



ComEd Appliance Rebate Program Impact Evaluation Report

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

Presented to
ComEd

DRAFT

February 25, 2019

Prepared by:

Jennifer Ma
Navigant Consulting, Inc

Michael Freed
Navigant Consulting, Inc



Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

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

Contact:

Randy Gunn, Managing Director 312.583.5714 Randy.Gunn@Navigant.Com	Jeff Erickson, Director 608.497.2322 Jeff.Erickson@Navigant.Com	Nishant Mehta, Managing Consultant 608.497.2345 Nishant.Mehta@Navigant.Com
--	---	--

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd based upon information provided by ComEd and from other sources. 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 Navigant 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. Cumulative Persisting Annual Savings	2
4. Program Savings Detail	7
5. Program Savings by Measure	7
6. Impact Analysis Findings and Recommendations	10
6.1 Impact Parameter Estimates	10
6.2 Other Impact Findings and Recommendations	11
7. Appendix 1. Impact Analysis Detail	Error! Bookmark not defined.
7.1 Advanced Thermostats	Error! Bookmark not defined.
8. Appendix 2. Total Resource Cost Detail	12

LIST OF TABLES AND FIGURES

Figure 2-1. Percent of Measures Installed by Type	2
Figure 3-1. Cumulative Persisting Annual Savings	6
Table 2-1. CY2018 Volumetric Findings Detail	1
Table 3-1. Cumulative Persisting Annual Savings (CPAS) – Electric	3
Table 3-2. Cumulative Persisting Annual Savings (CPAS) – Gas	4
Table 3-3. Cumulative Persisting Annual Savings (CPAS) – Total	5
Table 4-1. CY2018 Total Annual Incremental Electric Savings	7
Table 5-1. CY2018 Energy Savings by Measure – Electric	8
Table 5-2. CY2018 Demand Savings by Measure	8
Table 5-3. CY2018 Summer Peak Demand Savings by Measure	9
Table 5-4. CY2018 Energy Savings by Measure – Gas	9
Table 5-5. CY2018 Energy Savings by Measure – Total Combining Electricity and Gas	10
Table 6-1. Savings Parameters	11
Table 7-1. Thermostat Rebate IDs and Serial Numbers with Quantity and Savings	12
Table 8-1. Total Resource Cost Savings Summary	13

1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2018 Appliance Rebates Program. It presents a summary of the energy and demand impacts for the total program broken out by relevant measure and program structure details. CY2018 covers January 1, 2018 through December 31, 2018.

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, freezers, refrigerators, room air conditioners, water coolers, tier 1 advanced power strips, advanced thermostats, bathroom exhaust fans, and pool pumps. In CY2018, the program added dehumidifiers and removed heat pump water heaters.

The program had 128,620 participants in CY2018 and distributed 218,761 measures as shown in the following table and graph.

Table 2-1. CY2018 Volumetric Findings Detail

Participation	Total
Participants*	128,620
Total Measures	218,761
Number of Units/Projects	1.48
Installed Projects†	147,688
Air Purifier	8,009
Clothes Dryer	1,758
Clothes Washer	28,881
Dehumidifier	6,891
Freezer	1,152
Refrigerator	24,206
Room AC	2,925
Water Cooler	911
Advanced Power Strip - Tier 1	72,185
Advanced Thermostat	69,058
Bathroom Exhaust Fan‡	2,323
Pool Pump	462

