22,063,454	22,063,454	22,063,454	22,063,454	22,063,454	22,063,454	22,063,454	22,063,454	22,063,454
HVAC	Bathroom Exhaust Fan	19.0	4,631	0.70	61,587		3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241
Miscellaneous	Pool Pump	7.0	726,144	0.80	4,066,406		580,915	580,915	580,915	580,915	580,915	580,915	580,915	580,915	580,915
<b>CY2019 Program Total Electric Contribution to CPAS</b>			<b>38,951,334</b>		<b>380,811,814</b>		<b>34,542,134</b>	<b>33,113,774</b>	<b>33,113,774</b>						
<b>Historic Program Total Electric Contribution to CPAS‡</b>						<b>34,269,851</b>	<b>34,269,851</b>	<b>34,269,851</b>	<b>34,269,851</b>	<b>34,269,851</b>	<b>34,269,851</b>	<b>34,269,851</b>	<b>27,875,704</b>	<b>27,875,704</b>	<b>23,818,500</b>
<b>Program Total Electric CPAS</b>						<b>34,269,851</b>	<b>68,811,985</b>	<b>68,811,985</b>	<b>68,811,985</b>	<b>68,811,985</b>	<b>68,811,985</b>	<b>68,811,985</b>	<b>62,417,837</b>	<b>60,989,477</b>	<b>56,932,273</b>
<b>CY2019 Program Incremental Expiring Electric Savings§</b>								-	-	-	-	-	-	1,428,360	-
<b>Historic Program Incremental Expiring Electric Savings‡§</b>								-	-	-	-	-	6,394,147	-	4,057,204
<b>Program Total Incremental Expiring Electric Savings§</b>								-	-	-	-	-	6,394,147	1,428,360	4,057,204



# ComEd Appliance Rebates Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Appliance	Air Purifier														
Appliance	Clothes Dryer	175,736	175,736	175,736	175,736	175,736	175,736	175,736							
Appliance	Clothes Washer	1,744,930	1,744,930	1,744,930	1,744,930	1,744,930									
Appliance	Dehumidifier	3,318,738	3,318,738	3,318,738											
Appliance	Freezer	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	
Appliance	Refrigerator	991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025						
Appliance	Room AC	94,705	94,705	94,705											
Appliance	Water Cooler	4,469													
Consumer Electronics	Advanced Power Strip - Tier 1														
HVAC	Advanced Thermostat	22,063,454	22,063,454												
HVAC	Bathroom Exhaust Fan	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241				
Miscellaneous	Pool Pump														
CY2019 Program Total Electric Contribution to CPAS		28,434,930	28,430,461	6,367,007	2,953,564	2,953,564	1,208,634	1,208,634	1,032,898	41,873	41,873	38,631	38,631	38,631	-
Historic Program Total Electric Contribution to CPAS†		2,666,487	2,635,409	1,114,833	1,114,833	135,809	135,809	135,809	135,809	135,809	-	-	-	-	-
Program Total Electric CPAS		31,101,416	31,065,869	7,481,839	4,068,397	3,089,373	1,344,443	1,344,443	1,168,707	177,682	41,873	38,631	38,631	38,631	-
CY2019 Program Incremental Expiring Electric Savings§		4,678,844	4,469	22,063,454	3,413,443	-	1,744,930	-	175,736	991,025	-	3,241	-	-	38,631
Historic Program Incremental Expiring Electric Savings†§		21,152,013	31,078	1,520,576	-	979,024	-	-	-	-	135,809	-	-	-	-
Program Total Incremental Expiring Electric Savings§		25,830,857	35,547	23,584,030	3,413,443	979,024	1,744,930	-	175,736	991,025	135,809	3,241	-	-	38,631

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](https://www.ilsag.info/ntg_2019).

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

‡ Historical savings go back to CY2018

§ Incremental expiring savings are equal to  $CPAS_{Y_{n-1}} - CPAS_{Y_n}$

\*\* The TRM algorithm calculates net savings for advanced thermostats.

