



Appliance Rebates Program Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2020 (CY2020)
(1/1/2020-12/31/2020)

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ComEd
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1. Introduction

This report presents results from the CY2020 impact evaluation of ComEd's Residential Appliance Rebates Program. It summarizes the total energy and demand impacts for the program broken out by relevant measure and program structure details. The appendices provide the impact analysis methodology and details of the total resource cost inputs. CY2020 covers January 1, 2020 through December 31, 2020.

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 and information and education to increase customer awareness and acceptance of energy efficient appliances. (The program was previously known as Energy Star Appliance Rebate and is listed that way in the CY2020 Deemed NTG spreadsheet.) 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, water coolers, and pool pumps. Beginning in 2020, ComEd also distributed advanced power strips and advanced thermostats through ComEd Marketplace 2.0, an online marketplace. The implementer of this program for ComEd is CLEARresult.

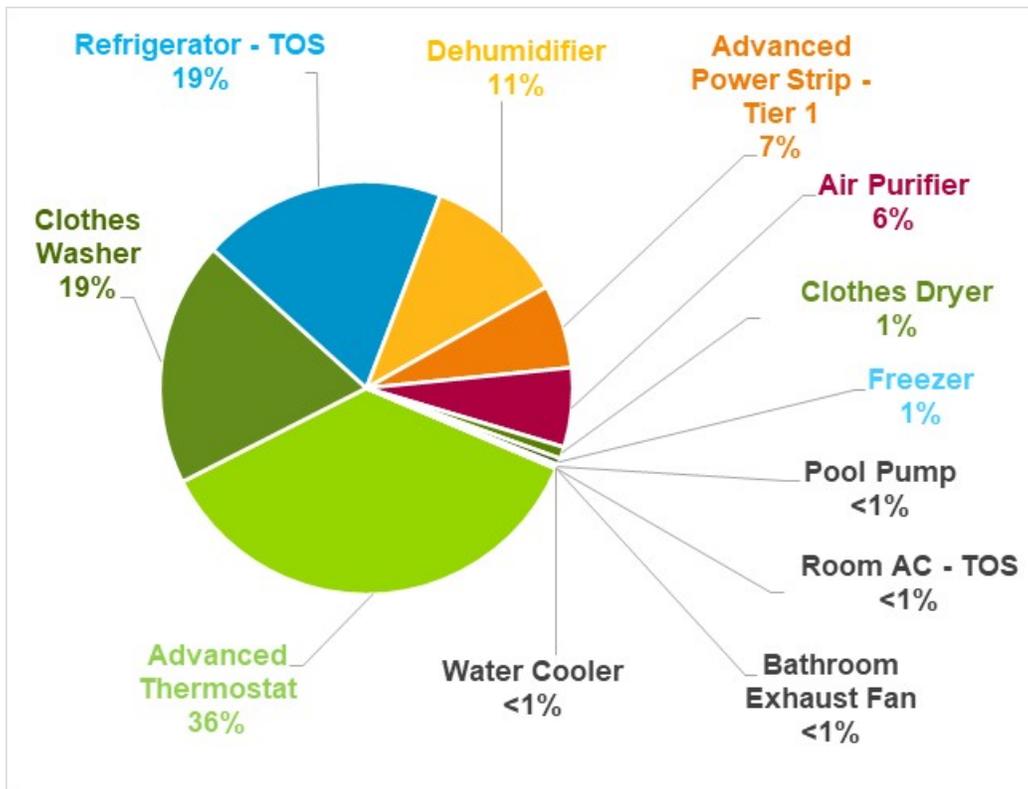
The program had 116,888 participants in CY2020 and distributed 148,298 measures as Table 2-1 and Figure 2-1 show.

Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total
Unique Participants	116,888
Total Measures	148,298
Advanced Thermostat	53,560
Clothes Washer	28,458
Refrigerator - TOS	28,389
Dehumidifier	16,357
Advanced Power Strip - Tier 1	9,713
Air Purifier	9,205
Clothes Dryer	1,383
Freezer	767
Pool Pump	353
Room AC - TOS	110
Bathroom Exhaust Fan	2
Water Cooler	1

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Appliance Rebates Program achieved in CY2020. The gas savings are only those that ComEd may be able to claim, which excludes savings claimed by gas utilities, either via joint or non-joint programs.¹

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

Table 3-1. CY2020 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Summer Peak* Demand Savings (kW)
Electricity		
Ex Ante Gross Savings	43,012,184	8,478
Program Gross Realization Rate	1.00	0.95
Verified Gross Savings	43,097,501	8,028
Program Net-to-Gross Ratio (NTG)	Varies	Varies
Verified Net Savings	36,042,091	7,004
Converted from Gas†		
Ex Ante Gross Savings	98,449,673	NA
Program Gross Realization Rate	1.00	NA
Verified Gross Savings	97,998,230	NA
Program Net-to-Gross Ratio (NTG)	Varies	NA
Verified Net Savings	96,770,657	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	141,461,857	8,478
Program Gross Realization Rate	1.00	0.95
Verified Gross Savings	141,095,730	8,028
Program Net-to-Gross Ratio (NTG)	Varies	Varies
Verified Net Savings	132,812,748	7,004

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

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

† Gas savings converted to kilowatt-hours (kWh) by multiplying therms by 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh). The evaluation determines which gas savings are 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 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 CY2020. Figure 4-1 shows the savings across the useful life of the measures. The electric CPAS across all measures installed in 2020 is 36,042,091 kWh (Table 4-1). The CY2020 gas contribution to CPAS (converted to equivalent electricity) is 96,770,657 kWh (Table 4-2). Adding the gas and electric contributions produces 132,812,748 kWh of total CY2020 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 Program Total Gas CPAS rows are the sum of the CY2020 contribution and the historic contribution.

