Guidehouse

ComEd Facility Assessments Impact Evaluation Report

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

Prepared for:

ComEd

FINAL

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1. Introduction

This report presents results from the CY2020 impact evaluation of ComEd's Facility Assessments (FA) Program (also referred to as the Business FA Program). It summarizes the total energy 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 (TRC) inputs. CY2020 covers January 1, 2020 through December 31, 2020.

2. Program Description

The FA Program consists of low cost and operational measures identified during ComEd engineering commercial and industrial facility assessments. These measures focus on existing equipment and apply maintenance and operational best practices to realize energy savings with little or no investment from the customer. FA measures are not covered by the Custom or Standard Programs because of their no cost or low-cost nature, but they are identified during customer audits completed by ComEd. Implementation of identified measures can occur at the time of the audit. If not implemented then, program outreach staff follows up with the customer to check on progress.

ComEd staff developed a calculator for each measure to estimate program savings. The measures and operational efficiencies identified through this program include turning off lights and equipment when not needed, addressing air compressor leaks and system pressure, adjusting space temperatures setpoints, and simple HVAC maintenance.

In CY2020, the FA Program had 129 participants and distributed 178 measures. The implementer did not clearly assign measures to defined measure types, instead marking them as Operational Savings – Standard or Operational Savings – Custom. The implementer did include general descriptions for most measures, which the evaluation team used to group measures to specific measure types, as Table 2-1, Figure 2-1, and Figure 2-2 show. Specifically, Table 2-1 illustrates the program volume distribution according to the 20 primary measure types.

Figure 2-2 illustrates the program distribution according to the measure end use types. Measures with HVAC, computer power controls, and manual lighting and on/off controls contributed the most savings.

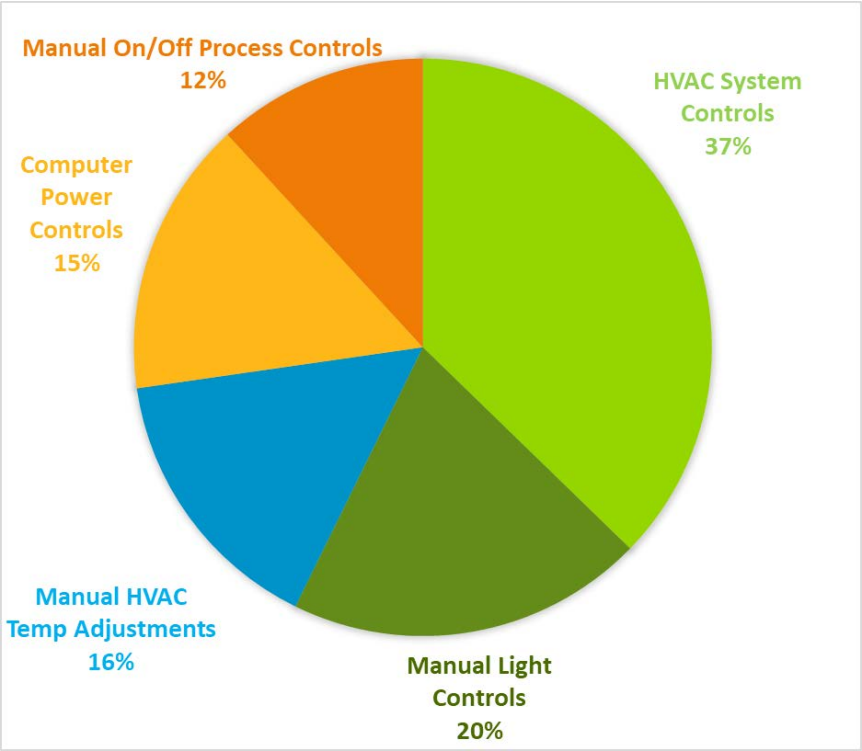
Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total
Participants	129
Total Measures	178
Research Measure Types	20
Research End Use Types	5

Measure Types	End Use	Total
HVAC System Controls	HVAC	41
Manual Light Controls	Lighting	22
Manual HVAC Temp Adjustments	HVAC	17
Computer Power Controls	Plug Load	17
Manual On/Off Process Controls	Process Equipment	13
Reduced Compressor Pressure	Air Compressor	9
Compressor Air Leaks	Air Compressor	8
Exhaust Fan Hour Reduction	HVAC	7
Server Closest HVAC Setpoint	HVAC	7
Air Compressor Other	Air Compressor	6
HVAC Maintenance	HVAC	6
Hot Water Control	Process Equipment	6
Photocell Repair	Lighting	6
Manual Compressor Off	Air Compressor	4
Heater Control	HVAC	2
Process Equipment Setpoints	Process Equipment	2
Disable Unneeded Equipment	Process Equipment	2
Ensure Closed Doors	HVAC	1
Delamp Lights	Lighting	1
Turn Off TV	Plug Load	1

