NAVIGANT

ComEd AirCare Plus Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2018 (CY2018)
(12/1/2018-12/31/2018)

Presented to
ComEd

DRAFT

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ComEd AirCare Plus Impact Evaluation Report

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1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's CY2018 AirCare Plus (ACP) Program. It presents a summary of the energy and demand impacts for the total program broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. CY2018 covers January 1, 2018 through December 31, 2018.

2. PROGRAM DESCRIPTION

The ACP Program focuses on optimizing the energy performance of HVAC packaged rooftop units (RTUs) and split systems, including mechanical adjustments (tune-ups, economizer repair) and hardware retrofits. The ACP Program is implemented by CLEAResult and includes both private and public sector customers. The available measures in the CY2018 ACP Program are air conditioner (AC) tune-up, advance early retirement of RTUs, thermostat replacement and adjustment, economizer repair and optimization, cogged v-belt, and demand-controlled ventilation (DCV), and RTU Real Seal (RTU sealing). The program is not scheduled to continue beyond CY2018.

The program had 636 participants in CY2018 and distributed 4,173 measures as shown in the following table and graph.

Table 2-1. CY2018 Volumetric Findings Detail

Participation	Private Sector	Public Sector	Total
Participants	571	65	636
Total Measures	3,468	705	4,173
Number of Units/Projects	1.78	1.88	1.80
Installed Projects	1,946	376	2,322
AC Tune-Up	637	148	785
Advanced Early Retirement	21	0	21
Cogged V-Belt	272	48	320
DCV	143	24	167
Economizer Adjustment & Repair	322	96	418
RTU Real Seal	883	211	1,094
Thermostat Adjustment	91	65	156
Thermostat Replacement	1,099	113	1,212

Source: ComEd tracking data and Navigant team analysis.

Figure 2-1. Measure Distribution by Sector
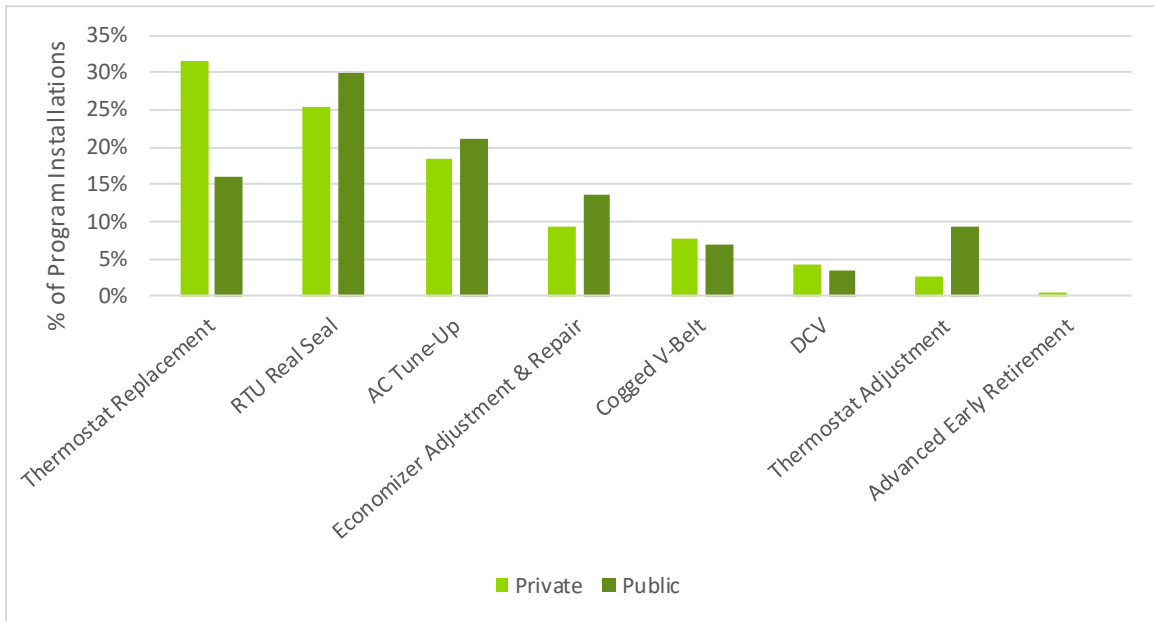
Source: ComEd tracking data and Navigant team analysis.

3. CUMULATIVE PERSISTING ANNUAL SAVINGS

The measure-specific and total ex ante gross savings for the ACP Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The total electric CPAS across all measures is 20,749,825 kWh. The program achieved 8,120,061 kWh CPAS equivalent of gas savings converted to electricity that might be counted toward ComEd's goal[1] (the middle table in the following set of tables). Adding the savings converted from gas savings to the electric savings produces a total of 28,869,886 kWh of total CPAS.

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[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	Verified Gross Savings	NTG*	Lifetime Net Savings†	Verified Net kWh Savings								
						2018	2019	2020	2021	2022	2023	2024	2025	2026
HVAC	AC Tune-Up	3.0	1,825,870	0.90	4,929,849	1,643,283	1,643,283	1,643,283	0	0	0	0	0	0
HVAC	Advanced Early Retirement	15.0	451,540	0.90	2,912,020	406,386	406,386	406,386	406,386	406,386	88,009	88,009	88,009	88,009
HVAC	Cogged V-Belt	4.1	72,128	0.90	269,353	64,915	64,915	64,915	64,915	9,694	0	0	0	0
HVAC	DCV	10.0	1,573,885	0.90	14,164,969	1,416,497	1,416,497	1,416,497	1,416,497	1,416,497	1,416,497	1,416,497	1,416,497	1,416,497
HVAC	Economizer Adjustment & Repair	5.0	297,116	0.90	1,337,022	267,404	267,404	267,404	267,404	267,404	0	0	0	0
HVAC	RTU Real Seal	5.0	999,091	0.90	4,495,908	899,182	899,182	899,182	899,182	899,182	0	0	0	0
HVAC	Thermostat Adjustment	2.0	2,986,159	0.90	5,375,086	2,687,543	2,687,543	0	0	0	0	0	0	0
HVAC	Thermostat Replacement	8.0	14,849,573	0.90	106,916,923	13,364,615	13,364,615	13,364,615	13,364,615	13,364,615	13,364,615	13,364,615	13,364,615	0
CY2018 Program Total Electric CPAS			**23,055,361**		**140,401,130**	**20,749,825**	**20,749,825**	**18,062,282**	**16,418,999**	**16,363,778**	**14,869,121**	**14,869,121**	**14,869,121**	**1,504,506**
CY2018 Program Expiring Electric Savings‡							**0**	**2,687,543**	**4,330,826**	**4,386,048**	**5,880,704**	**5,880,704**	**5,880,704**	**19,245,319**

