Guidehouse

ComEd Incentives - Custom Impact Evaluation Report

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

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Table of Contents

List of Tables, Figures and Equations

1. Introduction

This report presents results from the CY2020 impact evaluation of ComEd's Incentives – Custom Program. It summarizes the energy and demand impacts for the total 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

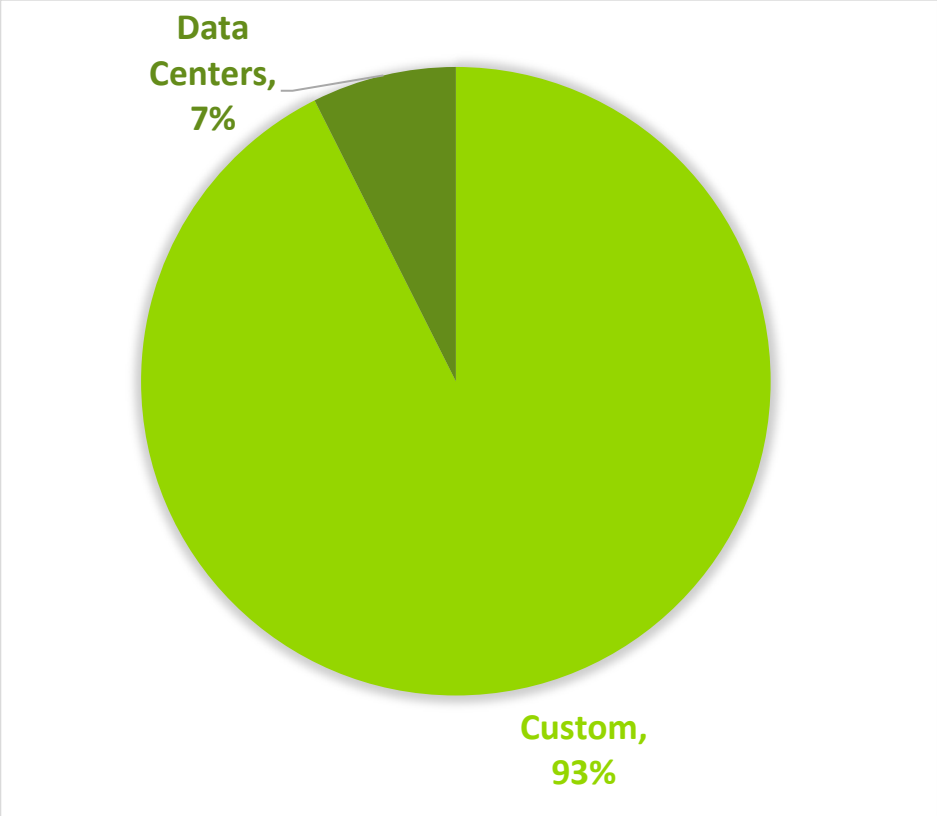
The Incentives - Custom Program provides custom incentives to commercial, industrial and public sector customers, for less common or more complex energy-saving measure that are not included in the standard offering. Custom incentives are available based on the project's kWh savings, provided the project meets all program eligibility requirements. Eligible projects that are pre-approved by ComEd can receive an incentive between $0.07 and $0.21 per first-year kWh saved, depending on the technology, and caps the incentives at 100% of the incremental project cost. In CY2019, the Data Center Program merged with the Custom Program. The program is implemented by ICF International, Inc., DNV, and the ComEd engineering team. The CY2020 program had 118 participants and distributed 216 measures as Table 2-1 and Figure 2-1 show. Custom participants accounted for 93% of the measures installed while data center participants accounted for only 7% of the measures.

Table 2-1. CY2020 Volumetric Findings Detail

Participation	Custom	Data Centers
Participants	106	12
Total Measures	200	16
Installed Projects	187	16

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Share of Custom Program Project Counts by Project Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Custom Program achieved in CY2020. The gas savings are only those that ComEd may be able to claim, which excludes savings the gas utilities claim, either via joint or non-joint programs.[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	41,277,847	6,455
Program Gross Realization Rate	1.12	0.81
Verified Gross Savings	46,192,018	5,201
Program Net-to-Gross Ratio (NTG)	0.67	0.61
Verified Net Savings	31,107,702	3,182
Converted from Gas†		
Ex Ante Gross Savings	334	NA
Program Gross Realization Rate	99.12	NA
Verified Gross Savings	33,120	NA
Program Net-to-Gross Ratio (NTG)	0.67	NA
Verified Net Savings	23,184	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	41,278,181	6,455
Program Gross Realization Rate	1.12	0.81
Verified Gross Savings	46,225,138	5,201
Program Net-to-Gross Ratio (NTG)	0.67	0.61
Verified Net Savings	31,130,886	3,182

Note: The Program Net-to-Gross Ratio (NTG) is an overall average value for the entire Custom Program based on measure specific deemed NTG values recommended by Illinois SAG. Verified Net Savings Converted from Gas are based only on a single measure, which had a deemed NTG value of 0.7. The measure specific deemed values are found on the SAG website: https://www.ilsag.info/ntg_2020.
NA = not applicable (refers to a piece of data that 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 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 will be converted to kWh and counted toward ComEd's electric savings goal while producing the portfolio-wide summary report. According to Section 8-103B(b-25) of the Illinois Public Utilities Act, "In no event shall more than 10% of each year's applicable annual incremental goal as defined in paragraph (7) of subsection (g) of this Section be met through savings of fuels other than electricity."
Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 to Table 4-3show the measure-specific and total verified gross savings for the Incentives - Custom 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 31,107,702 kWh (Table

4-1). The CY2020 gas contribution to CPAS (converted to equivalent electricity) is 23,184 kWh (Table 4-2). Adding the gas and electric contributions produces 31,130,886 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 the “Program Total Gas CPAS” 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
Custom	CHP	24.0	8,956,277	0.70	141,234,681			6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394
Custom	Process Cooling	23.0	6,737,774	0.70	108,478,160			4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442
Custom	Lighting	15.0	4,581,668	0.70	48,107,513			3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168
Custom	Lighting Controls ||	9.0	3,822,848	0.70	24,083,944			2,675,994	2,675,994	2,675,994	2,675,994	2,675,994	2,675,994	2,675,994
Custom	Compressed Air	13.0	3,623,689	0.70	32,975,570			2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582
Custom	VSD	15.0	2,310,694	0.70	24,262,283			1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486
Custom	Other	13.0	1,958,406	0.70	17,821,495			1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884
Custom	HVAC	13.0	1,748,574	0.70	15,912,023			1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002
Custom	Commercial Refrigeration	15.0	1,323,968	0.70	13,901,665			926,778	926,778	926,778	926,778	926,778	926,778	926,778
Custom	Waste Water Treatment	13.0	748,564	0.70	6,811,930			523,995	523,995	523,995	523,995	523,995	523,995	523,995
Custom	Pump	20.0	504,317	0.70	7,060,443			353,022	353,022	353,022	353,022	353,022	353,022	353,022
Custom	Industrial Refrigeration	20.0	238,626	0.70	3,340,770			167,039	167,039	167,039	167,039	167,039	167,039	167,039
Custom	New Construction	17.4	199,090	0.70	2,452,788			139,363	139,363	139,363	139,363	139,363	139,363	139,363
Custom	HVAC Controls	15.0	87,319	0.70	916,854			61,124	61,124	61,124	61,124	61,124	61,124	61,124
Custom	Fan	15.0	83,883	0.70	880,769			58,718	58,718	58,718	58,718	58,718	58,718	58,718
Custom	Process Heating	13.0	81,874	0.70	745,052			57,312	57,312	57,312	57,312	57,312	57,312	57,312
Data Center	New Construction	17.4	5,769,019	0.44	37,651,276			2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368
Data Center	Retrofit	15.0	3,415,428	0.78	37,717,983			2,664,033	2,664,033	2,664,033	2,664,033	2,664,033	2,664,033	2,664,033
CY2020 Program Total Electric Contribution to CPAS			46,192,018		524,355,200			31,107,702	31,107,702	31,107,702	31,107,702	31,107,702	31,107,702	31,107,702
Historic Program Total Electric Contribution to CPAS‡						32,605,460	37,024,991	36,991,524	36,991,524	36,991,524	35,961,302	35,249,201	35,012,650	35,012,650
Program Total Electric CPAS						32,605,460	37,024,991	68,099,226	68,099,226	68,099,226	67,069,004	66,356,903	66,120,352	66,120,352
CY2020 Program Incremental Expiring Electric Savings§									-	-	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§								33,467	-	-	1,030,222	712,101	236,551	-
Program Total Incremental Expiring Electric Savings§								33,467	-	-	1,030,222	712,101	236,551	-

