



ComEd Upstream Commercial Food Service Equipment Pilot Impact Evaluation Report

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

Prepared for:

ComEd

FINAL

April 14, 2021

Prepared by:

Sophie Berne
Guidehouse

Sahil Popli
Guidehouse

Sagar Deo
Guidehouse

Ariel Crowley
Guidehouse

Submitted to:

ComEd
2011 Swift Drive
Oak Brook, IL 60523

Submitted by:

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

Contact:

Charles Maglione, Partner
703.431.1983

cmaglione@guidehouse.com

Jeff Erickson, Director
608.616.4962

jeff.erickson@guidehouse.com

Patricia Plympton, Associate Director
202.253.9356

patricia.plympton@guidehouse.com

This report was prepared by Guidehouse for ComEd. The work presented in this report represents Guidehouse's professional judgment based on the information available at the time this report was prepared. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Guidehouse nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

Table of Contents

1. Introduction	1
2. Pilot Description.....	1
3. Pilot Savings Detail.....	3
4. Cumulative Persisting Annual Savings.....	3
5. Pilot Savings by Measure	7
6. Impact Analysis Findings and Recommendations.....	10
6.1 Impact Parameter Estimates	10
6.2 Other Impact Findings and Recommendations.....	17
6.2.1 Steamers	18
6.2.2 Combination Ovens	19
6.2.3 Convection Ovens.....	19
6.2.4 Refrigerators and Freezers	20
6.2.5 Ice Machines.....	20
6.2.6 Dishwashers	21
Appendix A. Impact Analysis Methodology.....	A-1
Appendix B. Total Resource Cost Detail.....	B-1

List of Tables, Figures, and Equations

Figure 2-1. Measures Installed by Type	2
Figure 4-1. Cumulative Persisting Annual Savings.....	7
Figure 5-1. Verified Net Savings by Measure – Electric.....	8
Table 2-1. CY2020 Volumetric Findings Detail.....	2
Table 3-1. CY2020 Total Annual Incremental Electric Savings.....	3
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric.....	4
Table 4-2. Cumulative Persisting Annual Savings (CPAS) – Gas.....	5
Table 4-3 Cumulative Persisting Annual Savings (CPAS) – Total	6
Table 5-1. CY2020 Energy Savings by Measure – Electric	8
Table 5-2. CY2020 Summer Peak Demand Savings by Measure	9
Table 5-3. CY2020 Energy Savings by Measure – Gas	9
Table 5-4. CY2020 Energy Savings by Measure – Electric and Gas	9
Table 5-5. Secondary Energy Savings from Water Reduction by Measure – Electric.....	10
Table 6-1. Commercial Steam Cooker Savings Parameters.....	11
Table 6-2. Combination Oven Savings Parameters.....	12
Table 6-3. ENERGY STAR Electric Convection Oven Savings Parameters	14
Table 6-4. Commercial Solid and Glass Door Refrigerators & Freezers Savings Parameters .	15
Table 6-5. Ice Maker Savings Parameters	16
Table 6-6. Dishwasher Savings Parameters	17

Table 6-7. Measure-Level Savings and Realization Rates	18
Table 6-8. Electric Combination Oven Parameters with Custom Values	19
Table 6-9. Electric Convection Oven Parameters with Custom Values.....	20
Table B-1. Total Resource Cost Savings Summary	B-1
Equation 6-1. Commercial Steam Cooker TRM Algorithms	10
Equation 6-2. Combination Oven TRM Algorithms	12
Equation 6-3. ENERGY STAR Electric Convection Oven TRM Algorithms	13
Equation 6-4. Commercial Solid and Glass Door Refrigerators and Freezers TRM Algorithms	14
Equation 6-5. Ice Maker TRM Algorithm.....	15
Equation 6-6. Dishwasher TRM Algorithms	16
Equation 6-7. ENERGY STAR Ice Maker Energy Consumption Rate for CEE Tier 2 Air Cooled Ice Makers	21
Equation 6-8. ENERGY STAR Ice Maker Energy Consumption Rate for CEE Tier 2 Air Cooled Ice Makers	21

1. Introduction

This report presents results from the CY2020 impact evaluation of the Upstream Commercial Food Service Equipment (UCFSE) Pilot. It summarizes the total energy and demand impacts for the pilot broken out by relevant measure and pilot 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. Pilot Description

The Upstream Commercial Food Service Equipment (UCFSE) Pilot incentivizes energy efficient commercial food service equipment for food service operators through an upstream approach. GTI and Frontier Energy implement this pilot on behalf of ComEd, Nicor Gas, Peoples Gas and North Shore Gas. The UCFSE Pilot launched in September 2019 and recruited 22 participating suppliers through December 31, 2020. Eleven participating suppliers submitted instant rebates on behalf of their customers. The implementers work with manufacturers and distributors by offering point-of-sale customer rebates, upstream incentives, and a simplified administrative process for cooking, refrigeration, sanitizing and ventilation measures. The pilot's goal is to help reduce barriers for using energy efficient equipment by food service operators, reducing electric and gas usage in the commercial food service sector. The gas savings associated with measures are captured in the gas utilities' CY2020 impact evaluation reports.