Advanced thermostats, clothes washers, refrigerators, and dehumidifiers produce the bulk of the savings for the Appliance Rebates Program. Thermostats are the most significant measure with energy savings from both electricity and gas (converted to electricity).

Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings												
						2018	2019	2020	2021	2022	2023	2024	2025	2026				
Appliance	Air Purifier	9.0	8,839,052	0.79	62,845,660			6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851			
Appliance	Clothes Washer	14.0	1,882,550	0.63	16,604,090			1,186,006	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006			
Appliance	Dehumidifier	12.0	3,344,751	0.67	26,891,796			2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983			
Appliance	Freezer	22.0	36,919	0.63	511,697			23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259			
Appliance	Refrigerator - TOS	17.0	1,706,285	0.65	18,854,449			1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085			
Appliance	Room AC - TOS	12.0	1,375	0.72	11,880			990	990	990	990	990	990	990	990			
Appliance	Clothes Dryer	16.0	222,404	0.67	2,384,172			149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011			
Appliance	Water Cooler	10.0	125	0.67	839			84	84	84	84	84	84	84	84			
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	10,744,342	0.76	57,159,899			8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700			
HVAC	Bathroom Exhaust Fan	19.0	55	0.66	687			36	36	36	36	36	36	36	36			
HVAC	Advanced Thermostat	11.0	15,641,856	NA#	172,060,417			15,641,856	15,641,856	15,641,856	15,641,856	15,641,856	15,641,856	15,641,856	15,641,856			
Miscellaneous	Pool Pump	7.0	677,787	0.80	3,795,606			542,229	542,229	542,229	542,229	542,229	542,229	542,229	542,229			
CY2020 Program Total Electric Contribution to CPAS			43,097,501		361,121,194			36,042,091	36,042,091	36,042,091	36,042,091	36,042,091	36,042,091	36,042,091	36,042,091			
Historic Program Total Electric Contribution to CPAS‡						34,269,851	68,811,985	68,811,985	68,811,985	68,811,985	68,811,985	68,811,985	68,811,985	62,417,837	60,989,477			
Program Total Electric CPAS						34,269,851	68,811,985	104,854,076	104,854,076	104,854,076	104,854,076	104,854,076	104,854,076	98,459,928	97,031,568			
CY2020 Program Incremental Expiring Electric Savings§																		
Historic Program Incremental Expiring Electric Savings‡§														6,394,147	1,428,360			
Program Total Incremental Expiring Electric Savings§														6,394,147	1,428,360			

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Air Purifier	6,982,851	6,982,851										
Appliance	Clothes Washer	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006	1,186,006					
Appliance	Dehumidifier	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983							
Appliance	Freezer	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259
Appliance	Refrigerator - TOS	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085		
Appliance	Room AC - TOS	990	990	990	990	990							
Appliance	Clothes Dryer	149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011			
Appliance	Water Cooler	84	84	84									
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan	36	36	36	36	36	36	36	36	36	36	36	36
HVAC	Advanced Thermostat	15,641,856	15,641,856	15,641,856	15,641,856								
Miscellaneous	Pool Pump												
CY2020 Program Total Electric Contribution to CPAS		27,334,162	27,334,162	20,351,311	20,351,227	4,709,371	2,467,398	2,467,398	1,281,391	1,281,391	1,132,380	23,295	23,295
Historic Program Total Electric Contribution to CPAS‡		56,932,273	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
Program Total Electric CPAS		84,266,435	58,435,578	51,417,180	27,833,066	8,777,767	5,556,771	3,811,841	2,625,834	2,450,098	1,310,062	65,168	61,927
CY2020 Program Incremental Expiring Electric Savings§		8,707,929		6,982,851	84	15,641,856	2,241,973		1,186,006		149,011	1,109,085	
Historic Program Incremental Expiring Electric Savings‡§		4,057,204	25,830,857	35,547	23,584,030	3,413,443	979,024	1,744,930		175,736	991,025	135,809	3,241
Program Total Incremental Expiring Electric Savings§		12,765,133	25,830,857	7,018,398	23,584,114	19,055,299	3,220,997	1,744,930	1,186,006	175,736	1,140,036	1,244,894	3,241

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Appliance	Air Purifier												
Appliance	Clothes Washer												
Appliance	Dehumidifier												
Appliance	Freezer	23,259	23,259	23,259									
Appliance	Refrigerator - TOS												
Appliance	RoomAC - TOS												
Appliance	Clothes Dryer												
Appliance	Water Cooler												
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan												
HVAC	Advanced Thermostat												
Miscellaneous	Pool Pump												
CY2020 Program Total Electric Contribution to CPAS		23,259	23,259	23,259									
Historic Program Total Electric Contribution to CPAS†													
Program Total Electric CPAS		23,259	23,259	23,259									
CY2020 Program Incremental Expiring Electric Savings§		36				23,259							
Historic Program Incremental Expiring Electric Savings‡§													
Program Total Incremental Expiring Electric Savings§		36				23,259							

Note: The green highlighted cell shows program total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2020 contribution to CPAS.