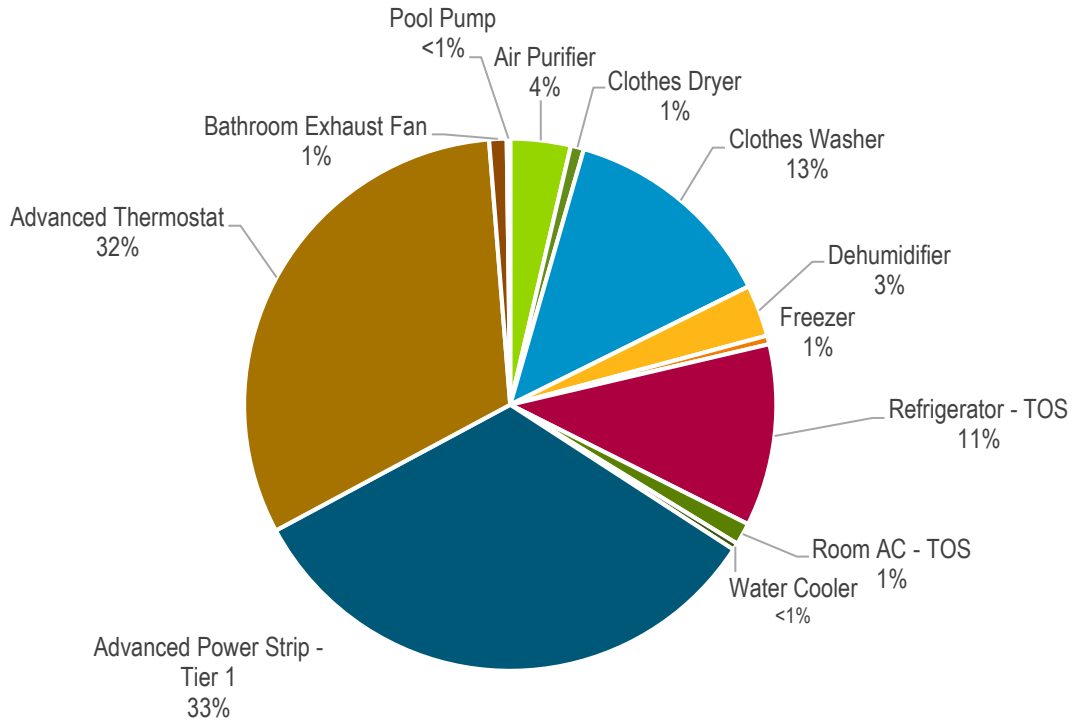
* Participants are defined as unique account numbers

† Projects are defined as unique Rebate IDs

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

Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. Percent of Measures Installed by Type



Source: ComEd tracking data and Navigant team analysis.

3. CUMULATIVE PERSISTING ANNUAL SAVINGS

The measure-specific and total ex ante gross savings for the Appliance Rebates Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The electric CPAS across all measures is 34,269,851 kWh. The program achieved 60,598,906 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd’s goal¹ (the middle table in the following set of tables). Adding the savings converted from gas savings to the electric savings produces a total of 94,868,757 kWh of total CPAS.

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

Table 3-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2018			Verified Net kWh Savings									
			Verified Gross Savings	NTG*	Lifetime Net Savings†	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Appliance	Air Purifier	9.0	5,482,708	0.74	36,514,835	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	
Appliance	Clothes Dryer	14.0	282,747	0.62	2,454,248	175,303	175,303	175,303	175,303	175,303	175,303	175,303	175,303	175,303	
Appliance	Clothes Washer	14.0	1,385,725	0.58	11,252,083	803,720	803,720	803,720	803,720	803,720	803,720	803,720	803,720	803,720	
Appliance	Dehumidifier	12.0	826,828	0.78	7,739,107	644,926	644,926	644,926	644,926	644,926	644,926	644,926	644,926	644,926	
Appliance	Freezer	11.0	57,552	0.54	341,859	31,078	31,078	31,078	31,078	31,078	31,078	31,078	31,078	31,078	
Appliance	Refrigerator - TOS	12.0	1,495,818	0.57	10,231,395	852,616	852,616	852,616	852,616	852,616	852,616	852,616	852,616	852,616	
Appliance	Room AC - TOS	12.0	36,563	0.63	276,413	23,034	23,034	23,034	23,034	23,034	23,034	23,034	23,034	23,034	
Appliance	Water Cooler	10.0	114,131	0.83	947,285	94,729	94,729	94,729	94,729	94,729	94,729	94,729	94,729	94,729	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	7,435,055	0.86	44,759,031	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	
HVAC	Advanced Thermostat	10.0	20,347,055	NA‡	203,470,545	20,347,055	20,347,055	20,347,055	20,347,055	20,347,055	20,347,055	20,347,055	20,347,055	20,347,055	
HVAC	Bathroom Exhaust Fan	19.0	205,771	0.66	2,580,369	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	
Miscellaneous	Pool Pump	10.0	887,787	0.80	7,102,300	710,230	710,230	710,230	710,230	710,230	710,230	710,230	710,230	710,230	
CY2018 Program Total Electric CPAS			38,557,739		327,669,470	34,269,851	34,269,851	34,269,851	34,269,851	34,269,851	34,269,851	34,269,851	27,875,704	27,875,704	
CY2018 Program Expiring Electric Savings§							0	0	0	0	0	0	6,394,147	6,394,147	
End Use Type	Research Category		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Appliance	Air Purifier														
Appliance	Clothes Dryer		175,303	175,303	175,303	175,303	175,303								
Appliance	Clothes Washer		803,720	803,720	803,720	803,720	803,720								
Appliance	Dehumidifier		644,926	644,926	644,926										
Appliance	Freezer		31,078	31,078											
Appliance	Refrigerator - TOS		852,616	852,616	852,616										
Appliance	Room AC - TOS		23,034	23,034	23,034										
Appliance	Water Cooler		94,729												
Consumer Electronics	Advanced Power Strip - Tier 1														
HVAC	Advanced Thermostat		20,347,055												
HVAC	Bathroom Exhaust Fan		135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809			
Miscellaneous	Pool Pump		710,230												
CY2018 Program Total Electric CPAS			23,818,500	2,666,487	2,635,409	1,114,833	1,114,833	135,809	135,809	135,809	135,809	135,809	0	0	
CY2018 Program Expiring Electric Savings§			10,451,351	31,603,364	31,634,442	33,155,019	33,155,019	34,134,042	34,134,042	34,134,042	34,134,042	34,134,042	34,269,851	34,269,851	