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
HVAC	AC Tune-Up	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Advanced Early Retirement	88,009	88,009	88,009	88,009	88,009	88,009	0	0	0	0	0	0
HVAC	Cogged V-Belt	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	DCV	1,416,497	0	0	0	0	0	0	0	0	0	0	0
HVAC	Economizer Adjustment & Repair	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	RTU Real Seal	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Replacement	0	0	0	0	0	0	0	0	0	0	0	0
CY2018 Program Total Electric CPAS		**1,504,506**	**88,009**	**88,009**	**88,009**	**88,009**	**88,009**	**0**	**0**	**0**	**0**	**0**	**0**
CY2018 Program Expiring Electric Savings‡		**19,245,319**	**20,661,816**	**20,661,816**	**20,661,816**	**20,661,816**	**20,661,816**	**20,749,825**	**20,749,825**	**20,749,825**	**20,749,825**	**20,749,825**	**20,749,825**

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.
‡ 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
HVAC	AC Tune-Up	3.0	0	0.90	0	0	0	0	0	0	0	0	0	0
HVAC	Advanced Early Retirement	15.0	0	0.90	0	0	0	0	0	0	0	0	0	0
HVAC	Cogged V-Belt	4.1	0	0.90	0	0	0	0	0	0	0	0	0	0
HVAC	DCV**	10.0	63,860	0.90	574,737	57,474	57,474	57,474	57,474	57,474	57,474	57,474	57,474	57,474
HVAC	Economizer Adjustment & Repair	5.0	112,010	0.90	504,044	100,809	100,809	100,809	100,809	100,809	0	0	0	0
HVAC	RTU Real Seal	5.0	64,290	0.90	289,304	57,861	57,861	57,861	57,861	57,861	0	0	0	0
HVAC	Thermostat Adjustment	2.0	1,514	0.90	2,725	1,363	1,363	0	0	0	0	0	0	0
HVAC	Thermostat Replacement**	8.0	66,150	0.90	476,278	59,535	59,535	59,535	59,535	59,535	59,535	59,535	59,535	0
CY2018 Program Total Gas CPAS (Therms)			307,823		1,847,089	277,041	277,041	275,678	275,678	275,678	117,009	117,009	117,009	57,474
CY2018 Program Total Gas CPAS (kWh Equivalent)‡					54,138,166	8,120,061	8,120,061	8,080,125	8,080,125	8,080,125	3,429,519	3,429,519	3,429,519	1,684,555
CY2018 Program Expiring Gas Savings (Therms)§							0	1,363	1,363	1,363	160,032	160,032	160,032	219,567
CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§							0	39,936	39,936	39,936	4,690,542	4,690,542	4,690,542	6,435,506

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
HVAC	AC Tune-Up	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Advanced Early Retirement	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Cogged V-Belt	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	DCV**	57,474	0	0	0	0	0	0	0	0	0	0	0
HVAC	Economizer Adjustment & Repair	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	RTU Real Seal	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Replacement**	0	0	0	0	0	0	0	0	0	0	0	0
CY2018 Program Total Gas CPAS (Therms)		57,474	0	0	0	0	0	0	0	0	0	0	0
CY2018 Program Total Gas CPAS (kWh Equivalent)‡		1,684,555	0	0	0	0	0	0	0	0	0	0	0
CY2018 Program Expiring Gas Savings (Therms)§		219,567	277,041	277,041	277,041	277,041	277,041	277,041	277,041	277,041	277,041	277,041	277,041
CY2018 Program Expiring Gas Savings (kWh Equivalent)‡§		6,435,506	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061	8,120,061

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.
‡ 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.
** These measures may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
Source: Navigant analysis

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

End Use Type	Research Category	EUL	CY2018 Verified Gross Savings	NTG*	Lifetime Net Savings†	Verified Net kWh Savings (Including Those Converted from Gas Savings)								
						2018	2019	2020	2021	2022	2023	2024	2025	2026
HVAC	AC Tune-Up	3.0	1,825,870	0.90	4,929,849	1,643,283	1,643,283	1,643,283	0	0	0	0	0	0
HVAC	Advanced Early Retirement	15.0	451,540	0.90	2,912,020	406,386	406,386	406,386	406,386	406,386	88,009	88,009	88,009	88,009
HVAC	Cogged V-Belt	4.1	72,128	0.90	269,353	64,915	64,915	64,915	64,915	9,694	0	0	0	0
HVAC	DCV**	10.0	3,445,613	0.90	31,010,518	3,101,052	3,101,052	3,101,052	3,101,052	3,101,052	3,101,052	3,101,052	3,101,052	3,101,052
HVAC	Economizer Adjustment & Repair	5.0	3,580,121	0.90	16,110,547	3,222,109	3,222,109	3,222,109	3,222,109	3,222,109	0	0	0	0
HVAC	RTU Real Seal	5.0	2,883,425	0.90	12,975,414	2,595,083	2,595,083	2,595,083	2,595,083	2,595,083	0	0	0	0
HVAC	Thermostat Adjustment	2.0	3,030,532	0.90	5,454,958	2,727,479	2,727,479	0	0	0	0	0	0	0
HVAC	Thermostat Replacement**	8.0	16,788,422	0.90	120,876,638	15,109,580	15,109,580	15,109,580	15,109,580	15,109,580	15,109,580	15,109,580	15,109,580	0
CY2018 Program Total CPAS			32,077,651		194,539,296	**28,869,886**	28,869,886	26,142,407	24,499,124	24,443,903	18,298,641	18,298,641	18,298,641	3,189,061
CY2018 Program Expiring Savings‡							0	2,727,479	4,370,762	4,425,983	10,571,246	10,571,246	10,571,246	25,680,825