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† 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 v8.0 algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

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

End Use Type	Research Category	EUL	CY2020		Lifetime Net Savings (Therms)†	Verified Net Therms Savings								
			Verified Gross Savings (Therms)	NTG*		2018	2019	2020	2021	2022	2023	2024	2025	2026
Appliance	Air Purifier	9.0		0.79										
Appliance	Clothes Washer	14.0	113,196	0.63	998,385			71,313	71,313	71,313	71,313	71,313	71,313	71,313
Appliance	Dehumidifier	12.0		0.67										
Appliance	Freezer	22.0		0.63										
Appliance	Refrigerator - TOS	17.0		0.65										
Appliance	Room AC - TOS	12.0		0.72										
Appliance	Clothes Dryer	16.0		0.67										
Appliance	Water Cooler	10.0		0.67										
Consumer Electronics	Advanced Power Strip - Tier 1	7.0		0.76										
HVAC	Bathroom Exhaust Fan	19.0		0.66										
HVAC	Advanced Thermostat	11.0	3,230,313	NA#	35,533,440			3,230,313	3,230,313	3,230,313	3,230,313	3,230,313	3,230,313	3,230,313
Miscellaneous	Pool Pump	7.0		0.80										
CY2020 Program Total Gas Contribution to CPAS (Therms)			3,343,508		36,531,825			3,301,626	3,301,626	3,301,626	3,301,626	3,301,626	3,301,626	3,301,626
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡								96,770,657	96,770,657	96,770,657	96,770,657	96,770,657	96,770,657	96,770,657
Historic Program Total Gas Contribution to 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
Program Total Gas CPAS (kWh Equivalent)‡								96,770,657	96,770,657	96,770,657	96,770,657	96,770,657	96,770,657	96,770,657
CY2020 Program Incremental Expiring Gas Savings (Therms)														
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)‡														
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§														
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡														

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Air Purifier												
Appliance	Clothes Washer	71,313	71,313	71,313	71,313	71,313	71,313	71,313					
Appliance	Dehumidifier												
Appliance	Freezer												
Appliance	Refrigerator - TOS												
Appliance	Room AC - TOS												
Appliance	Clothes Dryer												
Appliance	Water Cooler												
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan												
HVAC	Advanced Thermostat	3,230,313	3,230,313	3,230,313	3,230,313								
Miscellaneous	Pool Pump												
CY2020 Program Total Gas Contribution to CPAS (Therms)		3,301,626	3,301,626	3,301,626	3,301,626	71,313	71,313	71,313					
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)†		96,770,657	96,770,657	96,770,657	96,770,657	2,090,191	2,090,191	2,090,191					
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§		176,247,714	117,829,176	117,829,176	4,029,676	4,029,676	1,849,308						
Program Total Gas CPAS (kWh Equivalent)†		96,770,657	96,770,657	96,770,657	96,770,657	2,090,191	2,090,191	2,090,191					
CY2020 Program Incremental Expiring Gas Savings (Therms)						3,230,313			71,313				
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)†						94,680,467			2,090,191				
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§			58,418,539		113,799,500		2,180,367	1,849,308					
Program Total Incremental Expiring Gas Savings (kWh Equivalent)†			58,418,539		113,799,500	94,680,467	2,180,367	1,849,308	2,090,191				

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 CY2020.

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† 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 Y_{n-1} - CPAS Y_n.

The TRM v8.0 algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

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

End Use Type	Research Category	EUL	CY2020			Verified Net kWh Savings (Including Those Converted from Gas Savings)												
			Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	2018	2019	2020	2021	2022	2023	2024	2025	2026				
Appliance	Air Purifier	9.0	8,839,052	0.79	62,845,660			6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851	6,982,851			
Appliance	Clothes Washer	14.0	5,200,313	0.63	45,866,760			3,276,197	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197			
Appliance	Dehumidifier	12.0	3,344,751	0.67	26,891,796			2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983			
Appliance	Freezer	22.0	36,919	0.63	511,697			23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259			
Appliance	Refrigerator - TOS	17.0	1,706,285	0.65	18,854,449			1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085			
Appliance	Room AC - TOS	12.0	1,375	0.72	11,880			990	990	990	990	990	990	990	990			
Appliance	Clothes Dryer	16.0	222,404	0.67	2,384,172			149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011			
Appliance	Water Cooler	10.0	125	0.67	839			84	84	84	84	84	84	84	84			
Consumer Electronics	Advanced Power Strip - Tier 1	7.0	10,744,342	0.76	57,159,899			8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700	8,165,700			
HVAC	Bathroom Exhaust Fan	19.0	55	0.66	687			36	36	36	36	36	36	36	36			
HVAC	Advanced Thermostat	11.0	110,322,323	NA#	1,213,545,549			110,322,323	110,322,323	110,322,323	110,322,323	110,322,323	110,322,323	110,322,323	110,322,323			
Miscellaneous	Pool Pump	7.0	677,787	0.80	3,795,606			542,229	542,229	542,229	542,229	542,229	542,229	542,229	542,229			
CY2020 Program Total Contribution to CPAS			141,095,730		1,431,868,996			132,812,748										
Historic Program Total Contribution to CPAS‡						94,868,757	245,059,699	238,665,552	237,237,191									
Program Total CPAS						94,868,757	245,059,699	377,872,447	377,872,447	377,872,447	377,872,447	377,872,447	377,872,447	371,478,300	370,049,940			
CY2020 Program Incremental Expiring Savings§																		
Historic Program Incremental Expiring Savings‡§														6,394,147	1,428,360			
Program Total Incremental Expiring Savings§														6,394,147	1,428,360			