Note: The green highlighted cell shows program total first year electric savings.

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

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

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

Source: Navigant analysis

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

End Use Type	Research Category	EUL	CY2018 Verified Gross Savings (Therms)	NTG*	Lifetime Net Savings†	Verified Net Therms Savings										
						2018	2019	2020	2021	2022	2023	2024	2025	2026		
Appliance	Air Purifier	9.0		0.74												
Appliance	Clothes Dryer	14.0		0.62												
Appliance	Clothes Washer	14.0	128,258	0.58	1,041,458	74,390	74,390	74,390	74,390	74,390	74,390	74,390	74,390	74,390		
Appliance	Dehumidifier	12.0		0.78												
Appliance	Freezer	11.0		0.54												
Appliance	Refrigerator - TOS	12.0		0.57												
Appliance	Room AC - TOS	12.0		0.63												
Appliance	Water Cooler	10.0		0.83												
Consumer Electronics	Advanced Power Strip - Tier 1	7.0		0.86												
HVAC	Advanced Thermostat	10.0	1,993,127	NA‡	19,931,265	1,993,127	1,993,127	1,993,127	1,993,127	1,993,127	1,993,127	1,993,127	1,993,127	1,993,127		
HVAC	Bathroom Exhaust Fan	19.0		0.66												
Miscellaneous	Pool Pump	10.0		0.80												
CY2018 Program Total Gas CPAS (Therms)			2,121,385		20,972,723	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516		
CY2018 Program Total Gas CPAS (kWh Equivalent)§					614,710,525	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		
CY2018 Program Expiring Gas Savings (Therms) 							0	0	0	0	0	0	0	0		
CY2018 Program Expiring Gas Savings (kWh Equivalent)§, 							0	0	0	0	0	0	0	0		
End Use Type	Research Category		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038		
Appliance	Air Purifier															
Appliance	Clothes Dryer															
Appliance	Clothes Washer		74,390	74,390	74,390	74,390	74,390									
Appliance	Dehumidifier															
Appliance	Freezer															
Appliance	Refrigerator - TOS															
Appliance	Room AC - TOS															
Appliance	Water Cooler															
Consumer Electronics	Advanced Power Strip - Tier 1															
HVAC	Advanced Thermostat		1,993,127													
HVAC	Bathroom Exhaust Fan															
Miscellaneous	Pool Pump															
CY2018 Program Total Gas CPAS (Therms)			2,067,516	74,390	74,390	74,390	74,390	0	0	0	0	0	0	0		
CY2018 Program Total Gas CPAS (kWh Equivalent)§			60,598,906	2,180,367	2,180,367	2,180,367	2,180,367	0	0	0	0	0	0	0		
CY2018 Program Expiring Gas Savings (Therms) 			0	1,993,127	1,993,127	1,993,127	1,993,127	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516	2,067,516		
CY2018 Program Expiring Gas Savings (kWh Equivalent)§, 			0	58,418,539	58,418,539	58,418,539	58,418,539	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906	60,598,906		

Note: The green highlighted cell shows program total first year gas savings in kWh equivalents.