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
HVAC	AC Tune-Up	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Advanced Early Retirement	88,009	88,009	88,009	88,009	88,009	88,009	0	0	0	0	0	0
HVAC	Cogged V-Belt	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	DCV**	3,101,052	0	0	0	0	0	0	0	0	0	0	0
HVAC	Economizer Adjustment & Repair	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	RTU Real Seal	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	Thermostat Replacement**	0	0	0	0	0	0	0	0	0	0	0	0
CY2018 Program Total CPAS		3,189,061	88,009	88,009	88,009	88,009	88,009	0	0	0	0	0	0
CY2018 Program Expiring Savings‡		25,680,825	28,781,877	28,781,877	28,781,877	28,781,877	28,781,877	28,869,886	28,869,886	28,869,886	28,869,886	28,869,886	28,869,886

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.
‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.
** These measures may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
Source: Navigant analysis

Figure 3-1. Cumulative Persisting Annual Savings
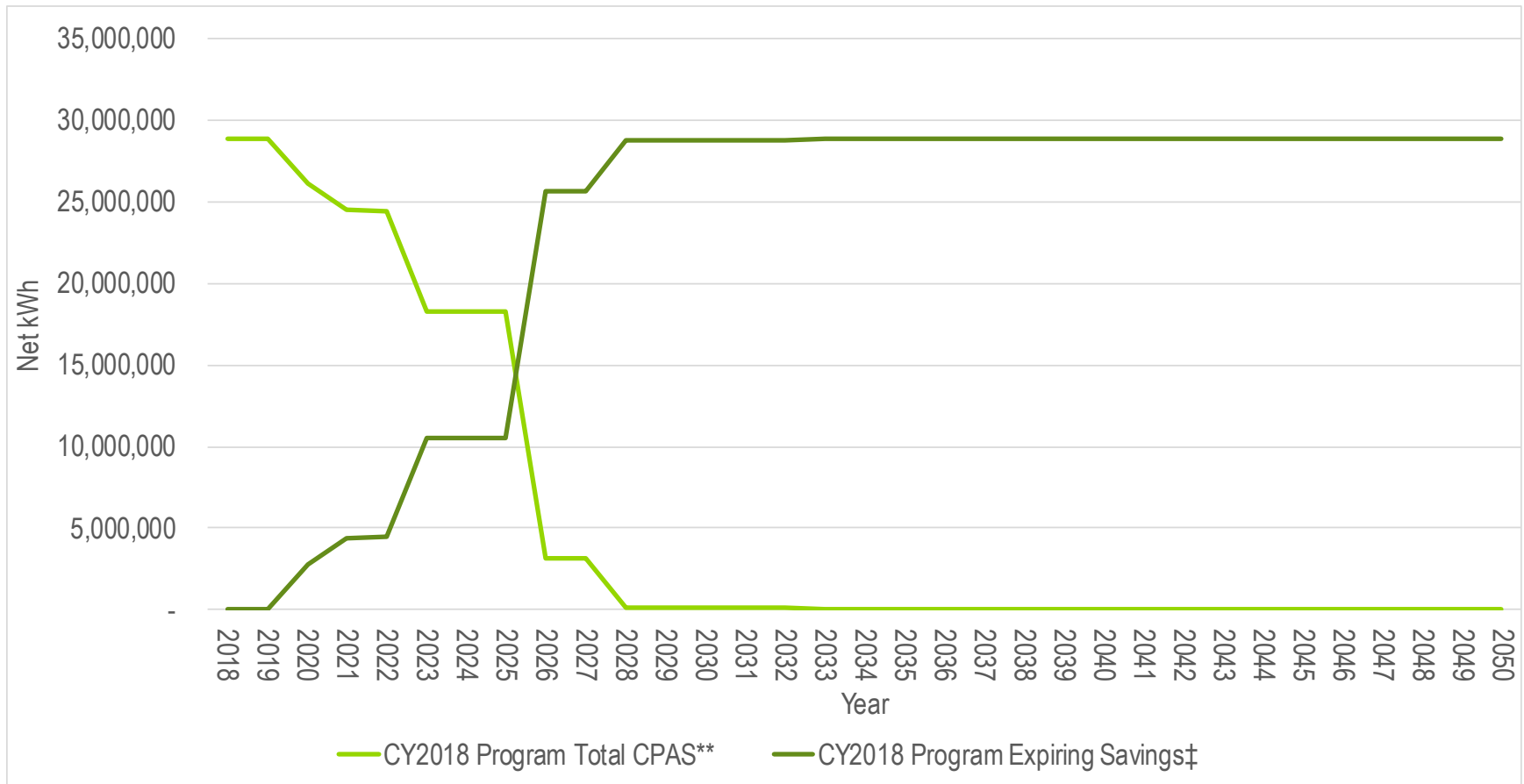
‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.
** These results may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
Source: Navigant analysis

4. PROGRAM SAVINGS DETAIL

Table 4-1 summarizes the incremental energy and demand savings the AirCare Plus 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	23,055,926	NR	3,568
Program Gross Realization Rate	1.00	NA	1.00
Verified Gross Savings	23,055,361	3,907	3,568
Program Net-to-Gross Ratio (NTG)	0.90	0.90	0.90
Verified Net Savings	20,749,825	3,516	3,211
Converted from Gas*†			
Ex Ante Gross Savings	8,950,263	NA	NA
Program Gross Realization Rate	1.01	NA	NA
Verified Gross Savings	9,022,290	NA	NA
Program Net-to-Gross Ratio (NTG)	0.90	NA	NA
Verified Net Savings	8,120,061	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	32,006,189	NA	3,568
Program Gross Realization Rate	1.00	NA	1.00
Verified Gross Savings	32,077,651	3,907	3,568
Program Net-to-Gross Ratio (NTG)	0.90	0.90	0.90
Verified Net Savings	28,869,886	3,516	3,211

NR = not reported
* Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).
† These values may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
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 eight measures as shown in the following tables. The thermostat replacement and adjustment measures contributed the most savings.