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Custom	CHP	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394	6,269,394
Custom	Process Cooling	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442
Custom	Lighting	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168				
Custom	Lighting Controls	2,675,994	2,675,994										
Custom	Compressed Air	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582						
Custom	VSD	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486				
Custom	Other	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884						
Custom	HVAC	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002						
Custom	Commercial Refrigeration	926,778	926,778	926,778	926,778	926,778	926,778	926,778	926,778				
Custom	Waste Water Treatment	523,995	523,995	523,995	523,995	523,995	523,995						
Custom	Pump	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022
Custom	Industrial Refrigeration	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039
Custom	New Construction	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	83,618	
Custom	HVAC Controls	61,124	61,124	61,124	61,124	61,124	61,124	61,124	61,124				
Custom	Fan	58,718	58,718	58,718	58,718	58,718	58,718	58,718	58,718				
Custom	Process Heating	57,312	57,312	57,312	57,312	57,312	57,312						
Data Center	New Construction	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,177,815	1,228,262	553,242	442,989	250,179	
Data Center	Retrofit	2,664,033	2,664,033	2,664,033	2,215,530	2,215,530	2,215,530	2,215,530	2,215,530				
CY2020 Program Total Electric Contribution to CPAS		31,107,702	31,107,702	28,431,708	27,983,204	27,983,204	27,983,204	21,909,876	20,960,323	12,198,501	12,088,248	11,839,693	11,505,896
Historic Program Total Electric Contribution to CPAS‡		35,012,650	34,936,678	34,936,678	34,936,678	25,213,379	25,196,170	11,965,786	8,694,726	8,543,492	8,335,545	8,335,545	289,254
Program Total Electric CPAS		66,120,352	66,044,379	63,368,386	62,919,882	53,196,583	53,179,374	33,875,661	29,655,049	20,741,993	20,423,793	20,175,238	11,795,150
CY2020 Program Incremental Expiring Electric Savings§		-	-	2,675,994	448,504	-	-	6,073,328	949,553	8,761,821	110,253	248,555	333,797
Historic Program Incremental Expiring Electric Savings‡§		-	75,972	-	-	9,723,299	17,209	13,230,385	3,271,059	151,235	207,947	-	8,046,291
Program Total Incremental Expiring Electric Savings§		-	75,972	2,675,994	448,504	9,723,299	17,209	19,303,713	4,220,612	8,913,056	318,200	248,555	8,380,088

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Custom	CHP	6,269,394	3,961,701	3,961,701	3,961,701	3,961,701							
Custom	Process Cooling	4,716,442	4,716,442	4,716,442	4,716,442								
Custom	Lighting												
Custom	Lighting Controls												
Custom	Compressed Air												
Custom	VSD												
Custom	Other												
Custom	HVAC												
Custom	Commercial Refrigeration												
Custom	Waste Water Treatment												
Custom	Pump	353,022											
Custom	Industrial Refrigeration	167,039											
Custom	New Construction												
Custom	HVAC Controls												
Custom	Fan												
Custom	Process Heating												
Data Center	New Construction												
Data Center	Retrofit												
CY2020 Program Total Electric Contribution to CPAS		11,505,896	8,678,143	8,678,143	8,678,143	3,961,701	-	-	-	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		289,254	289,254	-	-	-	-	-	-	-	-	-	-
Program Total Electric CPAS		11,795,150	8,967,397	8,678,143	8,678,143	3,961,701	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Electric Savings§		-	2,827,753	-	-	4,716,442	3,961,701	-	-	-	-	-	-
Historic Program Incremental Expiring Electric Savings‡§		-	-	289,254	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§		-	2,827,753	289,254	-	4,716,442	3,961,701	-	-	-	-	-	-

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
|| Custom Lighting Controls have an EUL of 10 years, but these projects are phase 2 projects in their second year. The EUL for these projects is 9 years.
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
Custom	CHP	24.0	1,130	0.70	18,984			791	791	791	791	791	791	791
Custom	Process Cooling	23.0		0.70	-									
Custom	Lighting	15.0		0.70	-									
Custom	Lighting Controls **	9.0		0.70	-									
Custom	Compressed Air	13.0		0.70	-									
Custom	VSD	15.0		0.70	-									
Custom	Other	13.0		0.70	-									
Custom	HVAC	13.0		0.70	-									
Custom	Commercial Refrigeration	15.0		0.70	-									
Custom	Waste Water Treatment	13.0		0.70	-									
Custom	Pump	20.0		0.70	-									
Custom	Industrial Refrigeration	20.0		0.70	-									
Custom	New Construction	17.4		0.70	-									
Custom	HVAC Controls	15.0		0.70	-									
Custom	Fan	15.0		0.70	-									
Custom	Process Heating	13.0		0.70	-									
Data Center	New Construction	17.4		0.44	-									
Data Center	Retrofit	15.0		0.78										
CY2020 Program Total Gas Contribution to CPAS (Therms)			1,130		18,984			791	791	791	791	791	791	791
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡						-	-	23,184	23,184	23,184	23,184	23,184	23,184	23,184
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§						70,753	70,753	70,753	70,753	70,753	70,753	70,753	70,753	70,753
Program Total Gas CPAS (kWh Equivalent)‡						70,753	70,753	93,937	93,937	93,937	93,937	93,937	93,937	93,937
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
Custom	CHP	791	791	791	791	791	791	791	791	791	791	791	791
Custom	Process Cooling												
Custom	Lighting												
Custom	Lighting Controls												
Custom	Compressed Air												
Custom	VSD												
Custom	Other												
Custom	HVAC												
Custom	Commercial Refrigeration												
Custom	Waste Water Treatment												
Custom	Pump												
Custom	Industrial Refrigeration												
Custom	New Construction												
Custom	HVAC Controls												
Custom	Fan												
Custom	Process Heating												
Data Center	New Construction												
Data Center	Retrofit												
CY2020 Program Total Gas Contribution to CPAS (Therms)		791	791	791	791	791	791	791	791	791	791	791	791
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡		23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§		70,753	70,753	70,753	70,753	-	-	-	-	-	-	-	-
Program Total Gas CPAS (kWh Equivalent)‡		93,937	93,937	93,937	93,937	23,184	23,184	23,184	23,184	23,184	23,184	23,184	23,184
CY2020 Program Incremental Expiring Gas Savings (Therms)‖		-	-	-	-	-	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)‡‖		-	-	-	-	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§		-	-	-	-	70,753	-	-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡‖		-	-	-	-	70,753	-	-	-	-	-	-	-