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Appliance	Air Purifier	6,982,851	6,982,851										
Appliance	Clothes Washer	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197	3,276,197					
Appliance	Dehumidifier	2,240,983	2,240,983	2,240,983	2,240,983	2,240,983							
Appliance	Freezer	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259	23,259
Appliance	Refrigerator - TOS	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085	1,109,085		
Appliance	Room AC - TOS	990	990	990	990	990							
Appliance	Clothes Dryer	149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011	149,011			
Appliance	Water Cooler	84	84	84									
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan	36	36	36	36	36	36	36	36	36	36	36	36
HVAC	Advanced Thermostat	110,322,323	110,322,323	110,322,323	110,322,323								
Miscellaneous	Pool Pump												
CY2020 Program Total Contribution to CPAS		124,104,819	124,104,819	117,121,968	117,121,884	6,799,561	4,557,588	4,557,588	1,281,391	1,281,391	1,132,380	23,295	23,295
Historic Program Total Contribution to 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		
Program Total CPAS		208,522,224	128,951,673	121,937,744	120,417,084	10,094,761	4,693,397	4,693,397	1,417,200	1,417,200	1,268,189	23,295	23,295
CY2020 Program Incremental Expiring Savings§		8,707,929		6,982,851	84	110,322,323	2,241,973		3,276,197		149,011	1,109,085	
Historic Program Incremental Expiring Savings‡§		4,057,204	79,570,552	31,078	1,520,576		3,159,391					135,809	
Program Total Incremental Expiring Savings§		12,765,133	79,570,552	7,013,929	1,520,660	110,322,323	5,401,364		3,276,197		149,011	1,244,894	

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Appliance	Air Purifier												
Appliance	Clothes Washer												
Appliance	Dehumidifier												
Appliance	Freezer	23,259	23,259	23,259									
Appliance	Refrigerator - TOS												
Appliance	Room AC - TOS												
Appliance	Clothes Dryer												
Appliance	Water Cooler												
Consumer Electronics	Advanced Power Strip - Tier 1												
HVAC	Bathroom Exhaust Fan												
HVAC	Advanced Thermostat												
Miscellaneous	Pool Pump												
CY2020 Program Total Contribution to CPAS		23,259	23,259	23,259									
Historic Program Total Contribution to CPAS†													
Program Total CPAS		23,259	23,259	23,259									
CY2020 Program Incremental Expiring Savings§		36			23,259								
Historic Program Incremental Expiring Savings‡§													
Program Total Incremental Expiring Savings§		36			23,259								

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 CY2020.

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

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

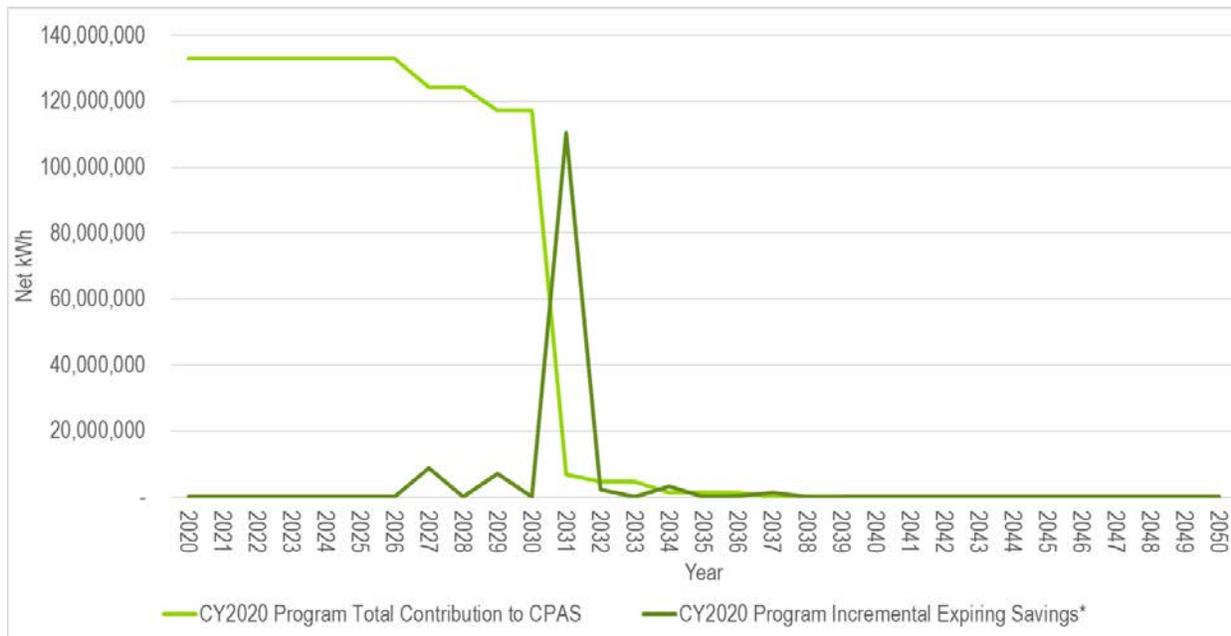
‡ Historic savings go back to CY2018.