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

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

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

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

Source: Navigant analysis

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

End Use Type	Research Category	EUL	CY2018			Verified Net kWh Savings (Including Those Converted from Gas Savings)									
			Verified Gross Savings	NTG*	Lifetime Net Savings†	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Appliance	Air Purifier	9.0	5,482,708	0.74	36,514,835	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	4,057,204	
Appliance	Clothes Dryer	14.0	282,747	0.62	2,454,248	175,303	175,303	175,303	175,303	175,303	175,303	175,303	175,303	175,303	
Appliance	Clothes Washer	14.0	5,144,978	0.58	41,777,223	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087	
Appliance	Dehumidifier	12.0	826,828	0.78	7,739,107	644,926	644,926	644,926	644,926	644,926	644,926	644,926	644,926	644,926	
Appliance	Freezer	11.0	57,552	0.54	341,859	31,078	31,078	31,078	31,078	31,078	31,078	31,078	31,078	31,078	
Appliance	Refrigerator - TOS	12.0	1,495,818	0.57	10,231,395	852,616	852,616	852,616	852,616	852,616	852,616	852,616	852,616	852,616	
Appliance	Room AC - TOS	12.0	36,563	0.63	276,413	23,034	23,034	23,034	23,034	23,034	23,034	23,034	23,034	23,034	
Appliance	Water Cooler	10.0	114,131	0.83	947,285	94,729	94,729	94,729	94,729	94,729	94,729	94,729	94,729	94,729	
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	7,435,055	0.86	44,759,031	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	6,394,147	
HVAC	Advanced Thermostat	10.0	78,765,593	NA‡	787,655,931	78,765,593	78,765,593	78,765,593	78,765,593	78,765,593	78,765,593	78,765,593	78,765,593	78,765,593	
HVAC	Bathroom Exhaust Fan	19.0	205,771	0.66	2,580,369	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	
Miscellaneous	Pool Pump	10.0	887,787	0.80	7,102,300	710,230	710,230	710,230	710,230	710,230	710,230	710,230	710,230	710,230	
CY2018 Program Total CPAS			100,735,531		942,379,995	94,868,757	94,868,757	94,868,757	94,868,757	94,868,757	94,868,757	94,868,757	88,474,609	88,474,609	
CY2018 Program Expiring Savings§							0	0	0	0	0	0	6,394,147	6,394,147	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Appliance	Air Purifier													
Appliance	Clothes Dryer	175,303	175,303	175,303	175,303	175,303								
Appliance	Clothes Washer	2,984,087	2,984,087	2,984,087	2,984,087	2,984,087								
Appliance	Dehumidifier	644,926	644,926	644,926										
Appliance	Freezer	31,078	31,078											
Appliance	Refrigerator - TOS	852,616	852,616	852,616										
Appliance	Room AC - TOS	23,034	23,034	23,034										
Appliance	Water Cooler	94,729												
Consumer Electronics	Advanced Power Strip - Tier 1													
HVAC	Advanced Thermostat	78,765,593												
HVAC	Bathroom Exhaust Fan	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809	135,809			
Miscellaneous	Pool Pump	710,230												
CY2018 Program Total CPAS		84,417,406	4,846,854	4,815,776	3,295,200	3,295,200	135,809	135,809	135,809	135,809	135,809	135,809	0	0
CY2018 Program Expiring Savings§		10,451,351	90,021,903	90,052,981	91,573,557	91,573,557	94,732,948	94,732,948	94,732,948	94,732,948	94,732,948	94,868,757	94,868,757	