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[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
HVAC	AC Tune-Up	1,826,760	1.00	1,825,870	0.90	1,643,283	3.0
HVAC	Advanced Early Retirement	451,540	1.00	451,540	0.90	406,386	15.0
HVAC	Cogged V-Belt	72,128	1.00	72,128	0.90	64,915	4.1
HVAC	DCV	1,573,885	1.00	1,573,885	0.90	1,416,497	10.0
HVAC	Economizer Adjustment & Repair	297,048	1.00	297,116	0.90	267,404	5.0
HVAC	RTU Real Seal	998,833	1.00	999,091	0.90	899,182	5.0
HVAC	Thermostat Adjustment	2,986,159	1.00	2,986,159	0.90	2,687,543	2.0
HVAC	Thermostat Replacement	14,849,573	1.00	14,849,573	0.90	13,364,615	8.0
	Total	**23,055,926**	**1.00**	**23,055,361**	**0.90**	**20,749,825**	

* 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.
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)
HVAC	AC Tune-Up	NR	NA	1,907.79	0.90	1,717.01
HVAC	Advanced Early Retirement	NR	NA	467.34	0.90	420.60
HVAC	Cogged V-Belt	NR	NA	12.47	0.90	11.22
HVAC	DCV	NR	NA	486.97	0.90	438.27
HVAC	Economizer Adjustment & Repair	NR	NA	0.00	0.90	0.00
HVAC	RTU Real Seal	NR	NA	1,031.94	0.90	928.75
HVAC	Thermostat Adjustment	NR	NA	0.00	0.90	0.00
HVAC	Thermostat Replacement	NR	NA	0.00	0.90	0.00
	Total	**NR**	**NA**	**3,906.52**	**0.90**	**3,515.86**

NR = not reported
* 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.
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)
HVAC	AC Tune-Up	1,741.82	1.00	1,741.82	0.90	1,567.63
HVAC	Advanced Early Retirement	426.68	1.00	426.68	0.90	384.01
HVAC	Cogged V-Belt	12.47	1.00	12.47	0.90	11.22
HVAC	DCV	444.60	1.00	444.60	0.90	400.14
HVAC	Economizer Adjustment & Repair	0.00	NA	0.00	0.90	0.00
HVAC	RTU Real Seal	942.17	1.00	942.17	0.90	847.95
HVAC	Thermostat Adjustment	0.00	NA	0.00	0.90	0.00
HVAC	Thermostat Replacement	0.00	NA	0.00	0.90	0.00
	Total	**3,567.73**	**1.00**	**3,567.73**	**0.90**	**3,210.96**

* 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.
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
HVAC	AC Tune-Up	0	NA	0	0.90	0	3.0
HVAC	Advanced Early Retirement	0	NA	0	0.90	0	15.0
HVAC	Cogged V-Belt	0	NA	0	0.90	0	4.1
HVAC	DCV**	63,333	1.01	63,860	0.90	57,474	10.0
HVAC	Economizer Adjustment & Repair	151,869	0.74	112,010	0.90	100,809	5.0
HVAC	RTU Real Seal	0	NA	64,290	0.90	57,861	5.0
HVAC	Thermostat Adjustment	4,853	0.31	1,514	0.90	1,363	2.0
HVAC	Thermostat Replacement**	85,310	0.78	66,150	0.90	59,535	8.0
	Total Therms	**305,366**	**1.01**	**307,823**	**0.90**	**277,041**	
	Total kWh Converted from Therms†	**8,950,263**	**1.01**	**9,022,290**	**0.90**	**8,120,061**	

* 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.
† Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).
** These measures may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
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)
HVAC	AC Tune-Up	1,826,760	1.00	1,825,870	0.90	1,643,283
HVAC	Advanced Early Retirement	451,540	1.00	451,540	0.90	406,386
HVAC	Cogged V-Belt	72,128	1.00	72,128	0.90	64,915
HVAC	DCV**	3,430,170	1.00	3,445,613	0.90	3,101,052
HVAC	Economizer Adjustment & Repair	4,748,332	0.75	3,580,121	0.90	3,222,109
HVAC	RTU Real Seal	998,833	2.89	2,883,425	0.90	2,595,083
HVAC	Thermostat Adjustment	3,128,405	0.97	3,030,532	0.90	2,727,479
HVAC	Thermostat Replacement**	17,350,022	0.97	16,788,422	0.90	15,109,580
	Total†	**32,006,189**	**1.00**	**32,077,651**		**28,869,886**

* 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 total includes the electric equivalent of the total therms.
** These measures may include gas savings that are potentially claimed by Nicor Gas, Peoples Gas or North Shore Gas, in their respective territories.
Source: ComEd tracking data and Navigant team analysis.

6. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

6.1 Impact Parameter Estimates

Energy and demand savings are estimated using the following formulae as specified in the Illinois Technical Reference Manual (TRM) or ComEd Program Work Papers. For detailed information on algorithm inputs, see Section 7 (Appendix 1).

The lifetime energy and demand savings are estimating by multiplying the verified savings by the effective useful life for each measure. The lone exception to this approach is the Advanced Early Retirement measure whose lifetime energy savings is based on a dual-baseline approach which accounts for the remaining useful life of the existing equipment.

6.1.1 Air Conditioner Tune-up

Navigant used the measure inputs deemed by the IL TRM v6.0 to calculate energy and demand savings. The energy and demand realization rates for the air conditioner tune-up measure are 100 percent. The TRM uses the following algorithms to calculate energy savings for this measure, the inputs of which are provided in Table 7-1.