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

The TRM v8.0 algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings

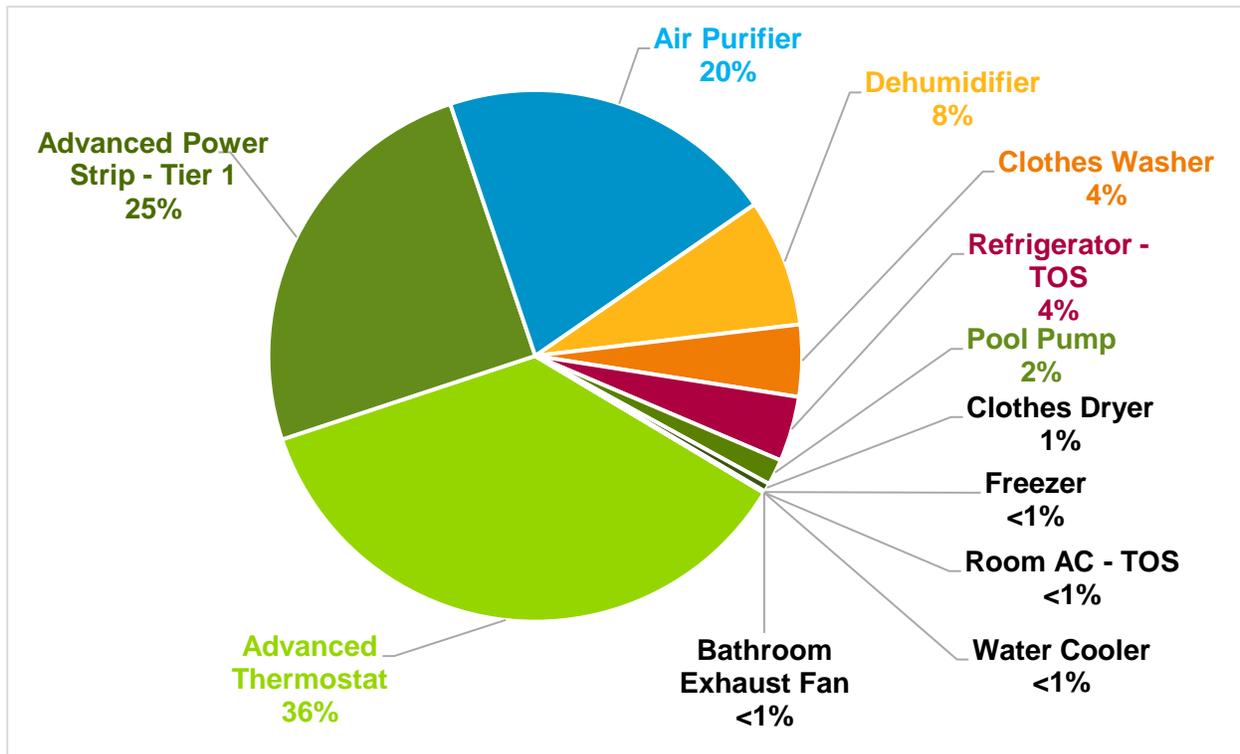


* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n .

Source: ComEd tracking data and evaluation team analysis

5. Program Savings by Measure

The program includes 12 measures as the following tables show. Advanced thermostats, advanced power strips, and air purifiers contributed the most savings (see Figure 5-1). Collectively, the remaining measures contributed approximately 19% of the savings. ComEd also distributed advanced thermostats and advanced power strips for the first time through Marketplace 2.0, an online market.

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


Source: ComEd tracking data and evaluation team analysis

Table 5-1. CY2020 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	Air Purifier	8,839,052	1.00	8,839,052	0.79	6,982,851	9.0
Appliance	Clothes Washer	1,699,721	1.11	1,882,550	0.63	1,186,006	14.0
Appliance	Dehumidifier	3,351,012	1.00	3,344,751	0.67	2,240,983	12.0
Appliance	Freezer	36,919	1.00	36,919	0.63	23,259	22.0
Appliance	Refrigerator - TOS	1,706,285	1.00	1,706,285	0.65	1,109,085	17.0
Appliance	Room AC - TOS	1,375	1.00	1,375	0.72	990	12.0
Appliance	Clothes Dryer	222,404	1.00	222,404	0.67	149,011	16.0
Appliance	Water Cooler	125	1.00	125	0.67	84	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	10,744,342	1.00	10,744,342	0.76	8,165,700	7.0
HVAC	Bathroom Exhaust Fan	77	0.71	55	0.66	36	19.0
HVAC	Advanced Thermostat	15,733,120	0.99	15,641,856	NA†	15,641,856	11.0
Miscellaneous	Pool Pump	677,752	1.00	677,787	0.80	542,229	7.0
	Total	43,012,184	1.00	43,097,501		36,042,091	