Source: Evaluation team analysis



# ComEd Appliance Rebates Impact Evaluation Report

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

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (Therms)	Lifetime Net Savings NTG* (Therms)†	Verified Net Therms Savings									
					2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Appliance	Air Purifier	9.0		0.78										
Appliance	Clothes Dryer	16.0		0.66										
Appliance	Clothes Washer	14.0	101,766	0.62	883,327		63,095	63,095	63,095	63,095	63,095	63,095	63,095	63,095
Appliance	Dehumidifier	12.0		0.78										
Appliance	Freezer	22.0		0.58										
Appliance	Refrigerator	17.0		0.61										
Appliance	Room AC	12.0		0.67										
Appliance	Water Cooler	10.0		0.87										
Consumer Electronics	Advanced Power Strip - Tier 1	7.0		0.86										
HVAC	Advanced Thermostat	11.0	3,882,617	NA**	42,708,785		3,882,617	3,882,617	3,882,617	3,882,617	3,882,617	3,882,617	3,882,617	3,882,617
HVAC	Bathroom Exhaust Fan	19.0		0.70										
Miscellaneous	Pool Pump	7.0		0.80										
CY2019 Program Total Gas Contribution to CPAS (Therms)			3,984,383		43,592,113		3,945,712	3,945,712	3,945,712	3,945,712	3,945,712	3,945,712	3,945,712	3,945,712
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†					-		115,648,808	115,648,808	115,648,808	115,648,808	115,648,808	115,648,808	115,648,808	115,648,808
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)†§						60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906
Program Total Gas CPAS (kWh Equivalent)†						60,598,906	176,247,714	176,247,714	176,247,714	176,247,714	176,247,714	176,247,714	176,247,714	176,247,714
CY2019 Program Incremental Expiring Gas Savings (Therms)								-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)†									-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§									-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†									-	-	-	-	-	-



# ComEd Appliance Rebates Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Appliance	Air Purifier														
Appliance	Clothes Dryer														
Appliance	Clothes Washer	63,095	63,095	63,095	63,095	63,095									
Appliance	Dehumidifier														
Appliance	Freezer														
Appliance	Refrigerator														
Appliance	Room AC														
Appliance	Water Cooler														
Consumer Electronics	Advanced Power Strip - Tier 1														
HVAC	Advanced Thermostat	3,882,617	3,882,617												
HVAC	Bathroom Exhaust Fan														
Miscellaneous	Pool Pump														
CY2019 Program Total Gas Contribution to CPAS (Therms)		3,945,712	3,945,712	63,095	63,095	63,095	-	-	-	-	-	-	-	-	-
CY2019 Program Total Gas Contribution to CPAS (kWh Equivalent)†		115,648,808	115,648,808	1,849,308	1,849,308	1,849,308	-	-	-	-	-	-	-	-	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)†§		2,180,367	2,180,367	2,180,367	2,180,367	-	-	-	-	-	-	-	-	-	-
Program Total Gas CPAS (kWh Equivalent)†		117,829,176	117,829,176	4,029,676	4,029,676	1,849,308	-	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (Therms)		-	-	3,882,617	-	-	63,095	-	-	-	-	-	-	-	-
CY2019 Program Incremental Expiring Gas Savings (kWh Equivalent)†		-	-	113,799,500	-	-	1,849,308	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)†§		58,418,539	-	-	-	2,180,367	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†		58,418,539	-	113,799,500	-	2,180,367	1,849,308	-	-	-	-	-	-	-	-

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](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.

|| Incremental expiring savings are equal to CPAS Yn-1 - CPAS Yn.

\*\* The TRM algorithm calculates net savings for advanced thermostats.