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Custom	CHP	791	791	791	791	791							
Custom	Process Cooling												
Custom	Lighting												
Custom	Lighting Controls												
Custom	Compressed Air												
Custom	VSD												
Custom	Other												
Custom	HVAC												
Custom	Commercial Refrigeration												
Custom	Waste Water Treatment												
Custom	Pump												
Custom	Industrial Refrigeration												
Custom	New Construction												
Custom	HVAC Controls												
Custom	Fan												
Custom	Process Heating												
Data Center	New Construction												
Data Center	Retrofit												
CY2020 Program Total Gas Contribution to CPAS (Therms)		791	791	791	791	791	-	-	-	-	-	-	-
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡		23,184	23,184	23,184	23,184	23,184	-	-	-	-	-	-	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Gas CPAS (kWh Equivalent)‡		23,184	23,184	23,184	23,184	23,184	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Gas Savings (Therms)‖		-	-	-	-	-	791	-	-	-	-	-	-
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)‡‖		-	-	-	-	-	23,184	-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡‖		-	-	-	-	-	23,184	-	-	-	-	-	-

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 Yn-1 - CPAS Y_n.
** Custom Lighting Controls have an EUL of 10 years but these projects are phase 2 projects in their second year. The EUL for these projects is 9 years.
Source: Evaluation team analysis

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

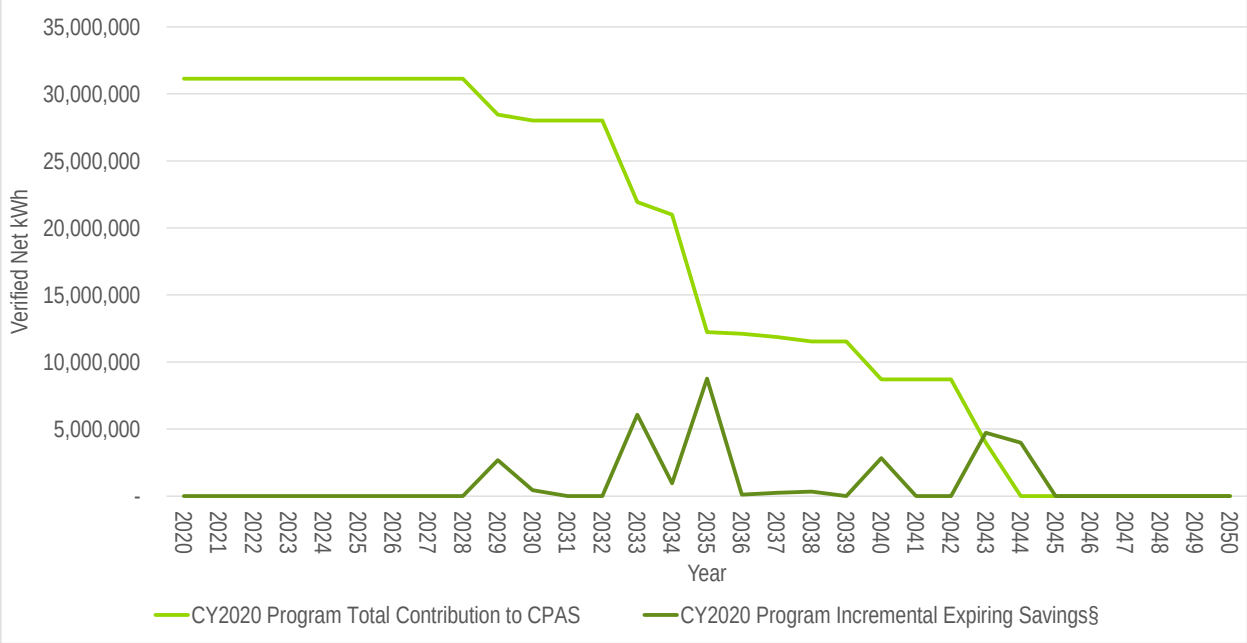
End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings (Including Those Converted from Gas Savings) 2018	2019	2020	2021	2022	2023	2024	2025	2026
Custom	CHP	24.0	8,989,397	0.70	141,791,102			6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578
Custom	Process Cooling	23.0	6,737,774	0.70	108,478,160			4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442
Custom	Lighting	15.0	4,581,668	0.70	48,107,513			3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168
Custom	Lighting Controls ||	9.0	3,822,848	0.70	24,083,944			2,675,994	2,675,994	2,675,994	2,675,994	2,675,994	2,675,994	2,675,994
Custom	Compressed Air	13.0	3,623,689	0.70	32,975,570			2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582
Custom	VSD	15.0	2,310,694	0.70	24,262,283			1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486
Custom	Other	13.0	1,958,406	0.70	17,821,495			1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884
Custom	HVAC	13.0	1,748,574	0.70	15,912,023			1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002
Custom	Commercial Refrigeration	15.0	1,323,968	0.70	13,901,665			926,778	926,778	926,778	926,778	926,778	926,778	926,778
Custom	Waste Water Treatment	13.0	748,564	0.70	6,811,930			523,995	523,995	523,995	523,995	523,995	523,995	523,995
Custom	Pump	20.0	504,317	0.70	7,060,443			353,022	353,022	353,022	353,022	353,022	353,022	353,022
Custom	Industrial Refrigeration	20.0	238,626	0.70	3,340,770			167,039	167,039	167,039	167,039	167,039	167,039	167,039
Custom	New Construction	17.4	199,090	0.70	2,452,788			139,363	139,363	139,363	139,363	139,363	139,363	139,363
Custom	HVAC Controls	15.0	87,319	0.70	916,854			61,124	61,124	61,124	61,124	61,124	61,124	61,124
Custom	Fan	15.0	83,883	0.70	880,769			58,718	58,718	58,718	58,718	58,718	58,718	58,718
Custom	Process Heating	13.0	81,874	0.70	745,052			57,312	57,312	57,312	57,312	57,312	57,312	57,312
Data Center	New Construction	17.4	5,769,019	0.44	37,651,276			2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368
Data Center	Retrofit	15.0	3,415,428	0.78	37,717,983			2,664,033	2,664,033	2,664,033	2,664,033	2,664,033	2,664,033	2,664,033
CY2020 Program Total Contribution to CPAS			46,225,138		524,911,621			31,130,886	31,130,886	31,130,886	31,130,886	31,130,886	31,130,886	31,130,886
Historic Program Total Contribution to CPAS‡						32,676,213	37,095,744	37,062,277	37,062,277	37,062,277	36,032,055	35,319,954	35,083,403	35,083,403
Program Total CPAS						32,676,213	37,095,744	68,193,163	68,193,163	68,193,163	67,162,941	66,450,840	66,214,289	66,214,289
CY2020 Program Incremental Expiring Savings§									-	-	-	-	-	-
Historic Program Incremental Expiring Savings‡§								33,467	-	-	1,030,222	712,101	236,551	-
Program Total Incremental Expiring Savings§								33,467	-	-	1,030,222	712,101	236,551	-