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

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2020 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	1,007.63	1.00	1,008.21	0.79	796.49
Appliance	Clothes Washer	218.33	1.00	219.21	0.63	138.10
Appliance	Dehumidifier	760.76	1.00	758.73	0.67	508.35
Appliance	Freezer	5.95	1.00	5.95	0.63	3.75
Appliance	Refrigerator - TOS	257.18	1.00	257.18	0.65	167.17
Appliance	Room AC - TOS	1.87	1.00	1.87	0.72	1.35
Appliance	Clothes Dryer	29.86	1.00	29.86	0.67	20.01
Appliance	Water Cooler	0.01	1.00	0.01	0.67	0.01
Consumer Electronics	Advanced Power Strip - Tier 1	1,210.04	1.00	1,205.71	0.76	916.34
HVAC	Bathroom Exhaust Fan	0.01	0.71	0.01	0.66	0.00
HVAC	Advanced Thermostat	4,539.06	0.90	4,094.23	NA†	4,094.23
Miscellaneous	Pool Pump	447.39	1.00	447.34	0.80	357.87
	Total	8,478.11	0.95	8,028.31		7,003.66

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 5-3. CY2020 Energy Savings by Measure – 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)
Appliance	Air Purifier	0	NA	0	0.79	0	9.0
Appliance	Clothes Washer	113,196	1.00	113,196	0.63	71,313	14.0
Appliance	Dehumidifier	0	NA	0	0.67	0	12.0
Appliance	Freezer	0	NA	0	0.63	0	22.0
Appliance	Refrigerator - TOS	0	NA	0	0.65	0	17.0
Appliance	Room AC - TOS	0	NA	0	0.72	0	12.0
Appliance	Clothes Dryer	0	NA	0	0.67	0	16.0
Appliance	Water Cooler	0	NA	0	0.67	0	10.0
Consumer Electronics	Advanced Power Strip - Tier 1	0	NA	0	0.76	0	7.0
HVAC	Bathroom Exhaust Fan	0	NA	0	0.66	0	19.0
HVAC	Advanced Thermostat	3,245,715	1.00	3,230,313	NA‡	3,230,313	11.0
Miscellaneous	Pool Pump	0	NA	0	0.80	0	7.0
	Total Therms	3,358,911	1.00	3,343,508		3,301,626	
	Total kWh Converted from Therms†	98,449,673	1.00	97,998,230		96,770,657	

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

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

‡ The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

Table 5-4. CY2020 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	8,839,052	1.00	8,839,052	0.79	6,982,851
Appliance	Clothes Washer	5,017,484	1.04	5,200,313	0.63	3,276,197
Appliance	Dehumidifier	3,351,012	1.00	3,344,751	0.67	2,240,983
Appliance	Freezer	36,919	1.00	36,919	0.63	23,259
Appliance	Refrigerator - TOS	1,706,285	1.00	1,706,285	0.65	1,109,085
Appliance	Room AC - TOS	1,375	1.00	1,375	0.72	990
Appliance	Clothes Dryer	222,404	1.00	222,404	0.67	149,011
Appliance	Water Cooler	125	1.00	125	0.67	84
Consumer Electronics	Advanced Power Strip - Tier 1	10,744,342	1.00	10,744,342	0.76	8,165,700
HVAC	Bathroom Exhaust Fan	77	0.71	55	0.66	36
HVAC	Advanced Thermostat	110,865,030	1.00	110,322,323	NA†	110,322,323
Miscellaneous	Pool Pump	677,752	1.00	677,787	0.80	542,229
	Total†	141,461,857	1.00	141,095,730		132,812,748

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

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

‡ The TRM algorithm calculates net savings for advanced thermostats.

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 5-5 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 5-5. 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	Air Purifier	0	0	NA	0	0.79	0
Appliance	Clothes Washer	44,970,032	178,454	1.01	180,778	0.63	113,890
Appliance	Dehumidifier	0	0	NA	0	0.67	0
Appliance	Freezer	0	0	NA	0	0.63	0
Appliance	Refrigerator - TOS	0	0	NA	0	0.65	0
Appliance	Room AC - TOS	0	0	NA	0	0.72	0
Appliance	Clothes Dryer	0	0	NA	0	0.67	0
Appliance	Water Cooler	0	0	NA	0	0.67	0
Consumer Electronics	Advanced Power Strip - Tier 1	0	0	NA	0	0.76	0
HVAC	Bathroom Exhaust Fan	0	0	NA	0	0.66	0
HVAC	Advanced Thermostat	0	0	NA	0	NA†	0
Miscellaneous	Pool Pump	0	0	NA	0	0.80	0
	Total	44,970,032	178,454	1.01	180,778		113,890

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 found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

† The TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team calculated verified gross and net program impacts for 12 measures: air purifier, clothes washer, clothes dryer, dehumidifier, freezer, refrigerator, room air conditioner, water cooler, advanced thermostat, bathroom exhaust fan, advanced power strip, and pool pump. These measures account for all quantifiable CY2020 electric savings.