Source: Evaluation team analysis



# ComEd Appliance Rebates Impact Evaluation Report

**Table 4-3. 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	2027	
Appliance	Air Purifier	9.0	5,998,518.0	0.78	42,109,596		4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	4,678,844	
Appliance	Clothes Dryer	16.0	266,267.2	0.66	2,811,781		175,736	175,736	175,736	175,736	175,736	175,736	175,736	175,736	175,736	
Appliance	Clothes Washer	14.0	5,797,159.0	0.62	50,319,340		3,594,239	3,594,239	3,594,239	3,594,239	3,594,239	3,594,239	3,594,239	3,594,239	3,594,239	
Appliance	Dehumidifier	12.0	4,254,792.4	0.78	39,824,857		3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	3,318,738	
Appliance	Freezer	22.0	66,606.0	0.58	849,893		38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	
Appliance	Refrigerator	17.0	1,624,631.0	0.61	16,847,423		991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025	
Appliance	Room AC	12.0	141,350.0	0.67	1,136,454		94,705	94,705	94,705	94,705	94,705	94,705	94,705	94,705	94,705	
Appliance	Water Cooler	10.0	5,136.5	0.87	44,688		4,469	4,469	4,469	4,469	4,469	4,469	4,469	4,469	4,469	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	985,401.0	0.86	5,932,114		847,445	847,445	847,445	847,445	847,445	847,445	847,445	-	-	
HVAC	Advanced Thermostat	11.0	135,862,954.0	NA**	1,494,492,494		135,862,954	135,862,954	135,862,954	135,862,954	135,862,954	135,862,954	135,862,954	135,862,954	135,862,954	
HVAC	Bathroom Exhaust Fan	19.0	4,630.6	0.70	61,587		3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	
Miscellaneous	Pool Pump	7.0	726,144	0.80	4,066,406		580,915	580,915	580,915	580,915	580,915	580,915	580,915	-	-	
<b>CY2019 Program Total Contribution to CPAS</b>			<b>155,733,590</b>		<b>1,658,496,633</b>		<b>150,190,942</b>	<b>148,762,582</b>	<b>148,762,582</b>							
<b>Historic Program Total Contribution to CPAS‡</b>							<b>94,868,757</b>	<b>94,868,757</b>	<b>94,868,757</b>	<b>94,868,757</b>	<b>94,868,757</b>	<b>94,868,757</b>	<b>88,474,609</b>	<b>88,474,609</b>	<b>84,417,406</b>	
<b>Program Total CPAS</b>							<b>94,868,757</b>	<b>245,059,699</b>	<b>245,059,699</b>	<b>245,059,699</b>	<b>245,059,699</b>	<b>245,059,699</b>	<b>245,059,699</b>	<b>238,665,552</b>	<b>237,237,191</b>	<b>233,179,988</b>
<b>CY2019 Program Incremental Expiring Savings§</b>									-	-	-	-	-	1,428,360	-	
<b>Historic Program Incremental Expiring Savings‡§</b>									-	-	-	-	6,394,147	-	4,057,204	
<b>Program Total Incremental Expiring Savings§</b>									-	-	-	-	6,394,147	1,428,360	4,057,204	



# ComEd Appliance Rebates Impact Evaluation Report

End Use Type	Research Category	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Appliance	Air Purifier														
Appliance	Clothes Dryer	175,736	175,736	175,736	175,736	175,736	175,736	175,736							
Appliance	Clothes Washer	3,594,239	3,594,239	3,594,239	3,594,239	3,594,239									
Appliance	Dehumidifier	3,318,738	3,318,738	3,318,738											
Appliance	Freezer	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	38,631	
Appliance	Refrigerator	991,025	991,025	991,025	991,025	991,025	991,025	991,025	991,025						
Appliance	Room AC	94,705	94,705	94,705											
Appliance	Water Cooler	4,469													
Consumer Electronics	Advanced Power Strip - Tier 1														
HVAC	Advanced Thermostat	135,862,954	135,862,954												
HVAC	Bathroom Exhaust Fan	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241	3,241				
Miscellaneous	Pool Pump														
<b>CY2019 Program Total Contribution to CPAS</b>		<b>144,083,738</b>	<b>144,079,269</b>	<b>8,216,315</b>	<b>4,802,873</b>	<b>4,802,873</b>	<b>1,208,634</b>	<b>1,208,634</b>	<b>1,032,898</b>	<b>41,873</b>	<b>41,873</b>	<b>38,631</b>	<b>38,631</b>	<b>38,631</b>	<b>-</b>
<b>Historic Program Total Contribution to CPAS*</b>		<b>4,846,854</b>	<b>4,815,776</b>	<b>3,295,200</b>	<b>3,295,200</b>	<b>135,809</b>	<b>135,809</b>	<b>135,809</b>	<b>135,809</b>	<b>135,809</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Program Total CPAS</b>		<b>148,930,592</b>	<b>148,895,045</b>	<b>11,511,515</b>	<b>8,098,072</b>	<b>4,938,682</b>	<b>1,344,443</b>	<b>1,344,443</b>	<b>1,168,707</b>	<b>177,682</b>	<b>41,873</b>	<b>38,631</b>	<b>38,631</b>	<b>38,631</b>	<b>-</b>
<b>CY2019 Program Incremental Expiring Savings§</b>		<b>4,678,844</b>	<b>4,469</b>	<b>135,862,954</b>	<b>3,413,443</b>	<b>-</b>	<b>3,594,239</b>	<b>-</b>	<b>175,736</b>	<b>991,025</b>	<b>-</b>	<b>3,241</b>	<b>-</b>	<b>-</b>	<b>38,631</b>
<b>Historic Program Incremental Expiring Savings†§</b>		<b>79,570,552</b>	<b>31,078</b>	<b>1,520,576</b>	<b>-</b>	<b>3,159,391</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>135,809</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Program Total Incremental Expiring Savings§</b>		<b>84,249,396</b>	<b>35,547</b>	<b>137,383,530</b>	<b>3,413,443</b>	<b>3,159,391</b>	<b>3,594,239</b>	<b>-</b>	<b>175,736</b>	<b>991,025</b>	<b>135,809</b>	<b>3,241</b>	<b>-</b>	<b>-</b>	<b>38,631</b>