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Custom	CHP	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578	6,292,578
Custom	Process Cooling	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442	4,716,442
Custom	Lighting	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168	3,207,168				
Custom	Lighting Controls	2,675,994	2,675,994										
Custom	Compressed Air	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582	2,536,582						
Custom	VSD	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486	1,617,486				
Custom	Other	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884	1,370,884						
Custom	HVAC	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002	1,224,002						
Custom	Commercial Refrigeration	926,778	926,778	926,778	926,778	926,778	926,778	926,778	926,778				
Custom	Waste Water Treatment	523,995	523,995	523,995	523,995	523,995	523,995						
Custom	Pump	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022	353,022
Custom	Industrial Refrigeration	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039	167,039
Custom	New Construction	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	139,363	83,618	
Custom	HVAC Controls	61,124	61,124	61,124	61,124	61,124	61,124	61,124	61,124				
Custom	Fan	58,718	58,718	58,718	58,718	58,718	58,718	58,718	58,718				
Custom	Process Heating	57,312	57,312	57,312	57,312	57,312	57,312						
Data Center	New Construction	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,538,368	2,177,815	1,228,262	553,242	442,989	250,179	
Data Center	Retrofit	2,664,033	2,664,033	2,664,033	2,215,530	2,215,530	2,215,530	2,215,530	2,215,530				
CY2020 Program Total Contribution to CPAS		31,130,886	31,130,886	28,454,892	28,006,388	28,006,388	28,006,388	21,933,060	20,983,507	12,221,686	12,111,433	11,862,877	11,529,080
Historic Program Total Contribution to CPAS‡		35,083,403	35,007,431	35,007,431	35,007,431	25,213,379	25,196,170	11,965,786	8,694,726	8,543,492	8,335,545	8,335,545	289,254
Program Total CPAS		66,214,289	66,138,317	63,462,323	63,013,819	53,219,767	53,202,558	33,898,845	29,678,233	20,765,177	20,446,977	20,198,422	11,818,334
CY2020 Program Incremental Expiring Savings§		-	-	2,675,994	448,504	-	-	6,073,328	949,553	8,761,821	110,253	248,555	333,797
Historic Program Incremental Expiring Savings‡§		-	75,972	-	-	9,794,052	17,209	13,230,385	3,271,059	151,235	207,947	-	8,046,291
Program Total Incremental Expiring Savings§		-	75,972	2,675,994	448,504	9,794,052	17,209	19,303,713	4,220,612	8,913,056	318,200	248,555	8,380,088

End Use Type	Research Category	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Custom	CHP	6,292,578	3,984,886	3,984,886	3,984,886	3,984,886							
Custom	Process Cooling	4,716,442	4,716,442	4,716,442	4,716,442								
Custom	Lighting												
Custom	Lighting Controls												
Custom	Compressed Air												
Custom	VSD												
Custom	Other												
Custom	HVAC												
Custom	Commercial Refrigeration												
Custom	Waste Water Treatment												
Custom	Pump	353,022											
Custom	Industrial Refrigeration	167,039											
Custom	New Construction												
Custom	HVAC Controls												
Custom	Fan												
Custom	Process Heating												
Data Center	New Construction												
Data Center	Retrofit												
CY2020 Program Total Contribution to CPAS		11,529,080	8,701,327	8,701,327	8,701,327	3,984,886	-	-	-	-	-	-	-
Historic Program Total Contribution to CPAS‡		289,254	289,254	-	-	-	-	-	-	-	-	-	-
Program Total CPAS		11,818,334	8,990,581	8,701,327	8,701,327	3,984,886	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Savings§		-	2,827,753	-	-	4,716,442	3,984,886	-	-	-	-	-	-
Historic Program Incremental Expiring Savings‡§		-	-	289,254	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Savings§		-	2,827,753	289,254	-	4,716,442	3,984,886	-	-	-	-	-	-

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
|| Custom Lighting Controls have an EUL of 10 years but these projects are phase 2 projects in their second year. The EUL for these projects is 9 years.
Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



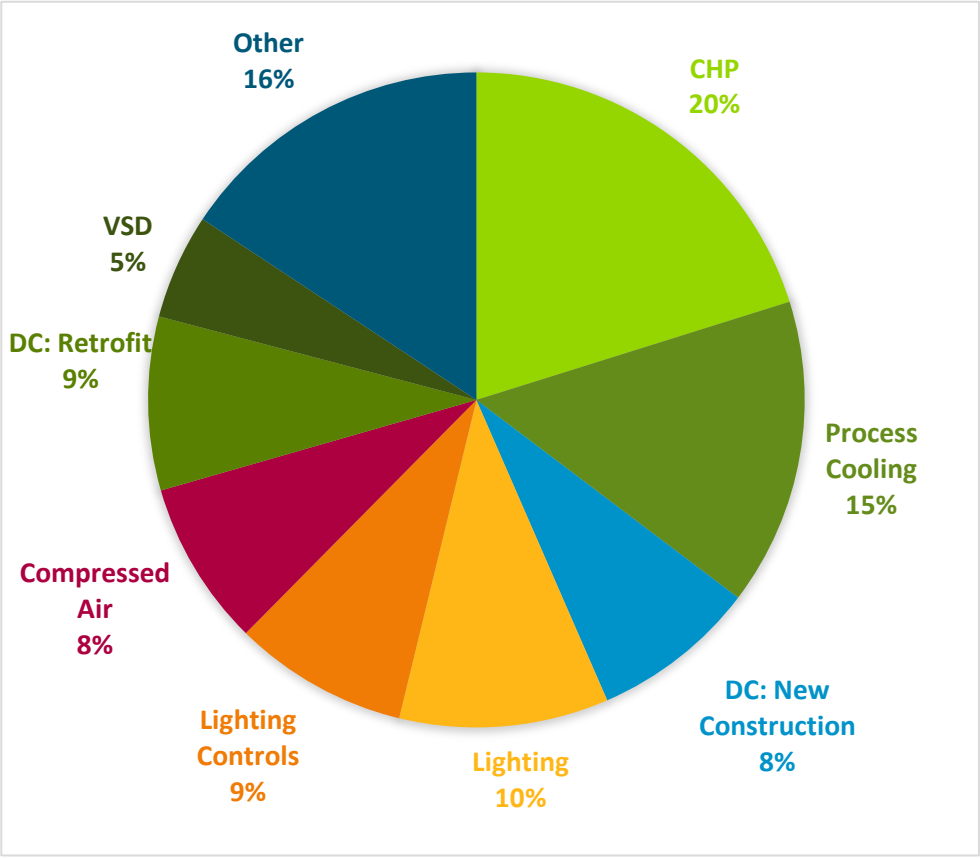
§ Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n + Expiring Savings Y_{n-1}.

Source: Evaluation team analysis

5. Program Savings by Measure

Figure 5-1 provides the breakdown of verified net savings by measure type. Combined Heat and Power (CHP), Process Cooling and the two Data Center measures represent 52% of the total verified net savings. HVAC, refrigeration, waste water treatment, pumps, fans and other small measure categories are grouped into “Other” category.

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



Source: Evaluation team analysis

Table 5-1 and Table 5-2 provides the verified net energy and demand savings by measure type. A separate evaluation sample was drawn for custom projects versus data center projects at the strata level and not at the measure level. Therefore, the sample results were rolled up to the population for each project type rather than at the measure level. The verified gross savings for each measure was estimated by multiplying the realization rate for each project type with the ex ante savings estimates.