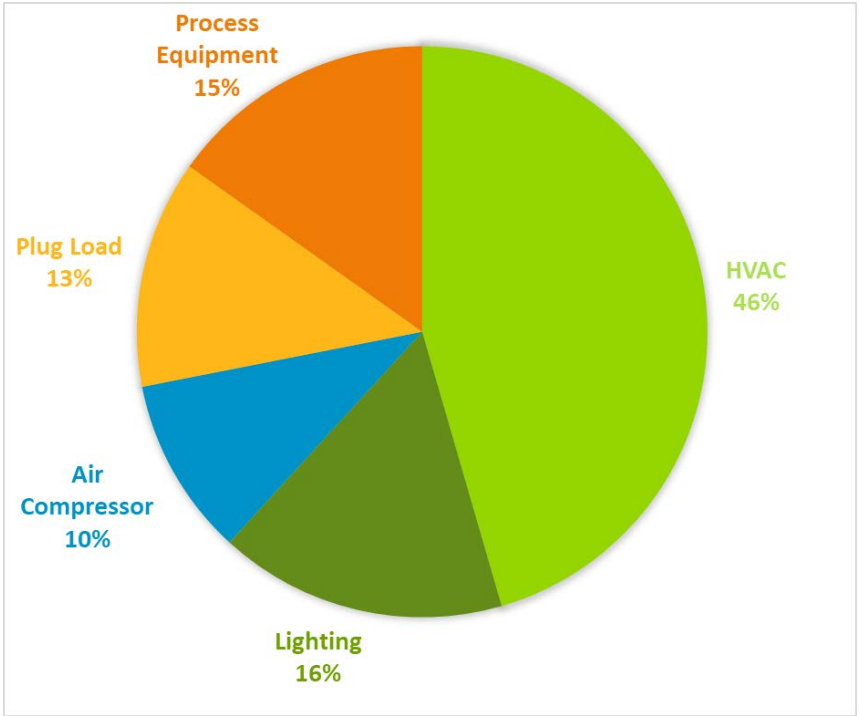
Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Top 5 Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

Figure 2-2. Share of Measures Installed by End Use



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy the FA Program achieved in CY2020. Gas savings are only those that ComEd may be able to claim, which excludes savings the gas utilities claim, either via joint or non-joint programs. The program achieved an overall savings of 3,669,464 kWh, with a program gross realization rate of 0.96. The measures in the program are custom with specific calculations developed for each project. These calculations did not include demand savings estimates and, due to the custom nature of these measures and calculations, the evaluation team did not apply a standard demand factor to these measures. The evaluation sample's precision is 6.5% (for kWh) at a 90/10, two-tailed confidence interval.

Table 3-1. CY2020 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Summer Peak* Demand Savings (kW)
Electricity		
Ex Ante Gross Savings	4,073,438	NR
Program Gross Realization Rate	0.96	NA
Verified Gross Savings	3,903,685	NA
Program Net-to-Gross Ratio (NTG)	0.94	NA
Verified Net Savings	3,669,464	NA
Converted from Gas†		
Ex Ante Gross Savings	287,666	NA
Program Gross Realization Rate	1.00	NA
Verified Gross Savings	287,666	NA
Program Net-to-Gross Ratio (NTG)	0.94	NA
Verified Net Savings	270,406	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	4,361,104	NR
Program Gross Realization Rate	0.96	NA
Verified Gross Savings	4,191,351	NA
Program Net-to-Gross Ratio (NTG)	0.94	NA
Verified Net Savings	3,939,870	NA

NA = not applicable (refers to a piece of data that cannot be produced or does not apply)
NR = not reported (refers to a piece of data that was not reported—i.e., non-coincident demand savings)
*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. Cumulative Persisting Annual Savings (CPAS) – Electric

 to Table 4-3 and Figure 4-1 show the measure-specific and total verified gross savings for the FA Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2020. The electric CPAS across all measures installed in 2020 is 3,669,464 kWh (Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

). The CY2020 gas contribution to CPAS (converted to equivalent electricity) is 270,406 kWh (Table 4-2). Adding the gas and electric contributions produces 3,939,870 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.