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](https://www.ilsag.info/ntg_2019).

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

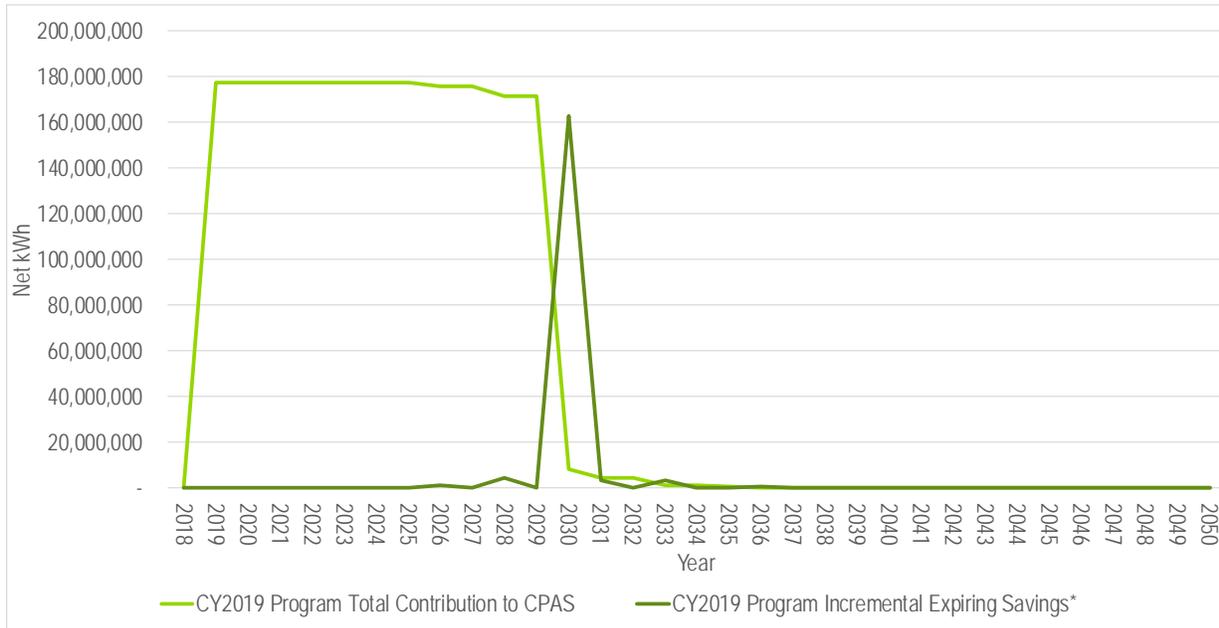
‡ Historic savings go back to CY2018.

§ Incremental expiring savings are equal to CPAS  $Y_{n-1}$  - CPAS  $Y_n$

\*\* The TRM algorithm calculates net savings for advanced thermostats.