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

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

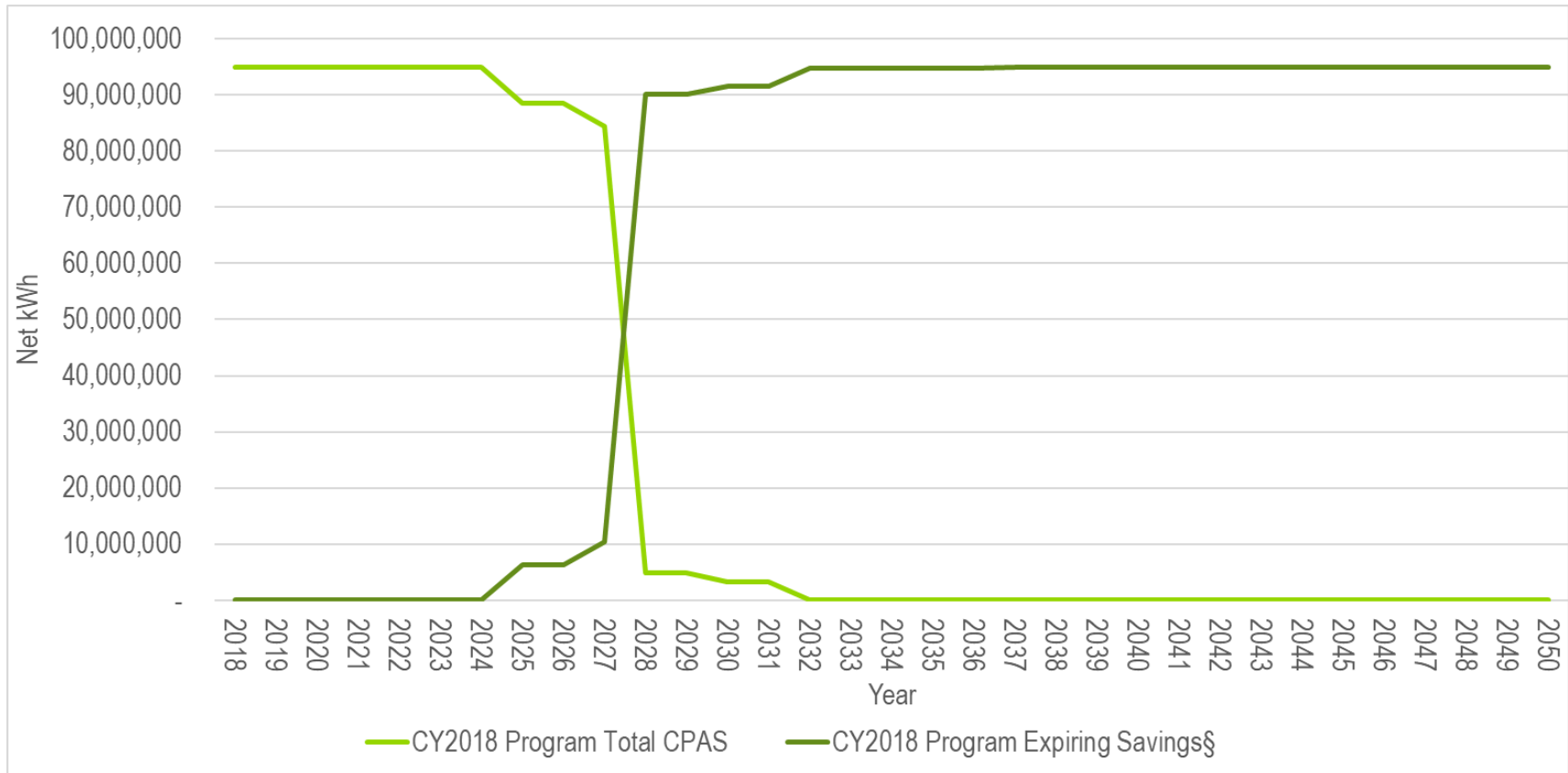
† Lifetime savings are the sum of CPAS savings through the EUL.

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

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

Source: Navigant analysis

Figure 3-1. Cumulative Persisting Annual Savings



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

Source: Navigant analysis

4. PROGRAM SAVINGS DETAIL

Table 4-1 summarizes the incremental energy and demand savings the Appliance Rebates Program achieved in CY2018. The gas savings are only those that the gas utilities are not claiming and ComEd can claim.²

Table 4-1. CY2018 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	38,615,596	NA	7,994
Program Gross Realization Rate	1.00	NA	0.99
Verified Gross Savings	38,557,739	31,237	7,892
Program Net-to-Gross Ratio (NTG)	Varies	Varies	Varies
Verified Net Savings	34,269,851	28,093	7,234
Converted from Gas*			
Ex Ante Gross Savings	63,080,048	NA	NA
Program Gross Realization Rate	0.99	NA	NA
Verified Gross Savings	62,177,792	NA	NA
Program Net-to-Gross Ratio (NTG)	Varies	NA	NA
Verified Net Savings	60,598,906	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	101,695,645	NA	7,994
Program Gross Realization Rate	0.99	NA	0.99
Verified Gross Savings	100,735,531	31,237	7,892
Program Net-to-Gross Ratio (NTG)	Varies	Varies	Varies
Verified Net Savings	94,868,757	28,093	7,234

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

Note: The coincident Summer Peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June through August.
Source: ComEd tracking data and Navigant team analysis.