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	2027
Air Compressor	Air Compressor Other	2.0	638,563	0.94	1,200,498			600,249	600,249	-	-	-	-	-	-
HVAC	HVAC System Controls	6.0	622,426	0.94	3,510,483			585,081	585,081	585,081	585,081	585,081	585,081	-	-
Process Equipment	Manual On/Off Process Controls	2.0	470,974	0.94	885,432			442,716	442,716	-	-	-	-	-	-
HVAC	Exhaust Fan Hour Reduction	6.0	386,289	0.94	2,178,670			363,112	363,112	363,112	363,112	363,112	363,112	-	-
HVAC	Manual HVAC Temp Adjustments	2.0	385,302	0.94	724,368			362,184	362,184	-	-	-	-	-	-
Air Compressor	Reduced Compressor Pressure	6.0	266,876	0.94	1,505,179			250,863	250,863	250,863	250,863	250,863	250,863	-	-
HVAC	HVAC Maintenance	2.0	256,608	0.94	482,422			241,211	241,211	-	-	-	-	-	-
HVAC	Heater Control	6.0	182,008	0.94	1,026,527			171,088	171,088	171,088	171,088	171,088	171,088	-	-
Plug Load	Computer Power Controls	6.0	141,676	0.94	799,053			133,176	133,176	133,176	133,176	133,176	133,176	-	-
Lighting	Manual Light Controls	2.0	128,445	0.94	241,476			120,738	120,738	-	-	-	-	-	-
Process Equipment	Process Equipment Setpoints	6.0	106,936	0.94	603,118			100,520	100,520	100,520	100,520	100,520	100,520	-	-
Process Equipment	Hot Water Control	6.0	98,105	0.94	553,311			92,219	92,219	92,219	92,219	92,219	92,219	-	-
Lighting	Photocell Repair	6.0	68,431	0.94	385,952			64,325	64,325	64,325	64,325	64,325	64,325	-	-
Process Equipment	Disable Unneeded Equipment	6.0	42,857	0.94	241,715			40,286	40,286	40,286	40,286	40,286	40,286	-	-
Air Compressor	Manual Compressor Off	2.0	32,094	0.94	60,337			30,169	30,169	-	-	-	-	-	-
Air Compressor	Compressor Air Leaks	2.0	23,998	0.94	45,117			22,559	22,559	-	-	-	-	-	-
HVAC	Ensure Closed Doors	6.0	18,610	0.94	104,959			17,493	17,493	17,493	17,493	17,493	17,493	-	-
HVAC	Server Closest HVAC Setpoint	6.0	16,801	0.94	94,760			15,793	15,793	15,793	15,793	15,793	15,793	-	-
Lighting	Delamp Lights	6.0	9,309	0.94	52,504			8,751	8,751	8,751	8,751	8,751	8,751	-	-
Plug Load	Turn Off TV	6.0	7,375	0.94	41,597			6,933	6,933	6,933	6,933	6,933	6,933	-	-
CY2020 Program Total Electric Contribution to CPAS			3,903,685		14,737,480			3,669,464	3,669,464	1,849,638	1,849,638	1,849,638	1,849,638	-	-
Historic Program Total Electric Contribution to CPAS‡						3,282,694	6,646,478	6,646,478	5,537,372	4,803,750	2,630,162				
Program Total Electric CPAS						3,282,694	6,646,478	10,315,942	9,206,835	6,653,388	4,479,800	1,849,638	1,849,638	-	-
CY2020 Program Incremental Expiring Electric Savings§									-	1,819,825	-	-	-	1,849,638	-
Historic Program Incremental Expiring Electric Savings‡§								-	1,109,106	733,622	2,173,588	2,630,162	-	-	-
Program Total Incremental Expiring Electric Savings§								-	1,109,106	2,553,447	2,173,588	2,630,162	-	1,849,638	-

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 found on the Illinois Stakeholder Advisory Group (SAG) website: https://www.ilsag.info/ntg_2020.

† Lifetime savings are the sum of CPAS savings through the effective useful life (EUL).

‡ Historic savings go back to CY2018.

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

Source: Evaluation team analysis

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

End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (Therms)	NTG*	Lifetime Net Savings (Therms)†	Verified Net Therms Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Air Compressor	Air Compressor Other	2.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	HVAC System Controls	6.0	5,936	0.94	33,479			5,580	5,580	5,580	5,580	5,580	5,580	-	-
Process Equipment	Manual On/Off Process Controls	2.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	Exhaust Fan Hour Reduction	6.0	177	0.94	998			166	166	166	166	166	166	-	-
HVAC	Manual HVAC Temp Adjustments	2.0	3,477	0.94	6,536			3,268	3,268		-	-	-	-	-
Air Compressor	Reduced Compressor Pressure	6.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	HVAC Maintenance	2.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	Heater Control	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Plug Load	Computer Power Controls	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Lighting	Manual Light Controls	2.0	-	0.94	-			-	-	-	-	-	-	-	-
Process Equipment	Process Equipment Setpoints	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Process Equipment	Hot Water Control	6.0	225	0.94	1,269			212	212	212	212	212	212	-	-
Lighting	Photocell Repair	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Process Equipment	Disable Unneeded Equipment	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Air Compressor	Manual Compressor Off	2.0	-	0.94	-			-	-	-	-	-	-	-	-
Air Compressor	Compressor Air Leaks	2.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	Ensure Closed Doors	6.0	-	0.94	-			-	-	-	-	-	-	-	-
HVAC	Server Closest HVAC Setpoint	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Lighting	Delamp Lights	6.0	-	0.94	-			-	-	-	-	-	-	-	-
Plug Load	Turn Off TV	6.0	-	0.94	-			-	-	-	-	-	-	-	-
CY2020 Program Total Gas Contribution to CPAS (Therms)			9,815		42,282			9,226	9,226	5,958	5,958	5,958	5,958	-	-
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡						-	-	270,406	270,406	174,621	174,621	174,621	174,621	-	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§						1,522,282	2,478,545	2,478,545	1,858,081	1,852,835	951,017				
Program Total Gas CPAS (kWh Equivalent)‡						1,522,282	2,478,545	2,748,951	2,128,487	2,027,456	1,125,638	174,621	174,621	-	-
CY2020 Program Incremental Expiring Gas Savings (Therms)‖									-	3,268	-	-	-	5,958	-
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)‡‖									-	95,785	-	-	-	174,621	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§‖								-	620,464	5,246	901,818	951,017	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡‖								-	620,464	101,031	901,818	951,017	-	174,621	-

Note: The green highlighted cell shows program total first-year gas savings in kWh equivalents. The gray cells are blank, indicating no values or no contribution to calculating CPAS in CY2020.

*A deemed value. Source 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.