Source: Evaluation team analysis

**Figure 4-1. Cumulative Persisting Annual Savings**

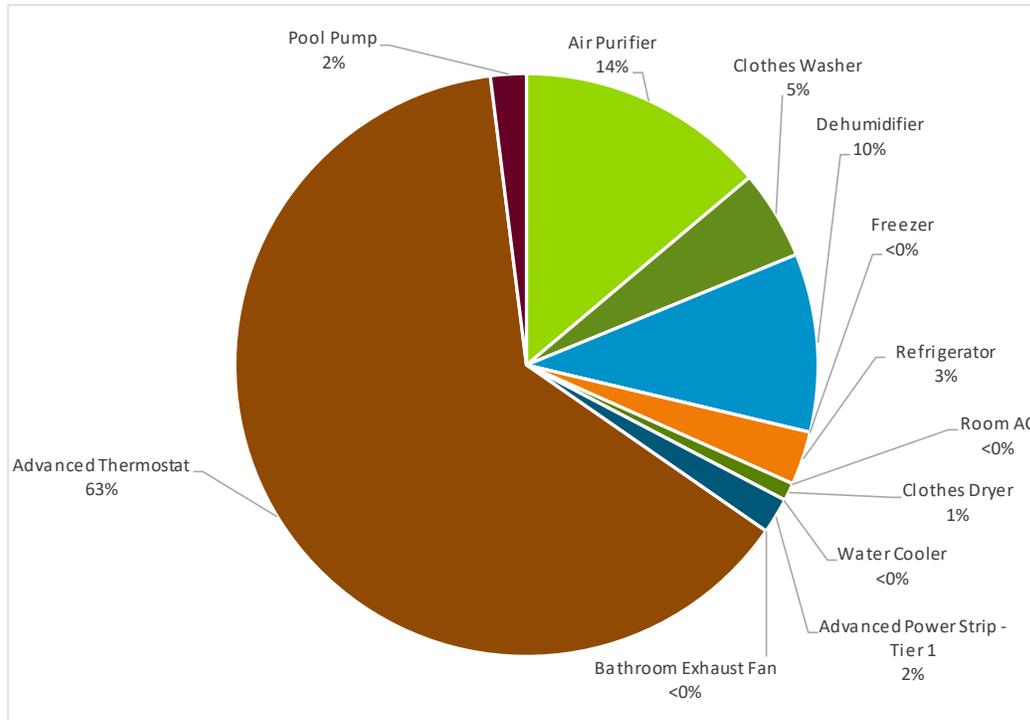


\* Expiring savings are equal to CPAS  $Y_{n-1}$  - CPAS  $Y_n$ .

Source: Evaluation team analysis

## 5. PROGRAM SAVINGS BY MEASURE

The program includes 12 measures as shown in the following tables. The advanced thermostat contributed the most savings at 63% of total combined savings (see Figure 5-1).

**Figure 5-1. Verified Net Savings by Measure – Electric**


Source: ComEd tracking data and evaluation team analysis

**Table 5-1. 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
Appliance	Air Purifier	5,998,518	1.00	5,998,518	0.78	4,678,844	9.0
Appliance	Clothes Washer	2,609,880	1.08	2,814,403	0.62	1,744,930	14.0
Appliance	Dehumidifier	4,252,206	1.00	4,254,792	0.78	3,318,738	12.0
Appliance	Freezer	66,606	1.00	66,606	0.58	38,631	22.0
Appliance	Refrigerator	1,624,631	1.00	1,624,631	0.61	991,025	17.0
Appliance	Room AC	141,350	1.00	141,350	0.67	94,705	12.0
Appliance	Clothes Dryer	266,267	1.00	266,267	0.66	175,736	16.0
Appliance	Water Cooler	5,141	1.00	5,137	0.87	4,469	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	985,401	1.00	985,401	0.86	847,445	7.0
HVAC	Bathroom Exhaust Fan	6,523	0.71	4,631	0.70	3,241	19.0
HVAC	Advanced Thermostat	24,401,966	0.90	22,063,454	1.00	22,063,454	11.0
Miscellaneous	Pool Pump	726,144	1.00	726,144	0.80	580,915	7.0
<b>Total</b>		<b>41,084,634</b>	<b>0.95</b>	<b>38,951,334</b>		<b>34,542,134</b>	

\* A deemed value. Source: is to be found on the Illinois SAG web site here: [https://www.ilsag.info/ntg\\_2019](https://www.ilsag.info/ntg_2019).

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 5-2. CY2019 Non-Coincident Demand Savings by Measure**

End Use Type	Research Category	Ex Ante Gross Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Demand Reduction (kW)	NTG*	Verified Net Demand Reduction (kW)
Appliance	Air Purifier	NR	NA	1,026.44	0.78	800.62
Appliance	Clothes Washer	NR	NA	9,896.08	0.62	6,135.57
Appliance	Dehumidifier	NR	NA	2,607.10	0.78	2,033.54
Appliance	Freezer	NR	NA	11.31	0.58	6.56
Appliance	Refrigerator	NR	NA	0.00	0.61	0.00
Appliance	Room AC	NR	NA	640.79	0.67	429.33
Appliance	Clothes Dryer	NR	NA	940.87	0.66	620.98
Appliance	Water Cooler	NR	NA	0.59	0.87	0.51
Consumer Electronics	Advanced Power Strip - Tier 1	NR	NA	138.22	0.86	118.87
HVAC	Bathroom Exhaust Fan	NR	NA	0.57	0.70	0.40
HVAC	Advanced Thermostat	NR	NA	26,289.81	1.00	26,289.81
Miscellaneous	Pool Pump	NR	NA	573.84	0.80	459.07
<b>Total</b>		<b>NR</b>	<b>NA</b>	<b>42,125.62</b>		<b>36,895.26</b>