The team calculated verified gross energy and demand savings using the algorithms in the Illinois Statewide Technical Reference Manual (TRM v8.0) and the TRM v8.0 Errata. Table 6-1 presents the deemed input parameter source the evaluation team used by measure. TRM v8.0 allows for custom or actual values to be used for some of the input parameters; the evaluation team based these values on the program tracking database when available.

To calculate verified net energy and demand (coincident peak and overall) savings, the evaluation team multiplied the verified gross savings estimates by a net-to-gross (NTG) ratio. Illinois SAG defined NTG estimates used to calculate net verified savings.

Table 6-1. Savings Parameters

End Use Type	Research Category	Unit	Ex Ante Gross kWh/Unit Savings	Ex Ante Gross Peak kW/Unit Savings	Verified Gross kWh/Unit Savings	Verified Gross Peak kW/Unit Savings	kWh Savings RR	Peak kW Savings RR	Source*
Appliance	Air Purifier	Each	706.59	0.08	706.59	0.08	1.00	1.00	IL TRM v8.0 - Section 5.1.01
Appliance	Clothes Washer	Each	113.98	0.01	120.44	0.01	1.06	1.01	IL TRM v8.0 - Section 5.1.02
Appliance	Dehumidifier	Each	214.94	0.05	215.07	0.05	1.00	1.00	IL TRM v8.0 - Section 5.1.03
Appliance	Freezer	Each	52.43	0.01	52.43	0.01	1.00	1.00	IL TRM v8.0 - Section 5.1.05
Appliance	Refrigerator	Each	61.82	0.01	61.82	0.01	1.00	1.00	IL TRM v8.0 - Errata Section 5.1.06
Appliance	Room AC	Each	12.50	0.02	12.50	0.02	1.00	1.00	IL TRM v8.0 - Section 5.1.07 and Implementer documentation
Appliance	Clothes Dryer	Each	158.82	0.02	158.82	0.02	1.00	1.00	IL TRM v8.0 - Section 5.1.10
Appliance	Water Cooler	Each	125.40	0.01	125.28	0.01	1.00	1.00	IL TRM v8.0 - Section 5.1.11 and Implementer documentation
Consumer Electronics	Advanced Power Strip - Tier 1	Each	103.00	0.01	103.00	0.01	1.00	1.00	IL TRM v8.0 - Section 5.2.01
HVAC	Bathroom Exhaust Fan	Each	88.60	0.01	55.45	0.01	0.63	0.63	IL TRM v8.0 - Section 5.3.09
HVAC	Advanced Thermostat	Each	2,248.35	0.08	2,125.85	0.07	0.95	0.96	IL TRM v8.0 - Section 5.3.16
Miscellaneous	Pool Pump	Each	1,952.00	1.28	1,952.00	1.28	1.00	1.00	IL TRM v8.0 - Section 5.7.01

* TRM is the State of Illinois Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>. The NTG values can be found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.

Source: ComEd tracking data and evaluation team analysis

6.2 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2020 evaluation. These findings suggest ways to improve the measure-level realization rates. Table 6-2 presents the end use-level realization rates and program savings percentages to give context to the team's recommendations.

Table 6-2. End Use-Level Savings and Realization Rates

Research Category	Realization Rate	Percentage of Verified Net Savings
Advanced Thermostat	0.99	43%
Clothes Washer	1.11	3%
Bathroom Exhaust Fan	0.71	<1%

Source: ComEd tracking data and evaluation team analysis

6.2.1 Advanced Thermostats

Finding 1. The evaluation team found that the tracking data had more than one thermostat for some account numbers. Per TRM v8.0, savings can only be claimed for one thermostat per household. We average the savings per account and adjust the final verified savings. Thermostats represent 43% of program savings and had a verified gross realization rate of 0.99.

Recommendation 1. Guidehouse recommends that ComEd claim savings for only one thermostat per account number to be consistent with TRM v8.0.

Finding 2. The evaluation team found that for Smart Thermostat Instant Rebate MP, ComEd Marketplace data used Summer System Peak Coincidence Factor for Central A/C (CFssp) of 34% instead of the TRM v8.0 recommended PJM Summer Peak Coincidence Factor for Central A/C (CFpjm) of 23.3%. This produces low demand savings for all advanced thermostats as a result. Thermostats account for 58% of total demand savings and had a demand realization rate of 0.90.

Recommendation 2. Guidehouse recommends that ComEd use CFpjm 23.3% in thermostat calculations.

6.2.2 Clothes Washers

Finding 3. The evaluation team found clothes washer realization rates are higher at 1.11 (kWh). We found that the ex ante water savings figures do not conform to the TRM v8.0 standard values. The TRM v8.0 deem water savings values at 2,157 gallons for Most Efficient and 1,295 gallons for less efficient clothes washers (ENERGYSTAR Most Efficient = N). We found that ex ante water savings values are incorrectly set to 1,259 for less efficient clothes washers for 18,235 records. Clothes washers represent 3% of program savings and had a verified gross realization rate of 1.11.

Recommendation 3. Guidehouse recommends that ComEd use ex ante water savings values from the TRM v8.0 calculations for less efficient clothes washers.

Finding 4. The evaluation team found that clothes washer ex ante energy savings do not include secondary savings from water as specified in TRM v8.0. ComEd communicated this to the evaluation team prior to the evaluation. The realization rate for clothes washers is higher at 1.11 as the evaluation team included secondary kWh savings in verified energy savings. Clothes washers represent 3% of program savings.