Source: Evaluation team analysis

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

End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings (Including Those Converted from Gas Savings) 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Air Compressor	Air Compressor Other	2.0	638,563	0.94	1,200,498			600,249	600,249	-	-	-	-	-	-
HVAC	HVAC System Controls	6.0	796,410	0.94	4,491,754			748,626	748,626	748,626	748,626	748,626	748,626	-	
Process Equipment	Manual On/Off Process Controls	2.0	470,974	0.94	885,432			442,716	442,716	-	-	-	-	-	
HVAC	Exhaust Fan Hour Reduction	6.0	391,477	0.94	2,207,929			367,988	367,988	367,988	367,988	367,988	367,988	-	
HVAC	Manual HVAC Temp Adjustments	2.0	487,201	0.94	915,939			457,969	457,969	-	-	-	-	-	
Air Compressor	Reduced Compressor Pressure	6.0	266,876	0.94	1,505,179			250,863	250,863	250,863	250,863	250,863	250,863	-	
HVAC	HVAC Maintenance	2.0	256,608	0.94	482,422			241,211	241,211	-	-	-	-	-	
HVAC	Heater Control	6.0	182,008	0.94	1,026,527			171,088	171,088	171,088	171,088	171,088	171,088	-	
Plug Load	Computer Power Controls	6.0	141,676	0.94	799,053			133,176	133,176	133,176	133,176	133,176	133,176	-	
Lighting	Manual Light Controls	2.0	128,445	0.94	241,476			120,738	120,738	-	-	-	-	-	
Process Equipment	Process Equipment Setpoints	6.0	106,936	0.94	603,118			100,520	100,520	100,520	100,520	100,520	100,520	-	
Process Equipment	Hot Water Control	6.0	104,700	0.94	590,506			98,418	98,418	98,418	98,418	98,418	98,418	-	
Lighting	Photocell Repair	6.0	68,431	0.94	385,952			64,325	64,325	64,325	64,325	64,325	64,325	-	
Process Equipment	Disable Unneeded Equipment	6.0	42,857	0.94	241,715			40,286	40,286	40,286	40,286	40,286	40,286	-	
Air Compressor	Manual Compressor Off	2.0	32,094	0.94	60,337			30,169	30,169	-	-	-	-	-	
Air Compressor	Compressor Air Leaks	2.0	23,998	0.94	45,117			22,559	22,559	-	-	-	-	-	
HVAC	Ensure Closed Doors	6.0	18,610	0.94	104,959			17,493	17,493	17,493	17,493	17,493	17,493	-	
HVAC	Server Closest HVAC Setpoint	6.0	16,801	0.94	94,760			15,793	15,793	15,793	15,793	15,793	15,793	-	
Lighting	Delamp Lights	6.0	9,309	0.94	52,504			8,751	8,751	8,751	8,751	8,751	8,751	-	
Plug Load	Turn Off TV	6.0	7,375	0.94	41,597			6,933	6,933	6,933	6,933	6,933	6,933	-	
CY2020 Program Total Contribution to CPAS			4,191,351		15,976,775			3,939,870	3,939,870	2,024,259	2,024,259	2,024,259	2,024,259	-	-
Historic Program Total Contribution to CPAS‡						4,804,976	9,125,023	9,125,023	7,395,453	6,656,585	3,581,179	-	-	-	-
Program Total CPAS						4,804,976	9,125,023	13,064,892	11,335,322	8,680,844	5,605,438	2,024,259	2,024,259	-	-
CY2020 Program Incremental Expiring Savings§									-	1,915,611	-	-	-	2,024,259	-
Historic Program Incremental Expiring Savings‡§								-	1,729,570	738,868	3,075,406	3,581,179	-	-	-
Program Total Incremental Expiring Savings§								-	1,729,570	2,654,479	3,075,406	3,581,179	-	2,024,259	-

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 no contribution to calculating CPAS in CY2020.

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

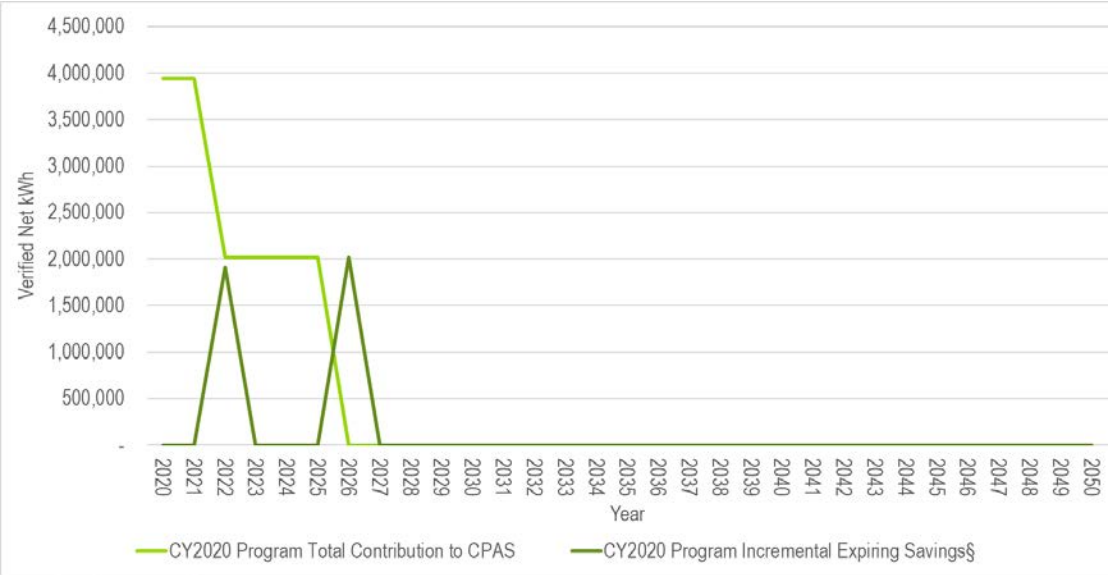
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ Historic savings go back to CY2018.