NA = Not applicable

NR = Not reported

\* A deemed value. Source: is to be found on the Illinois SAG web site here: [https://www.ilsag.info/ntg\\_2019](https://www.ilsag.info/ntg_2019).

Source: ComEd tracking data and evaluation team analysis

**Table 5-3. 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	Air Purifier	684.58	1.00	684.33	0.78	533.78
Appliance	Clothes Washer	376.05	1.00	376.05	0.62	233.15
Appliance	Dehumidifier	963.36	1.00	963.36	0.78	751.42
Appliance	Freezer	10.74	1.00	10.74	0.58	6.23
Appliance	Refrigerator	244.87	1.00	244.87	0.61	149.37
Appliance	Room AC	192.24	1.00	192.24	0.67	128.80
Appliance	Clothes Dryer	35.75	1.00	35.75	0.66	23.60
Appliance	Water Cooler	0.59	1.00	0.59	0.87	0.51
Consumer Electronics	Advanced Power Strip - Tier 1	110.98	1.00	110.58	0.86	95.10
HVAC	Bathroom Exhaust Fan	0.81	0.71	0.57	0.70	0.40
HVAC	Advanced Thermostat	6,405.10	0.96	6,125.53	1.00	6,125.53
Miscellaneous	Pool Pump	476.90	1.00	476.86	0.80	381.49
<b>Total</b>		<b>9,501.97</b>	<b>0.97</b>	<b>9,221.47</b>		<b>8,429.37</b>

\* A deemed value. Source: is to be found on the Illinois SAG web site here: [https://www.ilsag.info/ntg\\_2019](https://www.ilsag.info/ntg_2019).

Source: ComEd tracking data and evaluation team analysis

**Table 5-4. CY2019 Energy Savings by Measure – Gas**

End Use Type	Research Category	Ex Ante Gross Savings	Verified Gross Realization Rate	Verified Gross Savings	NTG*	Verified Net Savings	Effective Useful Life
Appliance	Air Purifier	0	NA	0	0.78	0	9.0
Appliance	Clothes Washer	101,766	1.00	101,766	0.62	63,095	14.0
Appliance	Dehumidifier	0	NA	0	0.78	0	12.0
Appliance	Freezer	0	NA	0	0.58	0	22.0
Appliance	Refrigerator	0	NA	0	0.61	0	17.0
Appliance	Room AC	0	NA	0	0.67	0	12.0
Appliance	Clothes Dryer	0	NA	0	0.66	0	16.0
Appliance	Water Cooler	0	NA	0	0.87	0	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	0	NA	0	0.86	0	7.0
HVAC	Bathroom Exhaust Fan	0	NA	0	0.70	0	19.0
HVAC	Advanced Thermostat	4,316,338	0.90	3,882,617	1.00	3,882,617	11.0
Miscellaneous	Pool Pump	0	NA	0	0.80	0	7.0
	<b>Total Therms</b>	<b>4,418,104</b>	<b>0.90</b>	<b>3,984,383</b>		<b>3,945,712</b>	
	<b>Total kWh Converted from Therms†</b>	<b>129,494,632</b>	<b>0.90</b>	<b>116,782,256</b>		<b>115,648,808</b>	

NA = Not applicable

\* A deemed value. Source: is to be found on the Illinois SAG web site here: [https://www.ilsag.info/ntg\\_2019](https://www.ilsag.info/ntg_2019).