Recommendation 4. Guidehouse recommends that ComEd include calculated kWh from water savings as a separate value to eliminate any confusion in calculating verified savings.

6.2.3 Therm Disposition

Finding 5. The evaluation team included energy savings from therm conversion to kWh in our findings. In previous years, the evaluation team determined if ComEd was planning to claim therm savings by examining ThermDisposition data. Since ComEd did not provide ThermDisposition data along with final tracking data, the evaluation team reported and verified all potential therms seen in the tracking data.

Recommendation 5. Guidehouse recommends that ComEd provide ThermDisposition data if ComEd plans to claim therms for only specific measures for CY2020.

6.2.4 Bathroom Exhaust Fans

Finding 6. The evaluation team found that bathroom fans have a realization rate of 0.71 (kWh). During the CY2019 Wave 1 evaluation, the implementer informed us to calculate energy savings using standard usage and unknown capacity, and the evaluation team used these characteristics and calculated verified savings of 27.4 kWh savings to be consistent with TRM v8.0. We found that ComEd reported 38.6 kWh savings, which matches fans for ENERGY STAR Most Efficient. The tracking data did not have data to indicate if these measures were ENERGY STAR Most Efficient. Without efficiency ratings, the evaluation team verified savings as ENERGY STAR Most Efficient = N to estimate conservatively. Bathroom fans represent less than 1% of the program savings and had a realization rate of 0.71.

Recommendation 6. Guidehouse recommends that ComEd follow ENERGY STAR savings of 27.4 kWh to match standard fan with unknown CFM in TRM v8.0.

Appendix A. Impact Analysis Methodology

Guidehouse determined verified gross savings for each program measure by:

- Reviewing the savings algorithm inputs in the measure databook for agreement with the TRM v8.0 and TRM v8.0 Errata, where applicable.
- Validating that the savings algorithm was applied correctly.
- Cross-checking per-unit savings values in the tracking data with the verified values in the measure databook or in the evaluation team's calculations if the databook did not agree with the TRM.
- Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

Appendix B. Total Resource Cost Detail

Table B-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 B-1. Total Resource Cost Savings Summary

Research Category	Units	Quantity	EUL (years)*	ER Flag †	Gross Electric Energy Savings (kWh)	Gross Peak Demand Reduction (kW)	Gross Gas Savings (Therms)	Gross Secondary Savings due to Water Reduction (kWh)	Gross Heating Penalty (kWh)	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Net Electric Energy Savings (kWh)	Net Peak Demand Reduction (kW)	Net Gas Savings (Therms)	Net Secondary Savings due to Water Reduction (kWh)	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Air Purifier	Each	10,798	9.0	No	8,839,052	1,008.21	0	0	NA	NA	0.79	0.79	0.79	6,982,851	796.49	0	0	NA	NA
Clothes Washer	Each	28,430	14.0	No	1,701,772	219.21	113,196	180,778	NA	NA	0.63	0.63	0.63	1,072,117	138.10	71,313	113,890	NA	NA
Dehumidifier	Each	27,445	12.0	No	3,344,751	758.73	0	0	NA	NA	0.67	0.67	0.67	2,240,983	508.35	0	0	NA	NA
Freezer	Each	767	22.0	No	36,919	5.95	0	0	NA	NA	0.63	0.63	0.63	23,259	3.75	0	0	NA	NA
Refrigerator - TOS	Each	28,323	17.0	No	1,706,285	257.18	0	0	NA	NA	0.65	0.65	0.65	1,109,085	167.17	0	0	NA	NA
Room AC - TOS	Each	110	12.0	No	1,375	1.87	0	0	NA	NA	0.72	0.72	0.72	990	1.35	0	0	NA	NA
Clothes Dryer	Each	1,383	16.0	No	222,404	29.86	0	0	NA	NA	0.67	0.67	0.67	149,011	20.01	0	0	NA	NA
Water Cooler	Each	1	10.0	No	125	0.01	0	0	NA	NA	0.67	0.67	0.67	84	0.01	0	0	NA	NA
Advanced Power Strip - Tier 1	Each	104,314	7.0	No	10,744,342	1,205.71	0	0	NA	NA	0.76	0.76	0.76	8,165,700	916.34	0	0	NA	NA
Bathroom Exhaust Fan	Each	2	19.0	No	55	0.01	0	0	NA	NA	0.66	0.66	0.66	36	0.00	0	0	NA	NA
Advanced Thermostat	Each	51,613	11.0	No	15,641,856	4,094.23	3,230,313	0	NA	NA	NA‡	NA‡	NA‡	15,641,856	4,094.23	3,230,313	0	NA	NA
Pool Pump	Each	353	7.0	No	677,787	447.34	0	0	NA	NA	0.80	0.80	0.80	542,229	357.87	0	0	NA	NA
Total		253,539	10.0		42,916,723	8,028.31	3,343,508	180,778	NA	NA				35,928,201	7,003.66	3,301,626	113,890	NA	NA

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis exclude secondary energy savings from water reduction measures. Table B-1 represents the kWh savings from Table 5-1 minus those shown in Table 5-5.

* 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 TRM algorithm calculates net savings for advanced thermostats.

Source: ComEd tracking data and evaluation team analysis