For units with cooling capacities less than 65 kBtu/hr (5.42 tons):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{SEER_{before}} - \frac{1}{SEER_{after}} \right) * EFLH$$

For units with cooling capacities equal to or greater than 65 kBtu/hr (5.42 tons):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{EER_{before}} - \frac{1}{EER_{after}} \right) * EFLH$$

Navigant calculated non-100 percent electric energy realization rates (RR$_{kWh}$) for 12 of the 785 installations of this measure.

> **Finding 1.** Navigant adjusted the RR$_{kWh}$ of 12 installations due to climate zone updates. The details of these updates are provided in Table 8-1.
> **Recommendation 1.** Navigant recommends using the climate zone guidance provided in the IL TRM.

6.1.2 Advanced Early Retirement

Navigant used the measure level inputs deemed by the ComEd ACP Program Work Papers and algorithms from the IL TRM v6.0 to calculate energy savings. The energy and demand realization rates for the air conditioner tune-up measure are 100 percent. The details of this measure's algorithms and inputs of are provided in Section 7.2.

> **Finding 2.** Navigant calculated electric energy and demand realization rates of 100 percent for all 21 installations of this measure.

6.1.3 Cogged V-Belts

Navigant used the measure level inputs deemed by the IL TRM v6.0 to calculate energy savings. The energy and demand realization rates for this measure are 100 percent. The TRM uses the following algorithm to calculate energy savings for this measure.

$$\Delta kWh = \left(\frac{HP * 0.746 * LF}{Motor\ Efficiency} \right) * Hours * ESF$$

> **Finding 3.** Navigant calculated 100 percent energy and demand realization rates for all 320 installations of this measure.

6.1.4 Demand-Controlled Ventilation

Navigant used the measure level inputs deemed by the ComEd ACP Program Work Papers[3] to calculate energy savings. The energy and demand realization rates for this measure are 100 percent. The Advanced Rooftop Control Work Paper uses the following algorithm to calculate electric energy savings for this measure:

$$\Delta kWh = (tons) * Normalized\ Electric\ Energy\ Savings$$

$$\Delta therm = kBtuh\ Output * Normalized\ Gas\ Energy\ Savings$$

> **Finding 4.** Navigant calculated electric energy and demand realization rates of 100 percent for all 167 installations of this measure.

> **Finding 5.** In one installation (equipment number 200-077), the tracking data did not include a heating capacity value, yet claimed gas savings. The ex ante gas savings was based on a heating system capacity of one kBtu/hr, however this value is too small to be accurate. Navigant applied a 1:1 cooling-to-heating capacity ratio, based on the analysis described in the Section 6.1.5.
> **Recommendation 2.** Navigant recommends the tracking data include accurate information in the necessary fields such as heating capacity for installation.

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[3] The IL Technical Advisory Committee accepted this work paper in IL TRM v7.0 (Section 4.4.41).

6.1.5 Economizer Repair and Optimization

Navigant used the measure level inputs deemed by the IL TRM v6.0 to calculate energy savings. The energy realization rate for this measure is 100 percent. The TRM uses the following algorithms to calculate energy savings for this measure.

$$\Delta kWh = (Baseline\ Energy\ Use - Proposed\ Energy\ Use) * Cooling\ Capacity$$

$$\Delta therm = (Baseline\ Energy\ Use - Proposed\ Energy\ Use) * Heating\ Output\ Capacity$$

Navigant calculated non-100 percent RR_{kWh} values for three of the 418 installations of this measure. The details of these three projects are provided in Table 8-2.

> **Finding 6.** Navigant found two installations (103-671, 105-832) with discrepancies between the "equation_inputs_X_EL" fields and the "two_stage_temp_control" fields. Navigant used the "two_stage_temp_control" field to calculate verified savings for this measure.

> **Finding 7.** Navigant calculated negative energy savings for one installation (equipment number 204-037). Navigant adjusted the savings to zero for this installation.

> **Finding 8.** In 375 installations of this measure (90 percent of the installations), Navigant considered the heating capacity values to be outside of the expected range. To support this assumption, Navigant analyzed program tracking data and manufacturer documentation to develop a cooling-to-heating capacity ratio estimate. Over 90 percent of the RTUs involved in the program are less than 25 tons. Navigant reviewed RTUs from three major manufacturers[4] and their rated capacities for low, medium, and high heat options.[5] These ratios range from 64 to 267 percent, with an average of 138 percent. Navigant used a conservative logic and adjusted the heating capacity value only if the ratio of heating capacity-to-cooling capacity was lower than 50 percent or higher than 500 percent. Navigant assumed a conservative value of 1.0 (100 percent) to convert cooling output capacity to heating output capacity, where the heating capacity values were considered inaccurate.
>
> Navigant utilized this approach in the thermostat measure, one DCV installation, and the RTU Real Seal measure.

> **Recommendation 3.** Navigant recommends the implementer research and develop a range of cooling-to-heating capacity ratios for the RTUs in the program territory.

> **Recommendation 4.** Navigant recommends the implementer review tracking data, specifically the heating capacity fields, for accuracy. One option to improve accuracy involves comparing the findings of Recommendation 3 to the heating capacity values and establishing a range of acceptable values.

6.1.6 RTU Real Seal

Navigant used the measure level inputs deemed by the ComEd ACP Program Work Papers[6] and IL TRM v7.0 to calculate energy savings. The electric energy and demand realization rates for this measure are 100 percent. The Rooftop Unit Sealing Work Paper uses the following algorithm to calculate energy savings for this measure.

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[4] These three manufacturers account for approximately three-quarters (75%) of the RTUs in Minnesota and over half (52%) of the installed capacity. Commercial Roof-top Units in Minnesota – Characteristics and Energy Performance. Minnesota Department of Commerce. March 31, 2016. http://mn.gov/commerce-stat/pdfs/card-seventhwave-rtu.pdf

[5] Rooftop Units of this size were consistently offered with three options for gas heat output capacity; low, medium, and high.