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

Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



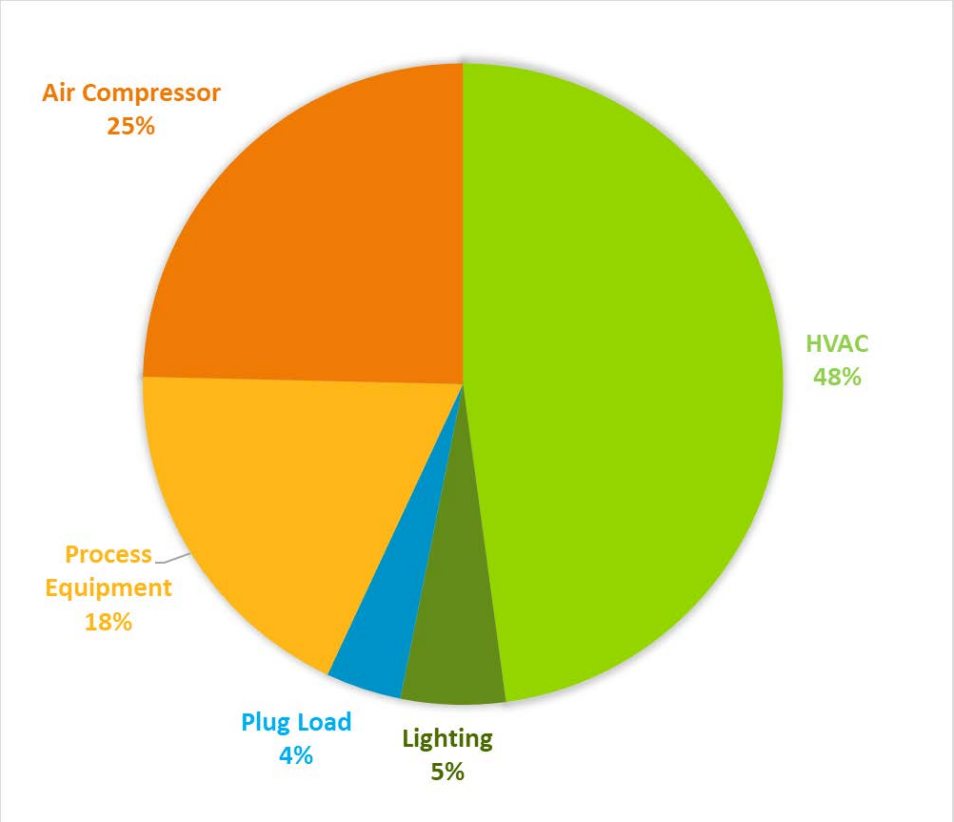
§Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n.

Source: Evaluation team analysis

5. Program Savings by Measure

The program includes 20 measures, as the following tables show. HVAC system controls and manual lighting controls contributed the most savings (see Figure 5-1). The largest saving measures come from HVAC, air compressors, and process equipment. The evaluation team determined each measure based on minimal descriptions included in the note's column in the utility program summary or program tracker that was provided to Guidehouse. For those measures without notes, the evaluation team grouped different projects into measure groups manually. The evaluation calculated the realization rate at the program level, not at a measure level and the measure-level verified gross and net in Table 5-1 and Table 5-2 are the result of applying the program-level realization to the measure level ex ante savings.

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



Source: 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)
Air Compressor	Air Compressor Other	666,331	0.96	638,563	0.94	600,249	2.0
HVAC	HVAC System Controls	649,493	0.96	622,426	0.94	585,081	6.0
Process Equipment	Manual On/Off Process Controls	491,455	0.96	470,974	0.94	442,716	2.0
HVAC	Exhaust Fan Hour Reduction	403,087	0.96	386,289	0.94	363,112	6.0
HVAC	Manual HVAC Temp Adjustments	402,057	0.96	385,302	0.94	362,184	2.0
Air Compressor	Reduced Compressor Pressure	278,481	0.96	266,876	0.94	250,863	6.0
HVAC	HVAC Maintenance	267,766	0.96	256,608	0.94	241,211	2.0
HVAC	Heater Control	189,923	0.96	182,008	0.94	171,088	6.0
Plug Load	Computer Power Controls	147,837	0.96	141,676	0.94	133,176	6.0
Lighting	Manual Light Controls	134,030	0.96	128,445	0.94	120,738	2.0
Process Equipment	Process Equipment Setpoints	111,586	0.96	106,936	0.94	100,520	6.0
Process Equipment	Hot Water Control	102,371	0.96	98,105	0.94	92,219	6.0
Lighting	Photocell Repair	71,407	0.96	68,431	0.94	64,325	6.0
Process Equipment	Disable Unneeded Equipment	44,721	0.96	42,857	0.94	40,286	6.0
Air Compressor	Manual Compressor Off	33,490	0.96	32,094	0.94	30,169	2.0
Air Compressor	Compressor Air Leaks	25,042	0.96	23,998	0.94	22,559	2.0
HVAC	Ensure Closed Doors	19,419	0.96	18,610	0.94	17,493	6.0
HVAC	Server Closest HVAC Setpoint	17,532	0.96	16,801	0.94	15,793	6.0
Lighting	Delamp Lights	9,714	0.96	9,309	0.94	8,751	6.0
Plug Load	Turn Off TV	7,696	0.96	7,375	0.94	6,933	6.0
	Total	**4,073,438**	**0.96**	**3,903,685**	**NA**	**3,669,464**	**NA**