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)
Custom	CHP	7,373,997	1.21	8,956,277	0.70	6,269,394	24.0
Custom	Process Cooling	5,547,431	1.21	6,737,774	0.70	4,716,442	23.0
Custom	Lighting	3,772,238	1.21	4,581,668	0.70	3,207,168	15.0
Custom	Lighting Controls ||	3,147,477	1.21	3,822,848	0.70	2,675,994	9.0
Custom	Compressed Air	2,983,502	1.21	3,623,689	0.70	2,536,582	13.0
Custom	VSD	1,902,470	1.21	2,310,694	0.70	1,617,486	15.0
Custom	Other	1,612,420	1.21	1,958,406	0.70	1,370,884	13.0
Custom	HVAC	1,439,658	1.21	1,748,574	0.70	1,224,002	13.0
Custom	Commercial Refrigeration	1,090,066	1.21	1,323,968	0.70	926,778	15.0
Custom	Waste Water Treatment	616,317	1.21	748,564	0.70	523,995	13.0
Custom	Pump	415,221	1.21	504,317	0.70	353,022	20.0
Custom	Industrial Refrigeration	196,469	1.21	238,626	0.70	167,039	20.0
Custom	New Construction	163,917	1.21	199,090	0.70	139,363	17.4
Custom	HVAC Controls	71,893	1.21	87,319	0.70	61,124	15.0
Custom	Fan	69,063	1.21	83,883	0.70	58,718	15.0
Custom	Process Heating	67,409	1.21	81,874	0.70	57,312	13.0
Data Center	New Construction	6,789,006	0.85	5,769,019	0.44	2,538,368	17.4
Data Center	Retrofit	4,019,290	0.85	3,415,428	0.78	2,664,033	15.0
	Total	41,277,847	1.12	46,192,018	NA	31,107,702	NA

Note: There were no 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.

|| Custom Lighting Controls have an EUL of 10 years but these projects are phase 2 projects in their second year. The EUL for these projects is 9 years.

Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2020 Summer Peak Demand Reduction 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)
Custom	CHP	689	0.87	598	0.63	377
Custom	Process Cooling	1,619	0.87	1,405	0.63	885
Custom	Lighting	696	0.87	605	0.63	381
Custom	Lighting Controls	0	0.87	0	0.63	0
Custom	Compressed Air	361	0.87	313	0.63	197
Custom	VSD	418	0.87	363	0.63	229
Custom	Other	202	0.87	175	0.63	110
Custom	HVAC	596	0.87	517	0.63	326
Custom	Commercial Refrigeration	78	0.87	68	0.63	43
Custom	Waste Water Treatment	120	0.87	104	0.63	66
Custom	Pump	36	0.87	31	0.63	19
Custom	Industrial Refrigeration	73	0.87	64	0.63	40
Custom	New Construction	19	0.87	16	0.63	10
Custom	HVAC Controls	8	0.87	7	0.63	5
Custom	Fan	8	0.87	7	0.63	4
Custom	Process Heating	8	0.87	7	0.63	4
Data Center	New Construction	929	0.60	561	0.34	191
Data Center	Retrofit	594	0.60	359	0.82	294
	Total	6,455	0.81	5,201	NA	3,182

* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.
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)
Custom	CHP	0	0.00	1,130	0.70	791	24.0
Custom	Process Cooling	1	0.00	0	0.70	0	23.0
Custom	Lighting	1	0.00	0	0.70	0	15.0
Custom	Lighting Controls	0	0.00	0	0.70	0	9.0
Custom	Compressed Air	0	0.00	0	0.70	0	13.0
Custom	VSD	1	0.00	0	0.70	0	15.0
Custom	Other	7	0.00	0	0.70	0	13.0
Custom	HVAC	0	0.00	0	0.70	0	13.0
Custom	Commercial Refrigeration	0	0.00	0	0.70	0	15.0
Custom	Waste Water Treatment	0	0.00	0	0.70	0	13.0
Custom	Pump	0	0.00	0	0.70	0	20.0
Custom	Industrial Refrigeration	0	0.00	0	0.70	0	20.0
Custom	New Construction	1	0.00	0	0.70	0	17.4
Custom	HVAC Controls	0	0.00	0	0.70	0	15.0
Custom	Fan	0	0.00	0	0.70	0	15.0
Custom	Process Heating	0	0.00	0	0.70	0	13.0
Data Center	New Construction	0	0.00	0	0.44	0	17.4
Data Center	Retrofit	0	0.00	0	0.78	0	15.0
	Total Therms	11	99.12	1,130	NA	791	NA
	Total kWh Converted From Therms†	334	99.12	33,120	NA	23,184	NA

* 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).
NA = not aplicable (refers to a piece of data cannot be produced or does not apply)
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)
Custom	CHP	7,373,997	1.22	8,989,397	0.70	6,292,578
Custom	Process Cooling	5,547,460	1.21	6,737,774	0.70	4,716,442
Custom	Lighting	3,772,267	1.21	4,581,668	0.70	3,207,168
Custom	Lighting Controls	3,147,477	1.21	3,822,848	0.70	2,675,994
Custom	Compressed Air	2,983,502	1.21	3,623,689	0.70	2,536,582
Custom	VSD	1,902,499	1.21	2,310,694	0.70	1,617,486
Custom	Other	1,612,637	1.21	1,958,406	0.70	1,370,884
Custom	HVAC	1,439,658	1.21	1,748,574	0.70	1,224,002
Custom	Commercial Refrigei	1,090,066	1.21	1,323,968	0.70	926,778
Custom	Waste Water Treatm	616,317	1.21	748,564	0.70	523,995
Custom	Pump	415,221	1.21	504,317	0.70	353,022
Custom	Industrial Refrigeratic	196,469	1.21	238,626	0.70	167,039
Custom	New Construction	163,947	1.21	199,090	0.70	139,363
Custom	HVAC Controls	71,893	1.21	87,319	0.70	61,124
Custom	Fan	69,063	1.21	83,883	0.70	58,718
Custom	Process Heating	67,409	1.21	81,874	0.70	57,312
Data Center	New Construction	6,789,006	0.85	5,769,019	0.44	2,538,368
Data Center	Retrofit	4,019,290	0.85	3,415,428	0.78	2,664,033
	Total†	41,278,181	1.12	46,225,138	NA	31,130,886

* 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.
NA = not applicable (refers to a piece of data cannot be produced or does not apply)
Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The Incentives - Custom Program does not have relevant impact parameters.

6.2 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2020 evaluation.

Finding 1: There were several projects where the trend data collected was not representative of the system operation. In one case, only a small percentage of the fans were metered. By examining the meter data, it was clear that the data was not representative of how the system

performed in general and did not account for overall system requirements. In another project, there were some periods of data included that did not represent typical operation.

Recommendation 1: When metering system equipment, ensure that a large enough sample of systems is metered that will accurately represent the overall operation of the facility, and that the analysis accounts for overall system requirements. Similarly, ensure that the data represents typical operation over the course of a year, and that any periods of unscheduled downtime are removed from analysis.

Finding 2: While the Uninterruptible Power Supply (UPS) baseline determination has been discussed in the past, one thing that has not been discussed is the UPS baseline load to use. This determination has been handled inconsistently by both the implementation and evaluation team in the past. Standardizing the UPS baseline load will help enable a more accurate representation of savings across all projects.

Recommendation 2: The evaluation team and ComEd are discussing to best standardize UPS baseline determination for projects going forward. Once this baseline is finalized, we recommend that ComEd follow the guidance going forward to ensure a consistent approach to estimating savings for UPS projects.