† 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 5-5. 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	Air Purifier	5,998,518	1.00	5,998,518	0.78	4,678,844
Appliance	Clothes Washer	5,592,636	1.04	5,797,159	0.62	3,594,239
Appliance	Dehumidifier	4,252,206	1.00	4,254,792	0.78	3,318,738
Appliance	Freezer	66,606	1.00	66,606	0.58	38,631
Appliance	Refrigerator	1,624,631	1.00	1,624,631	0.61	991,025
Appliance	Room AC	141,350	1.00	141,350	0.67	94,705
Appliance	Clothes Dryer	266,267	1.00	266,267	0.66	175,736
Appliance	Water Cooler	5,141	1.00	5,137	0.87	4,469
Consumer Electronics	Advanced Power Strip - Tier 1	985,401	1.00	985,401	0.86	847,445
HVAC	Bathroom Exhaust Fan	6,523	0.71	4,631	0.70	3,241
HVAC	Advanced Thermostat	150,913,842	0.90	135,862,954	1.00	135,862,954
Miscellaneous	Pool Pump	726,144	1.00	726,144	0.80	580,915
	<b>Total†</b>	<b>170,579,266</b>	<b>0.91</b>	<b>155,733,590</b>		<b>150,190,942</b>

\* A deemed value. Source: is to be found on the Illinois SAG web site here: [https://www.ilsag.info/ntg\\_2019](https://www.ilsag.info/ntg_2019).

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

Source: ComEd tracking data and evaluation team analysis

The Appliance Rebates program includes measures that save water. That reduction in water produces secondary kWh savings from water supply and wastewater treatment. Table 5-6 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 5-6. 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 <sub>water</sub> )	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Appliance	Air Purifier	0	0	NA	0	0.78	0
Appliance	Clothes Washer	132,585,165	533,792	0.37	199,965	0.62	123,978
Appliance	Dehumidifier	0	0	NA	0	0.78	0
Appliance	Freezer	0	0	NA	0	0.58	0
Appliance	Refrigerator	0	0	NA	0	0.61	0
Appliance	Room AC	0	0	NA	0	0.67	0
Appliance	Clothes Dryer	0	0	NA	0	0.66	0
Appliance	Water Cooler	0	0	NA	0	0.87	0
Consumer Electronics	Advanced Power Strip - Tier 1	0	0	NA	0	0.86	0
HVAC	Bathroom Exhaust Fan	0	0	NA	0	0.70	0
HVAC	Advanced Thermostat	0	0	NA	0	1.00	0
Miscellaneous	Pool Pump	0	0	NA	0	0.80	0
<b>Total</b>		<b>132,585,165</b>	<b>533,792</b>	<b>0.37</b>	<b>199,965</b>		<b>123,978</b>

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](https://www.ilsag.info/ntg_2019).

Source: ComEd tracking data and evaluation team analysis

## 6. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

### 6.1 Impact Parameter Estimates

Guidehouse calculated verified gross and net program impacts for 12 measures: Air Purifier, Clothes Washer, Clothes Dryer, Dehumidifier, Freezer, Refrigerator, Room AC, Water Cooler, Advanced Thermostat, Bathroom Exhaust Fan, Advanced Power Strip, and Pool Pump. These measures account for all quantifiable CY2019 electric savings.

Guidehouse calculated verified gross energy and demand savings using the algorithms in the Illinois Technical Reference Manual (TRM), v7, v7 Errata. Table 6-1 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.

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. SAG defined NTG estimates used to calculate net verified savings.

**Table 6-1. Savings Parameters**

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	Each	Evaluated	Program tracking data
NTG	Varies	NA	Deemed	IL SAG Consensus†
Air Purifier	Varies	Each	Deemed	IL TRM v7.0 - Section 5.1.01
Clothes Washer	Varies	Each	Deemed	IL TRM v7.0 Errata- Section 5.1.2
Clothes Dryer	Varies	Each	Deemed	IL TRM v7.0 - Section 5.1.10
Dehumidifier	Varies	Each	Deemed	IL TRM v6.0 Errata- Section 5.1.3
Freezer	Varies	Each	Deemed	IL TRM v7.0 - Section 5.1.05
Refrigerator	Varies	Each	Deemed	IL TRM v7.0 - Section 5.1.06
Room AC	13	Each	Deemed	Implementer Documentation and IL TRM v7.0 - Section 5.1.07
Water Cooler	125	Each	Deemed	Implementer Documentation and IL TRM v7.0 - Section 5.1.11
Advanced Power Strip	103	Each	Deemed	IL TRM v7.0 - Section 5.2.01
Advanced Thermostat	Varies	Each	Deemed	IL TRM v7.0 - Section 5.3.16
Bathroom Exhaust Fan	89	Each	Deemed	IL TRM v7.0 - Section 5.3.09
Pool Pump	1,921	Each	Deemed	IL TRM v7.0 - Section 5.7.01

\* TRM is 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](https://www.ilsag.info/ntg_2019).