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

Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2019 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)
HVAC	HVAC System Controls	5,936	1.00	5,936	0.94	5,580	6.0
HVAC	Manual HVAC Temp Adjustments	3,477	1.00	3,477	0.94	3,268	2.0
Process Equipment	Hot Water Control	225	1.00	225	0.94	212	6.0
HVAC	Exhaust Fan Hour Reduction	177	1.00	177	0.94	166	6.0
Lighting	Manual Light Controls	0	1.00	0	0.94	0	2.0
Plug Load	Computer Power Controls	0	1.00	0	0.94	0	6.0
Process Equipment	Manual On/Off Process Controls	0	1.00	0	0.94	0	2.0
Air Compressor	Reduced Compressor Pressure	0	1.00	0	0.94	0	6.0
Air Compressor	Compressor Air Leaks	0	1.00	0	0.94	0	2.0
HVAC	Server Closest HVAC Setpoint	0	1.00	0	0.94	0	6.0
Air Compressor	Air Compressor Other	0	1.00	0	0.94	0	2.0
HVAC	HVAC Maintenance	0	1.00	0	0.94	0	2.0
Lighting	Photocell Repair	0	1.00	0	0.94	0	6.0
Air Compressor	Manual Compressor Off	0	1.00	0	0.94	0	2.0
HVAC	Heater Control	0	1.00	0	0.94	0	6.0
Process Equipment	Process Equipment Setpoints	0	1.00	0	0.94	0	6.0
Process Equipment	Disable Unneeded Equipment	0	1.00	0	0.94	0	6.0
HVAC	Ensure Closed Doors	0	1.00	0	0.94	0	6.0
Lighting	Delamp Lights	0	1.00	0	0.94	0	6.0
Plug Load	Turn Off TV	0	1.00	0	0.94	0	6.0
	Total Therms	9,815	1.00	9,815	NA	9,226	NA
	Total kWh Converted From Therms†	287,666	1.00	287,666	NA	270,406	NA

*A deemed value. Source 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).

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The ex ante and verified savings calculations for this program include many custom calculations. Utility staff developed a calculator for each measure to estimate program savings. The evaluation team reviewed those calculations. Many of the calculations used sources such as the Illinois Statewide Technical Reference Manual v8 (TRM). Other calculations were completely custom and based purely on onsite staff estimates and subject matter experts' calculation methodologies. The evaluation team found issues with some of the input parameters and custom methods, which are shown in Table 6-1.

Table 6-1. Savings Parameters Issues

Gross Savings Input Parameters	Comments and Notes
Equipment load factors	Load factors were conservatively estimated at 65% in most cases. Although this is conservative, any load factor should be justified with a spot measurement of system usage if available.
Equipment quantity	No invoices were provided to verify the quantity of affected equipment.
Post equipment operation (kWh)	In some cases, the implementer did not monitor energy usage of equipment after measures were installed. Monitoring energy use at that point is useful to determine an accurate impact of installed measures.
High level calculation	Some measures were calculated using whole building data (like energy use intensity) instead of equipment-level information. Verified equipment data should be used whenever available.
Energy savings factors	An energy saving factor of 50% (hour reduction) was used without providing justification. Actual measured pre- and post-hours should be collected if possible, even if it is collected over the phone. Supporting references for assumptions should be provided in the calculations.
Measure Labeling	Measure labeling was not clear in the provided tracker. Some measures had no notes included to determine what measure category into which the measures should be grouped.
EUL	The evaluation team used an EUL for maintenance and manual measures of 2 years and an EUL of 6 years for behavior-based measure changes. This was based on the input of a Delphi panel that was formed to address this issue for ComEd.
NTG	A deemed value based on operational savings NTG. Source: 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.

6.2.1 Overall Program Results

Finding 1. The FA Program received an overall verified gross realization rate of 0.96 and an electric-only realization rate of 0.96. The main driver behind these realization rates was lower realization rates for the largest projects. The small and medium strata had realization rates at or above 1.00, and large projects had a realization rate of 0.84. Details regarding project-specific issues are included in Section 6.2.3.

Recommendation 1. Guidehouse recommends larger projects (100,000 kWh or more) receive additional review by the implementer or be included in the Custom Program Larger projects often use fully custom calculations, rely on trend data, have a larger impact on the program realization rate, and are generally much more complex than other projects.

6.2.2 Program Tracking

Finding 2. Limited measure descriptions were provided in the FA Program tracking system. New for 2020, all measures were labeled as Operational Savings – Custom/Standard. The notes in the tracker provided some additional measure details, but they are inconsistent and difficult to categorize. Not all measures in the final tracking data included notes, which makes it difficult to categorize measures. Additionally, some of the Operational Savings-Custom measures with similar names in the notes used different calculation methodologies.