5. PROGRAM SAVINGS BY MEASURE

The program includes 12 measures as shown in the following tables. The advanced thermostat contributed the most savings at 78 percent of total combined savings.

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

Table 5-1. CY2018 Energy Savings by Measure – Electric

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)	Effective Useful Life
Appliance	Air Purifier	5,482,708	1.00	5,482,708	0.74	4,057,204	9.0
Appliance	Clothes Dryer	282,747	1.00	282,747	0.62	175,303	14.0
Appliance	Clothes Washer	1,388,573	1.00	1,385,725	0.58	803,720	14.0
Appliance	Dehumidifier	828,159	1.00	826,828	0.78	644,926	12.0
Appliance	Freezer	57,552	1.00	57,552	0.54	31,078	11.0
Appliance	Refrigerator	1,495,818	1.00	1,495,818	0.57	852,616	12.0
Appliance	Room AC	36,563	1.00	36,563	0.63	23,034	12.0
Appliance	Water Cooler	114,239	1.00	114,131	0.83	94,729	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	7,435,055	1.00	7,435,055	0.86	6,394,147	7.0
HVAC	Advanced Thermostat	20,400,576	1.00	20,347,055	NA†	20,347,055	10.0
HVAC	Bathroom Exhaust Fan	205,818	1.00	205,771	0.66	135,809	19.0
Miscellaneous	Pool Pump	887,788	1.00	887,787	0.80	710,230	10.0
Total		38,615,596	1.00	38,557,739		34,269,851	

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

Source: ComEd tracking data and Navigant team analysis.

Table 5-2. CY2018 Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Demand Reduction (kW)	NTG*	Verified Net Demand Reduction (kW)
Appliance	Air Purifier	NA	NA	938.18	0.74	694.25
Appliance	Clothes Dryer	NA	NA	999.11	0.62	619.45
Appliance	Clothes Washer	NA	NA	4,696.54	0.58	2,723.99
Appliance	Dehumidifier	NA	NA	506.63	0.78	395.17
Appliance	Freezer	NA	NA	9.77	0.54	5.28
Appliance	Refrigerator	NA	NA	170.64	0.57	97.26
Appliance	Room AC	NA	NA	165.75	0.63	104.42
Appliance	Water Cooler	NA	NA	13.02	0.83	10.81
Consumer Electronics	Advanced Power Strip - Tier 1	NA	NA	1,042.93	0.86	896.92
HVAC	Advanced Thermostat	NA	NA	21,964.57	NA†	21,964.57
HVAC	Bathroom Exhaust Fan	NA	NA	23.47	0.66	15.49
Miscellaneous	Pool Pump	NA	NA	706.51	0.80	565.21
Total		NA		31,237.12		28,092.82

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

Source: ComEd tracking data and Navigant team analysis.

Table 5-3. CY2018 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Appliance	Air Purifier	625.71	1.00	625.35	0.74	462.76
Appliance	Clothes Dryer	37.97	1.00	37.97	0.62	23.54
Appliance	Clothes Washer	179.34	1.00	178.47	0.58	103.51
Appliance	Dehumidifier	189.65	1.00	189.65	0.78	147.92
Appliance	Freezer	9.28	1.00	9.28	0.54	5.01
Appliance	Refrigerator	225.46	1.00	225.46	0.57	128.51
Appliance	Room AC	49.73	1.00	49.73	0.63	31.33
Appliance	Water Cooler	13.03	1.00	13.02	0.83	10.81
Consumer Electronics	Advanced Power Strip - Tier 1	837.35	1.00	834.34	0.86	717.54
HVAC	Advanced Thermostat	5,216.18	0.98	5,117.74	NA†	5,117.74
HVAC	Bathroom Exhaust Fan	23.46	1.00	23.47	0.66	15.49
Miscellaneous	Pool Pump	587.20	1.00	587.11	0.80	469.69
Total		7,994.34	0.99	7,891.58		7,233.85