## 6.2 Other Impact Findings and Recommendations

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

**Finding 1.** The impact analysis team found that about 8% of account numbers had claimed ex ante savings for more than one thermostat. Per TRM v7.0, savings can only be claimed for one thermostat per household. We make this adjustment below and the result is about 92% of the original savings.

**Recommendation 1.** Guidehouse recommends the implementer claim savings for only one thermostat per account number to be consistent with the TRM.

**Finding 2.** Bathroom fans have a realization rate of 0.71 (kWh). During wave 1, the implementer advised us to use standard fan and usage with "unknown" CFM to calculate savings. Using these characteristics, we calculated a verified savings of 27.4 kWh savings to be consistent with TRM v7.0. We found that the implementer reported 38.6 kWh savings which matches fans for Energy Star Most Efficient even though they reported EnergyStarMostEfficient = N for all rows.

**Recommendation 2.** We recommend the implementer follow Energy Star savings of 27.4 kWh to match standard fan with unknown CFM in TRM v7.0.

**Finding 3.** Clothes washer realization rates are slightly higher than 1. We found that the ex ante water savings figures do not conform to the TRM v7.0 standard values. The TRM v7.0 deem water savings values at 1931 gallons for Most Efficient and 1159 gallons for less efficient clothes washers (EnergyStarMostEfficient = N). We found that ex ante water savings values range from 1728 minimum gallons to 7827 maximum gallons with no consistency across the efficiencies.

**Recommendation 3.** We recommend that the implementer use ex ante water savings values from the TRM v7.0 calculations or provide reasons for the exceptions.



# ComEd Appliance Rebates Impact Evaluation Report

## 7. APPENDIX 1. TOTAL RESOURCE COST DETAIL

Table 7-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

**Table 7-1. Total Resource Cost Savings Summary**

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)	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)
Appliance	Air Purifier	Each	7,703	9.0	No	5,998,518	684.33	0	0	0	0.78	0.78	0.78	4,678,844	533.78	0	0	0
Appliance	Clothes Washer	Each	28,040	14.0	No	2,614,439	376.05	101,766	0	0	0.62	0.62	0.62	1,620,952	233.15	63,095	0	0
Appliance	Dehumidifier	Each	18,785	12.0	No	4,254,792	963.36	0	0	0	0.78	0.78	0.78	3,318,738	751.42	0	0	0
Appliance	Freezer	Each	1,275	22.0	No	66,606	10.74	0	0	0	0.58	0.58	0.58	38,631	6.23	0	0	0
Appliance	Refrigerator	Each	26,237	17.0	No	1,624,631	244.87	0	0	0	0.61	0.61	0.61	991,025	149.37	0	0	0
Appliance	Room AC	Each	11,308	12.0	No	141,350	192.24	0	0	0	0.67	0.67	0.67	94,705	128.80	0	0	0
Appliance	Clothes Dryer	Each	1,656	16.0	No	266,267	35.75	0	0	0	0.66	0.66	0.66	175,736	23.60	0	0	0
Appliance	Water Cooler	Each	41	10.0	No	5,137	0.59	0	0	0	0.87	0.87	0.87	4,469	0.51	0	0	0
Consumer Electronics	Advanced Power Strip - Tier 1	Each	9,567	7.0	No	985,401	110.58	0	0	0	0.86	0.86	0.86	847,445	95.10	0	0	0
HVAC	Bathroom Exhaust Fan	Each	169	19.0	No	4,631	0.57	0	0	0	0.70	0.70	0.70	3,241	0.40	0	0	0
HVAC	Advanced Thermostat	Each	76,821	11.0	No	22,063,454	6,125.53	3,882,617	0	0	1.00	1.00	1.00	22,063,454	6,125.53	3,882,617	0	0
Miscellaneous	Pool Pump	Each	372	7.0	No	726,144	476.86	0	0	0	0.80	0.80	0.80	580,915	381.49	0	0	0
<b>Total</b>			<b>181,974</b>			<b>38,751,369</b>	<b>9,221.47</b>	<b>3,984,383</b>	<b>0</b>	<b>0</b>				<b>34,418,156</b>	<b>8,429.37</b>	<b>3,945,712</b>	<b>0</b>	<b>0</b>

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 9-1 represents the kWh savings from Table 5-1 minus those shown in Table 5-6)

\* 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: ComEd tracking data and evaluation team analysis