Recommendation 2. As the program moves forward, the implementation team should add measure details in the tracker to identify and categorize measures more accurately. The implementation team took steps in 2020 to identify custom from standard measures, but more details should be added over time to make it easier for evaluators to identify and categorize measures.

6.2.3 Project-Specific Findings

Finding 3. The various HVAC system control measures within this program represented over 30% of program savings. The implementation team estimated savings for two HVAC control measures (FACA-41271 Decrease Heating Temperature Set Point and FACA-41190 Adjust Space Temperature Thermostat) using a methodology based on a research paper.[1] This paper used an EnergyPlus model to estimate the impact of temperature adjustments on a variable air volume (VAV) system. Guidehouse noted several concerns while reviewing these calculations:

- This model was simulating specific HVAC system operations (VAV with a low minimum flow rate) that may not have represented the site operation or site system capabilities.
- The calculations for these projects incorrectly used cooling temperature adjustments to estimate savings for heating reductions.
- The calculations used average savings tables across weather zones where climate-specific results were included in the research paper with diverse results across climate zones.
- The results of the paper were savings above 10% per degree reduced, which is much higher than typical savings for this kind of measure. This 10% per degree savings was inconsistent with other similar calculations used within the FA Program.
- The evaluation team used a savings value drawn from the provided source from this calculation that was weather-specific to Chicago. It resulted in approximately 8% savings, or around 4% per degree reduced.
- These projects represented 7% of the programs total savings and received a final realization rate of approximately 0.20.

Recommendation 3. For larger custom projects in the FA program, the implementation team should apply a more rigorous review than is done for smaller low impact projects. Ideally, the implementation team should use a single custom method for each measure type to ensure best-in-class methods are being used. When developing standardized custom methods, sources should be carefully chosen that are not overly specific to certain types of system operation, or methods should be developed to properly represent the operation of the equipment found during the audit.

Finding 4. Project FACA-41204, Program Supply Fan Unoccupied Setback, had a realization rate of 0.81. It represented approximately 6% of the program's savings. During the review of this project, Guidehouse noted several issues:

- The occupied and unoccupied operation was defined by fan speed, not hours of operation. This produced inaccurate results. By examining the system using hours of operation, the evaluation team noted that one of the HVAC systems (AHU-15) did not

[1]Extending Air Temperature Setpoints: Simulated Energy Savings and Design Considerations for New and Retrofit Buildings, Tyler Hoyt, Center for the Built Environment, University of California at Berkeley, Sept 2014 https://escholarship.org/uc/item/13s1q2xc

seem to be controlled at all and was running nearly the same across all hours. As a result, the ex ante calculations inaccurately claimed savings for all HVAC systems with some being significantly higher savings and other being zero savings.

- The calculation did not include typical annual weather to estimate chiller savings.

Recommendation 4. For any HVAC calculation, weather dependence should be considered and included if needed. When estimating occupancy usage, hours of operation should be used with trend data to correctly identify system operation.

Finding 5. Project FACA-41231, Optimize Operation of Air Compressors, with ex ante savings of 436,383 kWh, represented nearly 10% of the FA Program's overall savings. The implementation team used a mix of trend data and simplified engineering calculations to estimate system usage. The baseline usage was based on trend data where the post-installation operation was estimated using motor horsepower and conversion factors. These two estimates did not align with the post installation energy usage being 20% lower across all loads. The evaluation staff calibrated the post installation estimates with a load factor based on the provided trend data. Overall, this project received a realization rate of 0.56. Based on the initial draft of this report, ComEd provided relevant trend data to show this issue was resolved and the final realization rate is 1.00.

Recommendation 5. If possible, the implementation team should use trend data to estimate system operation before and after installation. Extra effort, such as collecting post-installation trend data, should be considered for large projects.

Finding 6. Project FACA-41248 included turning off motors when they were not needed. The initial site report noted that 60 motors had been targeted, while the final site check-in noted that 35 motors had been put on automatic controls. However, the ex ante savings were based on only 20 motors being controlled. The evaluation team adjusted the savings calculations to align with the 35 motors identified in the documentation, resulting in a realization rate of 1.60.

Recommendation 6. The final calculations should reflect whatever final data is collected from the site contacts. If changes occurred in terms of the number of equipment upgraded, this should be updated in the calculations to properly represent what occurred at the site.

Finding 7. Some calculations used histographs to calculate inputs. These calculations were difficult to review because histographs result in hard-coded values that cannot easily be tracked or explained. Another calculator used hundreds of temperature bins to estimate HVAC power usage. The evaluation staff was unable to recreate these bins in a timely manner and instead used 5-degree temperature bins.

Recommendation 7. The implementer should identify best practices when developing custom calculations. Methods that are difficult to track, difficult to recreate or include many unexplained hard coded values should be avoided. Calculation methods that are commonly utilized should be developed into tools in order to increase efficiency and accuracy when reviewing these projects.

Appendix A. Impact Analysis Methodology

Guidehouse developed a sample of projects based on the tracking data to calculate verified savings with a target of 10% precision at 90% confidence. The final precision for this sample, based on ex post values, was 6.5%. The evaluation team developed the sample using strata based on the size of the energy efficiency projects installed, as Table A-1 shows.