[6] The IL Technical Advisory Committee accepted this work paper in IL TRM v7.0 (Section 4.4.43).

$$\Delta kWh = \frac{\left(\frac{kBtu_{cool}}{hr}\right)}{EER_{before}} * EFLH_{cool} * \%Savings_{cool}$$

The program implementer had not originally designed the work paper to account for gas savings, but IL TRM v7.0 provides the following gas savings algorithm.

$$\Delta therm = \frac{\left(\frac{kBtu_{heat}}{hr}\right)}{\left(100 * Efficiency_{before}\right)} * EFLH_{heat} * \%Savings_{heat}$$

Finding 9. The program tracking data did not include heating capacity values for RTU Sealing measures, though the implementer did track whether the heat fuel is gas or electric. As mentioned in Section 6.1.5, Navigant used a conservative value 1.0 (100 percent) to convert cooling output capacity to heating output capacity.

Recommendation 5. Navigant recommends that the gas savings be accounted for in future applications of this measure.

Recommendation 6. Navigant recommends that the gas heating output capacity values be tracked for all measures whose algorithms require it.

Finding 10. Navigant calculated non-100 percent energy realization rates for nine of the 1,094 installations of this measure, due to climate zone adjustments. The details of these installations are provided in Table 8-3.

6.1.7 Thermostat Adjustment and Replacement

Navigant used the measure level inputs from the tracking data and algorithms from the IL TRM v6.0 to calculate energy savings for thermostat adjustment and replacement. The electric and gas energy realization rates for adjustment and replacement are all 100 percent. The TRM uses the following algorithm to calculate savings for this measure.

$$\Delta kWh = (Baseline\ Energy\ Use - Proposed\ Energy\ Use) * Cooling\ Capacity$$

$$\Delta therm = (Baseline\ Energy\ Use - Proposed\ Energy\ Use) * Heating\ Output\ Capacity$$

Finding 11. Navigant calculated negative electric energy savings for 30 of the 1,368 installations of these measures. These adjustments result from changing fan modes or decreasing the magnitude of setback. Navigant treated the negative verified savings as zero savings. The details of these installations are provided in Table 8-4.

Recommendation 7. Navigant recommends that algorithms be corrected in eTrack to prevent future occurrences.

Finding 12. Navigant calculated verified gas savings for one installation (equipment number 110-821) which did not claim ex ante gas savings.

Recommendation 8. Navigant recommends that gas savings be claimed for all installations that result in savings, including gas savings.

Finding 13. Resulting from the Wave 1 evaluation, Navigant discovered an error in the TRM algorithm which affects the gas savings of 594 thermostat installations in the final tracking data. Navigant believes these installations should result in gas savings, but the algorithms in IL TRM v6.0 do not yield gas savings. This finding has been communicated to the TRM administrator. The author of the measure is currently revising the algorithms.

Recommendation 9. Navigant recommends updating the savings algorithms for thermostat measures when the IL TRM is updated.

Finding 14. In 1,124 (82 percent) installations of this measure, Navigant considered the heating capacity values to be outside of the expected range. To these installations, Navigant applied the approach outlined in Finding 8.
See Recommendation 4.

7. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

7.1 Air Conditioner Tune-up

Navigant used the measure inputs deemed by the IL TRM v6.0 and provided in the tracking data to calculate energy and demand savings. The TRM uses the following algorithms to calculate energy savings for this measure.

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{SEER_{before}} - \frac{1}{SEER_{after}} \right) * EFLH$$

$$\Delta kW = \frac{kBtu}{hr} * \left(\frac{1}{SEER_{before}} - \frac{1}{SEER_{after}} \right) * CF_{PJM}$$

For units with cooling capacities equal to or greater than 65 kBtu/hr (5.42 tons):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{EER_{before}} - \frac{1}{EER_{after}} \right) * EFLH$$

$$\Delta kW = \frac{kBtu}{hr} * \left(\frac{1}{EER_{before}} - \frac{1}{EER_{after}} \right) * CF_{PJM}$$

<div align="center">**Table 7-1. Air Conditioner Tune-Up Savings Parameters**</div>

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	# measures	Evaluated	Program Tracking Data
NTG	90	%	Deemed	IL SAG Consensus†
kBtu/hr	Varies	kBtu/hr	Evaluated	Program Tracking Data
Baseline Seasonal Energy Efficiency Ratio (SEER$_{before}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Proposed SEER (SEER$_{after}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Equivalent Full Load Hours (EFLH)	Varies	Hours/year	Deemed	IL TRM v6.0 – Section 4.4.1
Baseline Energy Efficiency Ratio (EER$_{before}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Proposed EER (EER$_{after}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
PJM Coincidence Factor (CF$_{PJM}$)	47.8	%	Deemed	IL TRM v6.0 – Section 4.4.1
Effective Useful Life (EUL)	3	Years	Mixture	IL TRM v7.0 – Section 4.4.1 And Evaluation report dated May 14, 2018

* 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.

7.2 Advanced Early Retirement

Navigant used the measure level inputs deemed by the ComEd ACP Program Work Papers[7] to calculate energy savings. The following equation to calculate energy savings for this measure,

For units with cooling capacities less than 65 kBtu/hr (5.42 tons):

For the remaining life of the existing unit (initial five years):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{SEER_{exist}} - \frac{1}{SEER_{ee}} \right) * EFLH$$

For the remaining measure life (next ten years):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}} \right) * EFLH$$

For units with cooling capacities equal to or greater than 65 kBtu/hr (5.42 tons):

For the remaining life of the existing unit (initial five years):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{IEER_{exist}} - \frac{1}{IEER_{ee}} \right) * EFLH$$

For the remaining measure life (next ten years):

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[7] The IL Technical Advisory Committee accepted the changes proposed by this work paper in IL TRM v7.0 - Section 4.4.15.