Finding 3: The ex ante calculations for one project used a regression analysis on fan speed data that had been averaged over temperature groupings.

Recommendation 3: Regressions should not be applied on binned or grouped averages. Averaging dependent data over grouped independent variable ranges reduces the variation in results at a given temperature, and falsely inflates precision of the estimates. This approach may also confound other impacts, like a relationship between time of day and temperature or usage. Additionally, when performing regression analyses, ComEd should ensure there is a good correlation between the independent and dependent variables.

Finding 4: In several projects, the implementer used trended data to develop correlations between the independent and dependent variables, however, the implementer used the correlation to estimate generator output to develop savings estimates instead of using trended output directly.

Recommendation 4: Where possible, the implementation team should use directly collected information to establish measure demand and energy usage. Using a trended output to develop a correlation to estimate output under the same conditions introduces chances for errors without improving accuracy.

Finding 5: The evaluation team identified a project where generic compressor performance curves were used for analysis.

Recommendation 5: Use site-specific or equipment specific data, like actual compressor performance curves for the equipment installed whenever possible.

Finding 6: In the absence of real data, variables like power factors, affinity factors, and chiller coefficients are not always applied by the implementation team consistently across projects.

Recommendation 6: In the absence of actual onsite measurement data, the evaluation team recommends using the following general values in the calculations:

- Power Factors:
    - For induction motors, a power factor of 0.85.
    - For EC motors, a power factor of 0.92.
    - For VSDs, a power factor of 1.0.
- Affinity Factors:
    - To estimate fan power, an affinity factor between 2.0 and 2.4 for fixed geometry systems.
    - To estimate pump power, an affinity factor of no more than 2.5 to account for static head.
- To develop cooling system energy consumption, EIR-FT coefficients are used. The evaluation team recommends using the values based on the ANSI/ASHRAE/IES Standard 90.1-2016 Performance Rating Method Reference Manual.[2]

Finding 7: Only the most recent 2 years-worth of interval meter data is readily available for the evaluators. In some cases where billing analysis is used having additional interval meter data to establish baseline would be helpful.

Recommendation 7: For projects that take multiple years to complete and where billing analysis is used to estimate the savings, the implementers should collect 2 years-worth of interval meter data for the pre period and include it along with the ex ante documentation.

Finding 8: There were several projects where average or maximum demand reduction was used to estimate the demand savings.

Recommendation 8: Peak demand savings should be estimated based on demand reduction during PJM peak summer period of 1:00 p.m.-5:00 PM Central Prevailing Time on non-holiday weekdays, for the months of June through August.

[2] Pacific Northwest National Laboratory. *ANSI/ASHRAE/IES Standard 90.1-2016 Performance Rating Method Reference Manual.* September 2017. PNNL-26917.

Appendix A. Impact Analysis Methodology

Consistent with the evaluation plan, the evaluation team used a stratified random sampling approach to select the gross impact sample of 20 custom projects and eight data center projects. Both project types are part of the Incentives - Custom Program. The evaluation team sampled the custom and data center projects separately. Historically, these measures have been two separate programs. The evaluation team did not feel it was representative to extrapolate data center project results to custom project results, and vice-versa. The evaluation team sorted each set of projects separately, based upon the level of ex ante kWh savings, and placed the projects in three strata.

Table A-1 provides a profile of the gross impact measurement and verification (M&V) sample for the custom projects in comparison with the custom population. The resulting sample consists of 20 projects. These projects make up approximately 17.3 million kWh, which represents 57% of the ex ante impact claim for the custom project population. The table also shows the ex ante-based kWh sample weights for each of the three strata.

Table A-1. CY2020 Custom Gross Impact Sample by Strata

	Population Summary			Sample		
Strata	Number of Tracking Records (N)	Ex Ante Gross Savings (kWh)	kWh Weights	Number of Tracking Records (n)	Ex Ante Gross Savings (kWh)	Sampled % of Popualtion kWh
1	5	11,995,906	0.39	5	11,995,906	1.00
2	16	8,590,847	0.28	8	4,750,264	0.55
3	166	9,882,798	0.32	7	580,290	0.06
Total	187	30,469,550	1.00	20	17,326,460	0.57

Source: Evaluation team analysis

Table A-2 provides a profile of the gross impact M&V sample for the data centers projects in comparison with the data centers population. The resulting sample consists of eight projects. These projects make up almost 7.1 million kWh, which represents 65% of the ex ante impact claim for the data centers project population. The table also shows the ex ante-based kWh sample weights for each of the three strata.

Table A-2. CY2020 Data Centers Gross Impact Sample by Strata

Strata	Population Summary			Sample		
	Number of Tracking Records (N)	Ex Ante Gross Savings (kWh)	kWh Weights	Number of Tracking Records (n)	Ex Ante Gross Savings (kWh)	Sampled % of Popualtion kWh
1	3	3,624,895	0.34	3	3,624,895	1.00
2	4	3,828,929	0.35	2	1,921,453	0.50
3	9	3,354,473	0.31	3	1,521,757	0.45
Total	16	10,808,296	1.00	8	7,068,106	0.65

Source: Evaluation team analysis

A.1 Roll-up of Savings

There are two basic statistical methods for combining individual gross realization rates from the sample projects into an estimate of verified gross kWh savings for the population — "separate" and "combined" ratio estimation.[3] For separate ratio estimator, the evaluation team calculates a separate gross kWh savings realization rate for each stratum and then combine them. For a combined ratio estimator, the evaluation team completes a single gross kWh savings realization rate calculation without first calculating separate gross realization rates by stratum.

The evaluation team used the separate ratio estimation technique to estimate verified gross impacts for the custom project population and the data center project population. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework,[4] which identifies best practices in program evaluation. The evaluation team matched these steps to the stratified random sampling method used to create the sample for the program. The evaluation team used the standard error to estimate the error bound around the estimate of verified gross impacts.

Once the evaluation team rolled up population-level savings for the custom and the data center projects, the team calculated a final Incentives — Custom Program gross realization rate (RR) using Equation A-1.

[3] A full discussion and comparison of separate vs. combined ratio estimation can be found in Sampling Techniques, Cochran, 1977, pp. 164-169.

[4] Tec Market Works, "The California Evaluation Framework," Prepared for the California Energy Commission, June 2004. Available at http://www.calmac.org

Equation A-1: Custom Program Realization Rate Equation

$$Custom\ Program\ RR = \frac{Verified\ Gross\ Savings_{Custom} + Verified\ Gross\ Savings_{DC}}{Ex\ Ante\ Gross\ Savings_{Custom} + Ex\ Ante\ Gross\ Savings_{DC}}$$

Appendix B. Impact Analysis Detail

B.1 Savings by Project – Custom Projects

The custom project type sample consists of 20 projects. Table B-1 provides the ex ante and verified gross energy savings plus verified net savings for all the projects in the sample.