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

Table 5-4. CY2018 Energy Savings by Measure – Gas

End Use Type	Research Category	Ex Ante Gross Savings	Verified Gross Realization Rate	Verified Gross Savings	NTG*	Verified Net Savings	Effective Useful Life
Appliance	Air Purifier	0	NA	0	0.74	0	9.0
Appliance	Clothes Dryer	0	NA	0	0.62	0	14.0
Appliance	Clothes Washer	128,258	1.00	128,258	0.58	74,390	14.0
Appliance	Dehumidifier	0	NA	0	0.78	0	12.0
Appliance	Freezer	0	NA	0	0.54	0	11.0
Appliance	Refrigerator	0	NA	0	0.57	0	12.0
Appliance	Room AC	0	NA	0	0.63	0	12.0
Appliance	Water Cooler	0	NA	0	0.83	0	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	0	NA	0	0.86	0	7.0
HVAC	Advanced Thermostat	2,023,910	0.98	1,993,127	NA†	1,993,127	10.0
HVAC	Bathroom Exhaust Fan	0	NA	0	0.66	0	19.0
Miscellaneous	Pool Pump	0	NA	0	0.80	0	10.0
Total Therms		2,152,168	0.99	2,121,385		2,067,516	
Total kWh Converted from Therms‡		63,080,048	0.99	62,177,792		60,598,906	

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

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

Source: ComEd tracking data and Navigant team analysis.

Table 5-5. CY2018 Energy Savings by Measure – Total Combining Electricity and Gas

End Use Type	Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Appliance	Air Purifier	5,482,708	1.00	5,482,708	0.74	4,057,204
Appliance	Clothes Dryer	282,747	1.00	282,747	0.62	175,303
Appliance	Clothes Washer	5,147,827	1.00	5,144,978	0.58	2,984,087
Appliance	Dehumidifier	828,159	1.00	826,828	0.78	644,926
Appliance	Freezer	57,552	1.00	57,552	0.54	31,078
Appliance	Refrigerator	1,495,818	1.00	1,495,818	0.57	852,616
Appliance	Room AC	36,563	1.00	36,563	0.63	23,034
Appliance	Water Cooler	114,239	1.00	114,131	0.83	94,729
Consumer Electronics	Advanced Power Strip - Tier 1	7,435,055	1.00	7,435,055	0.86	6,394,147
HVAC	Advanced Thermostat	79,721,371	0.99	78,765,593	NA†	78,765,593
HVAC	Bathroom Exhaust Fan	205,818	1.00	205,771	0.66	135,809
Miscellaneous	Pool Pump	887,788	1.00	887,787	0.80	710,230
Total‡		101,695,645	0.99	100,735,531		94,868,757

* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

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

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

Source: ComEd tracking data and Navigant team analysis.

6. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

6.1 Impact Parameter Estimates

Navigant 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 CY2018 electric savings.

Navigant calculated verified gross energy and demand savings using the algorithms in the Illinois Technical Reference Manual (TRM), v6 and v7 where appropriate. Table 6-1 presents the deemed input parameter source that Navigant used by measure. The Illinois TRM v6.0 allows for custom or actual values to be used for some of the input parameters. Navigant based these values on the program tracking database when available.

Navigant calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio. SAG defined NTG estimates used to calculate net verified savings³.

³ Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

Table 6-1. Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	Each	Evaluated	Program tracking data
NTG	Varies		Deemed	IL SAG Consensus†
Air Purifier	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.1
Clothes Washer	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.2
Clothes Dryer	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.10
Dehumidifier	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.3
Freezer	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.5
Refrigerator	Varies	Each	Deemed	IL TRM v6.0 - Section 5.1.6
Room AC	12.5	Each	Deemed	Implementer Documentation and IL TRM v6.0 – Section 5.1.7
Water Cooler	125.4	Each	Deemed	Implementer Documentation and IL TRM v6.0 – Section 5.1.11
Advanced Power Strip	103	Each	Deemed	IL TRM v6.0 - Section 5.2.1
Advanced Thermostat	Varies	Each	Deemed	IL TRM v7.0 - Section 5.3.16‡
Bathroom Exhaust Fan	88.6	Each	Deemed	IL TRM v6.0 - Section 5.3.9
Pool Pump	1921	Each	Deemed	IL TRM v6.0 - Section 5.7.1

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

† A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

‡ The impact analysis team followed guidelines from IL TRM v7.0 to more accurately estimate multi-family advanced thermostat savings, using 0.65 for household factor and 28000 Btu/hr for capacity for multi-family projects. This was communicated to ComEd on 09/25/2018 in the email with subject “0.65 MF Household Factor.”