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{IEER_{base}} - \frac{1}{IEER_{ee}} \right) * EFLH$$

For existing units with cooling capacities equal to or greater than 65 kBtu/hr (5.42 tons) and no available IEER rating:

For the remaining life of the existing unit (initial five years):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{EER_{exist}} - \frac{1}{EER_{ee}} \right) * EFLH$$

For the remaining measure life (next ten years):

$$\Delta kWh = \frac{kBtu}{hr} * \left(\frac{1}{EER_{base}} - \frac{1}{EER_{ee}} \right) * EFLH$$

For units of all sizes, demand savings is calculated by the following equation:

$$\Delta kW = \frac{kBtu}{hr} * \left(\frac{1}{EER_{before}} - \frac{1}{EER_{after}} \right) * CF_{PJM}$$

Table 7-2. Advanced Early Retirement Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	# measures	Evaluated	Program Tracking Data
NTG	90	%	Deemed	IL SAG Consensus†
kBtu/hr	Varies	kBtu/hr	Evaluated	Program Tracking Data
Existing Seasonal Energy Efficiency Ratio (SEER$_{exist}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Energy Efficient SEER (SEER$_{ee}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Baseline SEER (SEER$_{base}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Equivalent Full Load Hours (EFLH)	Varies	Hours/year	Deemed	IL TRM v6.0 – Section 4.4.15
Existing Integrated Energy Efficiency Ratio (IEER$_{exist}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Energy Efficient IEER (IEER$_{ee}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Baseline IEER (IEER$_{base}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Existing Energy Efficiency Ratio (EER$_{exist}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Energy Efficient EER (EER$_{ee}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
Baseline EER (EER$_{base}$)	Varies	kBtu/kW	Evaluated	Program Tracking Data
PJM Coincidence Factor (CF$_{PJM}$)	47.8	%	Deemed	IL TRM v6.0 – Section 4.4.15
Effective Useful Life (EUL)	15	Years	Mixture	IL TRM v7.0 – Section 4.4.15
Remaining Useful Life (RUL)	5	Years	Mixture	IL TRM v7.0 – Section 4.4.15

* 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.

7.3 Cogged V-Belts

Navigant used the measure level inputs deemed by the IL TRM v6.0 to calculate energy savings. The TRM uses the following algorithm to calculate energy savings for this measure:

$$\Delta kWh = \left(\frac{HP * 0.746 * LF}{Motor\ Efficiency}\right) * Hours * ESF$$

$$\Delta kW = \left(\frac{HP * 0.746 * LF}{Motor\ Efficiency}\right) * ESF$$

Table 7-3. Cogged V-Belt Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	# measures	Evaluated	Program Tracking Data
NTG	90	%	Deemed	IL SAG Consensus†
Motor Horsepower (HP)	Varies	hp	Evaluated	Program Tracking Data
Conversion Factor (0.746)	0.746	kWh/hp	Deemed	IL TRM v6.0 – Section 4.4.30
Load Factor (LF)	80	%	Deemed	IL TRM v6.0 – Section 4.4.30
Motor Efficiency	Varies	%	Deemed or Actual	IL TRM v6.0 – Section 4.4.30 or Program Tracking Data
Energy Savings Factor (ESF)	2	%	Deemed	IL TRM v6.0 – Section 4.4.30
Effective Useful Life (EUL)	Varies	Years	Mixture	IL TRM v7.0 – Section 4.4.30 And Evaluation report dated May 14, 2018

* 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.

7.4 Demand-Controlled Ventilation

$$\Delta kWh = (tons) * Normalized\ Electric\ Energy\ Savings$$

$$\Delta therm = kBtuh\ Output * Normalized\ Gas\ Energy\ Savings$$

Table 7-4. DCV Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	# measures	Evaluated	Program Tracking Data
NTG	90	%	Deemed	IL SAG Consensus†
Tons	Varies	Tons	Evaluated	Program Tracking Data
Normalized Electric Energy Savings	Varies	kWh/ton	Evaluated	Program Work Papers
kBtu/hr	Varies	kBtu/hr	Evaluated	Program Work Papers
Normalized Gas Energy Savings	Varies	therm/kBtu/hr	Evaluated	Program Tracking Data
Effective Useful Life (EUL)	5	Years	Deemed	IL TRM v7.0 – Section 4.4.43

* 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.

7.5 Economizer Repair & Optimization

Navigant used the measure level inputs provided in the tracking data to calculate energy savings. The Economizer Repair and Optimization Work Paper is consistent with the IL TRM. Due to the complexity of this algorithm it will not be provided in this section. For details on this algorithm, see Section 4.4.35 of IL TRM v6.0.

7.6 RTU Real Seal

Navigant used the measure level inputs deemed by the ComEd ACP Program Work Papers[8] to calculate energy savings. The RTU Real Seal Work Paper uses the following algorithm to calculate energy savings for this measure:

$$\Delta kWh = \frac{\left(\frac{kBtu}{hr}\right)}{EER_{before}} * EFLH * \%Savings$$

$$\Delta kW = \frac{\left(\frac{kBtu}{hr}\right)}{EER_{before}} * \%Savings * CF_{PJM}$$

The IL TRM v7.0 provides an algorithm for calculating gas savings.

$$\Delta therm = \frac{\frac{kBtu}{hr}}{100} * Efficiency_{pre} * EFLH * \%Savings_{gas}$$

Table 7-5. RTU Real Seal Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed * or Evaluated?	Source
Quantity	Varies	# measures	Evaluated	Program Tracking Data
NTG	90	%	Deemed	IL SAG Consensus†
kBtu/hr	Varies	kBtu/hr	Evaluated	Program Tracking Data
Baseline Energy Efficiency Ratio (EER_{before})	Varies	kBtu/kW	Evaluated	Program Tracking Data
Equivalent Full Load Hours (EFLH)	Varies	Hours/year	Deemed	IL TRM v6.0 – Section 4.4.1
%Savings	6.11	%	Deemed	Program Work Papers
PJM Coincidence Factor (CF_{PJM})	47.8	%	Deemed	IL TRM v6.0 – Section 4.4.1 and Program Work Papers
Effective Useful Life (EUL)	5	Years	Deemed	IL TRM v7.0 – Section 4.4.43

* 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.