Table B-1. CY2020 Energy Savings by Project – Custom Projects

Project ID	Strata	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
CUST-50745	1	3,032,582	1.00	3,032,582	0.70	2,122,807
CUST-39359	1	2,220,277	1.06	2,349,864	0.70	1,644,905
CUST-50512	1	2,323,138	1.01	2,347,437	0.70	1,643,206
CUST-39132	1	2,336,575	1.00	2,333,747	0.70	1,633,623
CUST-50243	1	2,083,333	1.02	2,122,725	0.70	1,485,908
CUST-50196	2	1,041,666	1.00	1,041,666	0.70	729,166
CUST-50290	2	769,837	1.00	770,229	0.70	539,160
CUST-50533	3	294,920	2.20	648,887	0.70	454,221
CUST-50677	2	618,398	1.01	623,568	0.70	436,498
CUST-50251	2	550,563	1.00	550,563	0.70	385,394
CUST-50617	2	497,840	1.03	513,541	0.70	359,479
CUST-50627	2	372,151	1.34	498,589	0.70	349,012
CUST-50540	2	469,205	0.93	434,752	0.70	304,326
CUST-50320	2	430,604	0.91	391,882	0.70	274,317
CUST-50528	3	105,500	1.44	151,865	0.70	106,306
CUST-50562	3	69,063	0.75	51,561	0.70	36,093
CUST-50586	3	68,853	0.75	51,323	0.70	35,926
CUST-50460	3	23,886	0.97	23,218	0.70	16,253
CUST-50463	3	11,706	1.01	11,872	0.70	8,310
CUST-50570	3	6,361	1.00	6,361	0.70	4,453
Total Sample		17,326,460	1.04	17,956,232	NA	12,569,363

Note: The Verified Gross Realization Rates are based on the sampled projects and are unweighted.
NA = not applicable (refers to a piece of data cannot be produced or does not apply)
* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.
Source: Evaluation team analysis

Table B-2 provides the ex ante and verified gross peak demand reduction for all the projects in the sample.

Table B-2. CY2020 Peak Demand Reduction by Project – Custom Projects

Project ID	Strata	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
CUST-50745	1	0	0.00	0	0.70	0
CUST-39359	1	378	1.02	386	0.70	270
CUST-50512	1	0	0.00	267	0.70	187
CUST-39132	1	0	0.00	262	0.70	183
CUST-50243	1	987	0.78	773	0.70	541
CUST-50196	2	499	0.26	128	0.70	89
CUST-50290	2	20	5.74	114	0.70	80
CUST-50533	3	40	1.85	74	0.70	52
CUST-50677	2	2	6.72	12	0.70	8
CUST-50251	2	0	0.00	0	0.70	0
CUST-50617	2	46	0.95	44	0.70	31
CUST-50627	2	55	1.04	57	0.70	40
CUST-50540	2	15	3.49	52	0.70	37
CUST-50320	2	62	0.67	42	0.70	29
CUST-50528	3	71	0.00	0	0.70	0
CUST-50562	3	8	2.34	18	0.70	13
CUST-50586	3	15	0.74	12	0.70	8
CUST-50460	3	2	0.99	2	0.70	1
CUST-50463	3	1	0.85	1	0.70	1
CUST-50570	3	1	1.00	1	0.70	1
Total Sample		2,201	1.02	2,244	NA	1,571

Note: The Verified Gross Realization Rates are based on the sampled projects and are unweighted.
NA = not applicable (refers to a piece of data cannot be produced or does not apply)
* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.
Source: Evaluation team analysis

The evaluation team provided ComEd with site-specific M&V reports for each verified project. These site-specific evaluation reports summarize the ex ante savings, the evaluation team findings from their data collection activities, and the final evaluation analysis and savings. The evaluation team uncovered some issues in five of the 20 projects, which resulted in energy realization rates with a discrepancy of greater than 10% from a realization rate of 1.0. Some key

observations from these site-specific evaluation results for each project that saw large differences in savings are discussed below.

- **CUST-50533:** The overall energy RR for this project is 220% and it represented 3.6% of the verified net kWh sample savings. The primary reason for the increase in savings is due to differences in the performance curves used to establish the baseline compressor demand profile. Using the performance curves obtained from the compressor manufacturer instead of generic curves resulted in increased savings.

  Another factor contributing to the increased savings is that some trended data for the swing compressor was removed in the calculations by the evaluation team so as the compressor was shut down for maintenance during that time and it did not represent typical operation.

- **CUST-50627:** The overall energy RR for this project is 134% and it represents 2.8% of the verified net kWh sample savings. The verified energy savings are higher due to a different approach to modelling baseline operation. The evaluation team adjusted the savings to correlate to the airflow data and not with pressure or the weather data. While enthalpy appeared to be a reasonable factor in the pre-case, it had a very low t stat value, which indicates that is does not have much effect on the correlation.

- **CUST-50528:** The overall energy RR for this project is 144% and it represents less than 1% of the verified net kWh sample savings. The verified energy savings are higher due to the adjustment to hours of operation by the evaluation team. The increase in savings was slightly offset due to operation between 35°F and 40°F. The ex ante analysis assumed that the dry cooler would satisfy the cooling demand below 40°F. However, during interviews with the customer the evaluation team determined that one chiller would be needed in this temperature range to meet the required chilled water supply temperature.

- **CUST-50562:** The overall energy RR for this project is 75% and it represents less than 1% of the verified net kWh sample savings. The reduction in savings is mainly due to the adjustment to full load motor power from 161 kW down to 109 kW. The ex ante calculations assumed a 100% load factor for the motor, while the evaluation team calculations assumed a 70% load factor.

  The reduction in savings was mitigated by the adjustment to the operating speed profile. The evaluation team analysis assumed that most operation would be at about 40% speed and the fan would not operate above 50% speed.

- **CUST-50586:** The overall energy RR for this project is 75% and it represents less than 1% of the verified net kWh sample savings. The primary reason for the reduction in energy and demand savings is due to the adjustment to fixture quantities and the

associated square footage. The ex ante calculations removed some of the fixtures that are not qualified fixtures but did not adjust the square footage accordingly.

B.2 Savings by Project – Data Center Projects

The data center sample consists of eight projects. Table B-3 provides the ex ante and verified gross energy savings for all the projects in the sample.

Table B-3. CY2020 Energy Savings by Project – Data Center Projects

Project ID	Strata	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
DCEN-40076	1	1,216,092	1.10	1,337,208	0.78	1,043,022
DCEN-40112	2	1,029,440	1.07	1,098,571	0.78	856,885
DCEN-40111	2	892,013	0.94	839,234	0.78	654,603
DCEN-40085	1	1,293,606	1.07	1,382,454	0.44	608,280
DCEN-38194	1	1,115,197	0.46	517,253	0.44	227,591
DCEN-21990	3	775,223	0.61	475,513	0.44	209,226
DCEN-31486	3	630,531	0.57	356,935	0.44	157,051
DCEN-24054	3	116,003	0.98	113,875	0.44	50,105
Total Sample		7,068,106	0.87	6,121,043	NA	3,806,763

Note: The Verified Gross Realization Rates are based on the sampled projects and are unweighted.
NA = not applicable (refers to a piece of data cannot be produced or does not apply)
* A deemed value. Source: is found on the Illinois SAG website:: https://www.ilsag.info/ntg_2020.
Source: Evaluation team analysis

Table B-4 provides the ex ante and verified gross peak demand reduction for all the projects in the Data Center sample.