6.2 Other Impact Findings and Recommendations

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

Finding 1. The impact analysis team found that 1.4 percent of account numbers had claimed ex ante savings for more than one thermostat. TRM v6.0 indicates that advanced thermostat savings are calculated per household and multiple thermostats installed in a household do not result in additional savings. The impact analysis team calculated savings for only one thermostat per household to follow TRM guidelines if the net number of thermostats was more than one for the household. We were not able to confirm where additional thermostats were installed. This removed savings for about one and a half percent of thermostats and reduced the total energy realization rate by one percent.

Recommendation 1. Navigant recommends the implementer claim savings for only one thermostat per account number or provide additional information to justify claiming savings for more than one thermostat per account number.

Finding 2. When aggregating thermostat quantities by account number, the impact analysis team found that 0.2 percent of account numbers had a total of less than zero thermostats. This might suggest that these participants returned more thermostats than they had purchased. The following table isolates two of these instances:

Table 6-2. Thermostat Rebate IDs and Serial Numbers with Quantity and Savings

Account	Rebate ID	Make	Model	Serial Number	Thermostat Quantity	Ex Ante kWh Savings
A	EA-0001867269	ECOBEE	EB-STATe4-01	511857476480	1	259.5247
A	EA-0002040957	ECOBEE	EB-STATe4-01	511857476480	-1	-259.5247
A	EA-0002042081	ECOBEE	EB-STATe4-01	511883483348	-1	-259.5247
B	EA-0001157096	NEST	T3007ES	09AB01AC04180MWH	1	259.5247
B	EA-0001669284	NEST	T4000ES	15AA01AC48170N48	-1	-246.5800
B	EA-0001669286	NEST	T3007ES	09AA01AC50170T0S	-1	-211.8085

Source: ComEd tracking data and Navigant team analysis.

Table 6-2 suggests that Participant A bought and returned the same ECOBEE thermostat, but also returned another ECOBEE thermostat. Participant B seemed to have purchased one NEST thermostat and returned two different NEST thermostats. These extra returned thermostats may not have been previously rebated, may have been purchased in a different program year, or may have been purchased elsewhere. Navigant noted these discrepancies but did not alter the data. This means that in the examples displayed above, we verified net negative savings for the account numbers.

Recommendation 2. Navigant recommends the implementer provide supplemental information in these situations.

Finding 3. The impact analysis team found that six percent of advanced thermostat projects used the Summer System Peak (SSP) Coincidence Factor (CF) instead of the PJM CF to calculate peak demand savings. This resulted in a one percent difference between ex ante and verified gross peak demand savings.

Recommendation 3. Navigant recommends the implementer use the PJM CF to calculate ex ante peak demand savings for all advanced thermostat projects.

7. APPENDIX 2. TOTAL RESOURCE COST DETAIL

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

Table 7-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (kWh)	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)
Appliance	Air Purifier	Each	8,009	9.0	5,482,708	625.71	5,482,708	625.35
Appliance	Clothes Dryer	Each	1,758	14.0	282,747	37.97	282,747	37.97
Appliance	Clothes Washer	Each	28,881	14.0	1,388,573	179.34	1,385,725	178.47
Appliance	Dehumidifier	Each	6,891	12.0	828,159	189.65	826,828	189.65
Appliance	Freezer	Each	1,152	11.0	57,552	9.28	57,552	9.28
Appliance	Refrigerator	Each	24,206	12.0	1,495,818	225.46	1,495,818	225.46
Appliance	Room AC	Each	2,925	12.0	36,563	49.73	36,563	49.73
Appliance	Water Cooler	Each	911	10.0	114,239	13.03	114,131	13.02
Consumer Electronics	Advanced Power Strip - Tier 1	Each	72,185	7.0	7,435,055	837.35	7,435,055	834.34
HVAC	Advanced Thermostat	Each	69,058	10.0	20,400,576	5,216.18	20,347,055	5,117.74
HVAC	Bathroom Exhaust Fan	Each	2,323	19.0	205,818	23.46	205,771	23.47
Miscellaneous	Pool Pump	Each	462	10.0	887,788	587.20	887,787	587.11

Source: ComEd tracking data and Navigant team analysis.