Table A-1. FA Program Sample Details

Strata	Population Quantity	Sample Quantity	Average Savings of Installed Measures (kWh)
Small (0 kWh-35,000 kWh)	146	21	2,622
Medium (35,001 kWh-85,000 kWh)	22	6	14,982
Large (85,001+ kWh)	10	10	73,716

Source: ComEd tracking data and evaluation team analysis

The team requested the documentation associated with the sampled projects for review. Final ex post values were determined through this detailed review of the sampled projects. Realization rates for each strata were developed from the ex post savings and this strata realization rate was weighted against the total savings in each strata to come up with a final program realization rate.

In CY2020, program data was collected over the course of the year into evaluation waves and evaluation tasks were undertaken periodically throughout the year on each wave. Initial evaluation of the initial wave one was completed in December of 2020. The Final Wave evaluation was completed in February of 2020.

ComEd provided several key program documents for this program:

- **Tracking data:** This information provided ex ante savings and a detailed log of customer interaction regarding each measure claimed.
- **Facility assessment report, final customer call log, and supporting calculations:** This documentation included the measure identified during the site visit and the estimated savings for each recommended measure.

Appendix B. Total Resource Cost Detail

Table B-1 shows the 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) is not included in this table and will be provided to the evaluation team later.

Table B-1. Total Resource Cost Savings Summary

End Use Type	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)
HVAC	HVAC System Controls	Measure	41	6.0	No	622,426	0.00	5,936	0	0	0	0.94	0.94	0.94	585,081	0	5,580	0	0	0
Lighting	Manual Light Controls	Measure	22	2.0	No	128,445	0.00	0	0	0	-1,927	0.94	0.94	0.94	120,738	0	0	0	0	-1,811
HVAC	Manual HVAC Temp Adjustments	Measure	17	2.0	No	385,302	0.00	3,477	0	0	0	0.94	0.94	0.94	362,184	0	3,268	0	0	0
Plug Load	Computer Power Controls	Measure	17	6.0	No	141,676	0.00	0	0	0	0	0.94	0.94	0.94	133,176	0	0	0	0	0
Process Equipment	Manual On/Off Process Controls	Measure	13	2.0	No	470,974	0.00	0	0	0	0	0.94	0.94	0.94	442,716	0	0	0	0	0
Air Compressor	Reduced Compressor Pressure	Measure	9	6.0	No	266,876	0.00	0	0	0	0	0.94	0.94	0.94	250,863	0	0	0	0	0
Air Compressor	Compressor Air Leaks	Measure	8	2.0	No	23,998	0.00	0	0	0	0	0.94	0.94	0.94	22,559	0	0	0	0	0
HVAC	Exhaust Fan Hour Reduction	Measure	7	6.0	No	386,289	0.00	177	0	0	0	0.94	0.94	0.94	363,112	0	166	0	0	0
HVAC	Server Closest HVAC Setpoint	Measure	7	6.0	No	16,801	0.00	0	0	0	0	0.94	0.94	0.94	15,793	0	0	0	0	0
Air Compressor	Air Compressor Other	Measure	6	2.0	No	638,563	0.00	0	0	0	0	0.94	0.94	0.94	600,249	0	0	0	0	0
HVAC	HVAC Maintenance	Measure	6	2.0	No	256,608	0.00	0	0	0	0	0.94	0.94	0.94	241,211	0	0	0	0	0
Process Equipment	Hot Water Control	Measure	6	6.0	No	98,105	0.00	225	0	0	0	0.94	0.94	0.94	92,219	0	212	0	0	0
Lighting	Photocell Repair	Measure	6	6.0	No	68,431	0.00	0	0	0	0	0.94	0.94	0.94	64,325	0	0	0	0	0
Air Compressor	Manual Compressor Off	Measure	4	2.0	No	32,094	0.00	0	0	0	0	0.94	0.94	0.94	30,169	0	0	0	0	0
HVAC	Heater Control	Measure	2	6.0	No	182,008	0.00	0	0	0	0	0.94	0.94	0.94	171,088	0	0	0	0	0
Process Equipment	Process Equipment Setpoints	Measure	2	6.0	No	106,936	0.00	0	0	0	0	0.94	0.94	0.94	100,520	0	0	0	0	0
Process Equipment	Disable Unneeded Equipment	Measure	2	6.0	No	42,857	0.00	0	0	0	0	0.94	0.94	0.94	40,286	0	0	0	0	0
HVAC	Ensure Closed Doors	Measure	1	6.0	No	18,610	0.00	0	0	0	0	0.94	0.94	0.94	17,493	0	0	0	0	0
Lighting	Delamp Lights	Measure	1	6.0	No	9,309	0.00	0	0	0	-140	0.94	0.94	0.94	8,751	0	0	0	0	-131
Plug Load	Turn Off TV	Measure	1	6.0	No	7,375	0.00	0	0	0	0	0.94	0.94	0.94	6,933	0	0	0	0	0
	Total			4.0		3,903,685	0	9,815	0	0	-2,066	NA	NA	NA	3,669,464	0	9,226	0	0	-1,942

Note: No secondary energy savings from water reduction measures are included in the verified gross kWh and net kWh in this table. There were no water reduction measures in this program.

* The total of the EUL is calculated as the sum product of the EUL and measure savings divided by total program savings.

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

Source: ComEd tracking data and evaluation team analysis