Table B-4. CY2020 Peak Demand Reduction by Project – Data Center Projects

Project ID	Strata	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
DCEN-40076	1	349	1.01	351	0.82	288
DCEN-40112	2	118	1.07	125	0.82	103
DCEN-40111	2	102	0.94	96	0.82	79
DCEN-40085	1	35	0.91	32	0.34	11
DCEN-38194	1	45	-0.55	-25	0.34	-8
DCEN-21990	3	404	0.00	0	0.34	0
DCEN-31486	3	0	0.00	19	0.34	6
DCEN-24054	3	43	-0.62	-27	0.34	-9
Total Sample		1,095	0.52	571	NA	469

Note: The Verified Gross Realization Rates are based on the sampled projects and are unweighted.
NA = not applicable (refers to a piece of data cannot be produced or does not apply)
* A deemed value. Source: is found on the Illinois SAG website: https://www.ilsag.info/ntg_2020.
Source: Evaluation team analysis

The evaluation team provided ComEd with site-specific M&V reports for each verified project. These site-specific evaluation reports summarize the ex ante savings, the evaluation team findings from their data collection activities, and the final evaluation analysis and savings. Table B-3 and Table B-4 summarize the results for each project. The evaluation team uncovered some issues in four of the eight projects, which resulted in energy realization rates with a discrepancy of 10% or greater from a realization rate of 1.0. Some key observations from these site-specific evaluation results for each project that saw large differences in savings are discussed below.

- **DCEN-40076:** This project had an overall energy RR of 110% and it represents 27% of the verified net kWh sample savings. There were several reasons for the increase in savings. Part of the increase was due to the inclusion of 2 months of operating data in the evaluation team verification. The added data included summer months which were not available at the time of ex ante analysis. It appears that most of the savings increases occurred during the July to September months.

  The evaluation team analysis used updated IT load data for the normalized baseline and proposed conditions. Finally, the ex ante calculations for days per month in the normalizing table were not entered correctly. For example, the calculations for February included 31 days of data while March included 29 days of data.

- **DCEN-21990:** The project had an overall energy RR of 61% and it represents 5% of the verified net kWh sample savings. The decrease in energy savings was due to several factors. The primary reason for the reduction was that the correlations used to establish verified Kyoto power were divided into two temperature ranges. While the ex ante exponential correlation used had a good R^2 value, the data did not include OATs below 30°F. That regression used by ComEd results in about 82 kW Kyoto power at 10°F, compared to the average 238 kW observed at temperatures below 50°F.

- **DCEN-31486:** This project had an overall energy RR of 57% and it represents 4% of the verified net kWh sample savings. The primary reason for the reduction in savings was due to the baseline UPS efficiency. The baseline UPS system efficiency was based on a UPS loading of 19.2%. The 2013 PGE baseline document[5] states that if the UPS loading is below 25%, system efficiency at 25% should be used. Interactive effects also resulted in reduced baseline chilled water plant power and energy usage.

  Adjusting the load factor of the as-installed UPS Room RTUs slightly increased savings, while re-calculating the chilled water pump average power slightly decreased savings.

- **DCEN-38194:** This project had an overall energy RR of 46% and it represents 6% of the verified net kWh sample savings. The reductions in energy savings were due to several factors. The first was a cell reference error in the ex ante calculations for the CRAC compressor power in the UPS room, which resulted in zero power being estimated for compressor operation in temperatures above 55°F.

  The evaluation team also used a different approach then ComEd in the calculation of the CRAC fan energy. The ex ante calculations counted the number of CRAC fans that ran at some point during the metered period, and then averaged the speed for each of those units. These calculations included fans or compressors that were not running during the metered period. Because of the affinity relationships, using the ex ante approach significantly underestimated the baseline power usage, of each fan. Even though more fans are used in the analysis, the overall result led to reduced overall power. The evaluation team methodology accounted for cycling by considering the number of CRACs running and average speeds of units running at any given hour. There was a similar difference in calculation methodology for the CRAC compressors, as for the fans.

[5] Integral Group. *Energy Efficiency Baselines for Data Centers. Statewide Customed New Construction and Customized Retrofit Incentive Programs.* March 1, 2013.

Appendix C. Total Resource Cost Detail

Table C-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) are not included in this table and will be provided to the evaluation team later.

Table C-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)
Custom	CHP	Measure	4	24.0	No	8,956,277	598	1,130	NA	NA	0	0.70	0.63	0.70	6,269,394	377	791	NA	NA	0
Custom	Process Cooling	Measure	8	23.0	No	6,737,774	1,405	0	NA	NA	0	0.70	0.63	0.70	4,716,442	885	0	NA	NA	0
Custom	Lighting	Measure	63	15.0	No	4,581,668	605	0	NA	NA	-1,282	0.70	0.63	0.70	3,207,168	381	0	NA	NA	-897
Custom	Lighting Controls	Measure	2	9.0	No	3,822,848	0	0	NA	NA	0	0.70	0.00	0.70	2,675,994	0	0	NA	NA	0
Custom	Compressed Air	Measure	12	13.0	No	3,623,689	313	0	NA	NA	0	0.70	0.63	0.70	2,536,582	197	0	NA	NA	0
Custom	VSD	Measure	19	15.0	No	2,310,694	363	0	NA	NA	0	0.70	0.63	0.70	1,617,486	229	0	NA	NA	0
Custom	Other	Measure	16	13.0	No	1,958,406	175	0	NA	NA	0	0.70	0.63	0.70	1,370,884	110	0	NA	NA	0
Custom	HVAC	Measure	23	13.0	No	1,748,574	517	0	NA	NA	0	0.70	0.63	0.70	1,224,002	326	0	NA	NA	0
Custom	Commercial Refrigeration	Measure	41	15.0	No	1,323,968	68	0	NA	NA	0	0.70	0.63	0.70	926,778	43	0	NA	NA	0
Custom	Waste Water Treatment	Measure	2	13.0	No	748,564	104	0	NA	NA	0	0.70	0.63	0.70	523,995	66	0	NA	NA	0
Custom	Pump	Measure	4	20.0	No	504,317	31	0	NA	NA	0	0.70	0.63	0.70	353,022	19	0	NA	NA	0
Custom	Industrial Refrigeration	Measure	1	20.0	No	238,626	64	0	NA	NA	0	0.70	0.63	0.70	167,039	40	0	NA	NA	0
Custom	New Construction	Measure	1	17.4	No	199,090	16	0	NA	NA	0	0.70	0.63	0.70	139,363	10	0	NA	NA	0
Custom	HVAC Controls	Measure	2	15.0	No	87,319	7	0	NA	NA	0	0.70	0.63	0.70	61,124	5	0	NA	NA	0
Custom	Fan	Measure	1	15.0	No	83,883	7	0	NA	NA	0	0.70	0.63	0.70	58,718	4	0	NA	NA	0
Custom	Process Heating	Measure	1	13.0	No	81,874	7	0	NA	NA	0	0.70	0.63	0.70	57,312	4	0	NA	NA	0
Data Center	New Construction	Measure	10	17.4	No	5,769,019	561	0	NA	NA	0	0.44	0.34	0.44	2,538,368	191	0	NA	NA	0
Data Center	Retrofit	Measure	6	15.0	No	3,415,428	359	0	NA	NA	0	0.78	0.82	0.78	2,664,033	294	0	NA	NA	0
	Total			17.5		46,192,018	5,201	1,130	NA	NA	-1,282	NA	NA	NA	31,107,702	3,182	791	NA	NA	-897

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 C-1 represents the kWh savings from Table 5-1.

* 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.

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

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

†§ The kWh savings account for electric heating penalties, where applicable. The electric heating penalties columns show the magnitude of adjustments applied to the program savings. Gas heating penalties represent the program therms heating penalties. The therms penalties are not required to be applied to the program savings.
Source: ComEd tracking data and evaluation team analysis