7.7 Thermostat Adjustment and Replacement

Navigant used the measure level inputs provided in the tracking data to calculate energy savings. The Thermostat Adjustment and Replacement work paper is consistent with the IL TRM. Due to the complexity of this algorithm it will not be provided in this section. For details on this algorithm, see Section 4.4.25 of IL TRM v6.0.

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[8] The IL Technical Advisory Committee accepted this work paper in IL TRM v7.0 - Section 4.4.43.

8. APPENDIX 2. IMPACT ANALYSIS DETAIL

Table 8-1. Air Conditioner Tune-Up Climate Zone Adjustments

Equipment Number	RR$_{kWh}$	Implementer Climate Zone	Evaluation Climate Zone
114-042	94%	2	1
114-051	94%	2	1
114-053	94%	2	1
200-684	91%	2	1
200-685	94%	2	1
200-686	94%	2	1
200-687	94%	2	1
201-518	91%	2	1
201-525	91%	2	1
201-600	91%	2	1
201-601	91%	2	1
201-602	91%	2	1

Source: ComEd tracking data and Navigant team analysis.

Table 8-2. Economizer Non-100% Realization Rates

Equipment Number	RR$_{kWh}$	Description of Discrepancy
103-671	112%	The "equation_inputs_X_EL" fields do not reflect the "two_stage_temp_control" fields.
105-832	108%	The "equation_inputs_X_EL" fields do not reflect the "two_stage_temp_control" fields.
204-037	0%	The verified savings is a negative value.

Source: ComEd tracking data and Navigant team analysis.

Table 8-3. RTU Real Seal Climate Zone Adjustments

Equipment Number	RR$_{kWh}$	Implementer Climate Zone	Evaluation Climate Zone
107-412	94%	1	2
107-416	94%	1	2
107-454	94%	1	2
111-497	107%	2	1
111-498	107%	2	1
111-499	107%	2	1
111-500	107%	2	1
111-501	107%	2	1
114-434	95%	2	1

Source: ComEd tracking data and Navigant team analysis.

Table 8-4. Thermostat Non-100% Realization Rates

Equipment Number	Measure Description	RR$_{kWh}$	Calculated Savings (kWh)	Cause of Negative Savings
101-157	Thermostat Replacement	0%	-13,571	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
101-159	Thermostat Replacement	0%	-8,482	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
103-810	Thermostat Replacement	0%	-4,164	Cooling setback decreases from 15°F to 10°F, Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
104-497	Thermostat Replacement	0%	-6,289	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
105-597	Thermostat Replacement	0%	-7,794	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
107-972	Thermostat Adjustment	0%	-13,927	Fan mode changes (Fu: 0 → 1)
108-308	Thermostat Adjustment	0%	-12,718	Fan mode changes (Fu: 0 → 1)
108-669	Thermostat Replacement	0%	-4,192	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
108-671	Thermostat Replacement	0%	-4,192	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
108-673	Thermostat Replacement	0%	-4,192	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
108-674	Thermostat Replacement	0%	-8,385	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
110-764	Thermostat Replacement	0%	-7,985	Fan mode changes (Fu: 0 → 1)
111-071	Thermostat Replacement	0%	-4,192	Fan mode changes (Fu: 0 → 1)
111-073	Thermostat Replacement	0%	-4,192	Fan mode changes (Fu: 0 → 1)
112-991	Thermostat Replacement	0%	-12,570	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
112-992	Thermostat Replacement	0%	-12,570	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
112-993	Thermostat Replacement	0%	-12,570	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
112-996	Thermostat Replacement	0%	-12,570	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
112-997	Thermostat Replacement	0%	-27,654	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
112-999	Thermostat Replacement	0%	-10,056	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
113-000	Thermostat Replacement	0%	-5,028	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
113-406	Thermostat Replacement	0%	-4,259	Fan mode changes (Fu: 0 → 1)
113-418	Thermostat Replacement	0%	-4,259	Fan mode changes (Fu: 0 → 1)
114-340	Thermostat Adjustment	0%	-14,100	Fan mode changes (Fu: 0 → 1)
114-466	Thermostat Replacement	0%	-5,478	Fan mode changes (Fu: 0 → 1)
114-467	Thermostat Replacement	0%	-5,493	Fan mode changes (Fu: 0 → 1)
114-468	Thermostat Replacement	0%	-5,513	Fan mode changes (Fu: 0 → 1)
114-470	Thermostat Replacement	0%	-6,993	Cooling setback decreases from 15°F to 13°F, Fan mode changes (Fo: 0 → 1)
201-002	Thermostat Replacement	0%	-5,474	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)
204-282	Thermostat Replacement	0%	-4,368	Fan mode changes (Fo: 0 → 1; Fu: 0 → 1)

Source: ComEd tracking data and Navigant team analysis.

9. APPENDIX 3. TOTAL RESOURCE COST DETAIL

Table 9-1, 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.

Table 9-1. 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)
HVAC	AC Tune-Up	Each	785	3.0	1,826,760	1,741.82	1,825,870	1,741.82
HVAC	Advanced Early Retirement	Each	21	15.0	451,540	426.68	451,540	426.68
HVAC	Cogged V-Belt	Each	320	4.1	72,128	12.47	72,128	12.47
HVAC	DCV	Each	167	10.0	1,573,885	444.60	1,573,885	444.60
HVAC	Economizer Adjustment & Repair	Each	418	5.0	297,048	0.00	297,116	0.00
HVAC	RTU Real Seal	Each	1,094	5.0	998,833	942.17	999,091	942.17
HVAC	Thermostat Adjustment	Each	156	2.0	2,986,159	0.00	2,986,159	0.00
HVAC	Thermostat Replacement	Each	1,212	8.0	14,849,573	0.00	14,849,573	0.00

Source: ComEd tracking data and Navigant team analysis.