In October 2020 on behalf of the Midwest Market Transformation Collaborative, Resource Innovations (RI) and the Midwest Energy Efficiency Alliance (MEEA) recommended to the Illinois Stakeholders Advisory Group Market Transformation Saving Working Group that the Commercial Food Service pilot not be offered as a market transformation program for northern Illinois. RI and MEEA recommended that the pilot be continued as an upstream offering.¹

In CY2020, 31 ComEd customers received instant rebates on 52 electric measures, shown in Table 2-1 and Figure 2-1. This is the first year of reporting savings for this pilot.

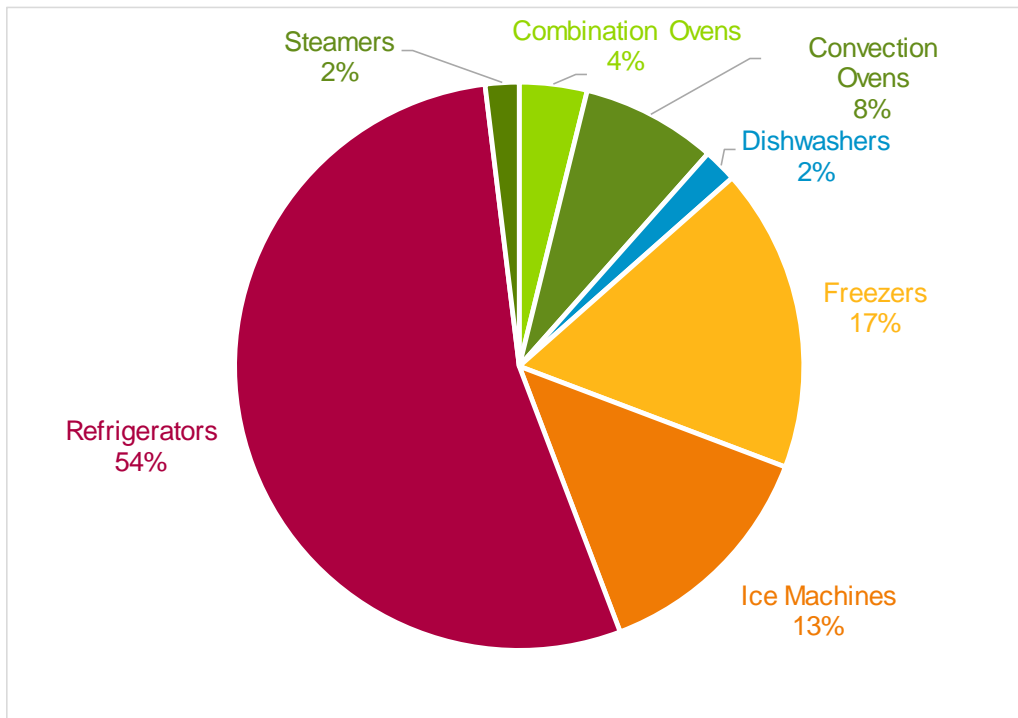
¹ "Commercial Food Service Natural Market Baseline Report and Recommendation," RI and MEEA, October 19, 2020. https://ilsag.s3.amazonaws.com/CFS-Baseline_MT-Recs_10.19.2020_IL-SAG-MT.pdf

Table 2-1. CY2020 Volumetric Findings Detail

Participation	Total
Participants (ComEd Customers)	31
Installed Projects	32
Research Measure Types	10
Installed Steamers	1
Installed Combination Ovens	2
Installed Convection Ovens	4
Installed Refrigerators	28
Installed Freezers	9
Installed Ice Machines	7
Installed Dishwashers	1
Installed Electric Fryers	0
Installed Electric Griddles	0
Installed Hand Wrap Machines	0
Total Measures Installed	52

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Pilot Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the UCFSE Pilot 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.²

Table 3-1. CY2020 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Summer Peak* Demand Savings (kW)
Electricity		
Ex Ante Gross Savings	64,798	8
Program Gross Realization Rate	1.30	1.51
Verified Gross Savings	84,129	12
Program Net-to-Gross Ratio (NTG)	0.80	0.80
Verified Net Savings	67,304	9
Converted from Gas		
Ex Ante Gross Savings	1,319	NA
Program Gross Realization Rate	1.27	NA
Verified Gross Savings	1,671	NA
Program Net-to-Gross Ratio (NTG)	0.80	NA
Verified Net Savings	1,337	NA
Total Electric Plus Gas		
Ex Ante Gross Savings	66,117	8
Program Gross Realization Rate	1.30	1.51
Verified Gross Savings	85,800	12
Program Net-to-Gross Ratio (NTG)	0.80	0.80
Verified Net Savings	68,640	9

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.

Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 shows the measure-specific and total verified gross savings for the UCFSE Pilot 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 CY2020 is 67,304 kWh (Table 4-1). The historic rows in the table are typically the CPAS contribution back to CY2018. Since this is the first year the pilot is claiming savings, there are no historic contribution values to include. The gas utilities claim the gas savings from this pilot and so the electric CPAS is equivalent to total CPAS.

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

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			
Food Service Equipment	Steamers	12.0	33,822	0.80	324,689			27,057	27,057	27,057	27,057	27,057	27,057	27,057	27,057		
Food Service Equipment	Combination Ovens	12.0	16,313	0.80	136,603			13,050	13,050	13,050	13,050	13,050	13,050	13,050	13,050		
Food Service Equipment	Convection Ovens	12.0	7,436	0.80	71,389			5,949	5,949	5,949	5,949	5,949	5,949	5,949	5,949		
Food Service Equipment	Refrigerators	12.0	10,938	0.80	105,006			8,751	8,751	8,751	8,751	8,751	8,751	8,751	8,751		
Food Service Equipment	Freezers	12.0	8,286	0.80	79,542			6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628		
Food Service Equipment	Ice Machines	9.0	4,591	0.80	38,054			3,673	3,673	3,673	3,673	3,673	3,673	3,673	3,673		
Food Service Equipment	Dishwashers	10.0	2,744	0.80	21,952			2,195	2,195	2,195	2,195	2,195	2,195	2,195	2,195		
CY2020 Program Total Electric Contribution to CPAS			84,129		792,234			67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304		
Historic Program Total Electric Contribution to CPAS‡																	
Program Total Electric CPAS								-	-	67,304	67,304	67,304	67,304	67,304	67,304		
CY2020 Program Incremental Expiring Electric Savings§																	
Historic Program Incremental Expiring Electric Savings‡§																	
Program Total Incremental Expiring Electric Savings§																	

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Food Service Equipment	Steamers	27,057	27,057	27,057	27,057	27,057	-	-	-	-	-	-	-
Food Service Equipment	Combination Ovens	13,050	13,050	13,050	13,050	13,050	-	-	-	-	-	-	-
Food Service Equipment	Convection Ovens	5,949	5,949	5,949	5,949	5,949	-	-	-	-	-	-	-
Food Service Equipment	Refrigerators	8,751	8,751	8,751	8,751	8,751	-	-	-	-	-	-	-
Food Service Equipment	Freezers	6,628	6,628	6,628	6,628	6,628	-	-	-	-	-	-	-
Food Service Equipment	Ice Machines	3,673	3,673	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Dishwashers	3,532	3,532	3,532	-	-	-	-	-	-	-	-	-
CY2020 Program Total Contribution to CPAS		68,640	68,640	64,967	61,436	61,436	-	-	-	-	-	-	-
Historic Program Total Contribution to CPAS‡		-	-	-	-	-	-	-	-	-	-	-	-
Program Total CPAS		68,640	68,640	64,967	61,436	61,436	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Savings§		-	-	3,673	3,532	-	61,436	-	-	-	-	-	-
Historic Program Incremental Expiring Savings‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Savings§		-	-	3,673	3,532	-	61,436	-	-	-	-	-	-

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

*A deemed value. Source: Guidehouse research memo on the Illinois SAG website: <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

†Lifetime savings are the sum of CPAS savings through the Effective Useful Life (EUL).

‡CY2020 was the first year this pilot was implemented and there are no historical savings for this pilot.

§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	
Food Service Equipment	Steamers	12.0	-	0.80	-										
Food Service Equipment	Combination Ovens	12.0	-	0.80	-										
Food Service Equipment	Convection Ovens	12.0	-	0.80	-										
Food Service Equipment	Refrigerators	12.0	-	0.80	-										
Food Service Equipment	Freezers	12.0	-	0.80	-										
Food Service Equipment	Ice Machines	9.0	-	0.80	-										
Food Service Equipment	Dishwashers	10.0	57	0.80	456			46	46	46	46	46	46	46	
CY2020 Program Total Gas Contribution to CPAS (Therms)			57		456			46	46	46	46	46	46	46	
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡								1,337	1,337	1,337	1,337	1,337	1,337	1,337	
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§															
Program Total Gas CPAS (kWh Equivalent)‡								1,337	1,337	1,337	1,337	1,337	1,337	1,337	
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
Food Service Equipment	Steamers	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Combination Ovens	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Convection Ovens	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Refrigerators	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Freezers	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Ice Machines	-	-	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Dishwashers	46	46	46	-	-	-	-	-	-	-	-	-
CY2020 Program Total Gas Contribution to CPAS (Therms)		46	46	46	-	-	-	-	-	-	-	-	-
CY2020 Program Total Gas Contribution to CPAS (kWh Equivalent)‡		1,337	1,337	1,337	-	-	-	-	-	-	-	-	-
Historic Program Total Gas Contribution to CPAS (kWh Equivalent)‡§													
Program Total Gas CPAS (kWh Equivalent)‡		1,337	1,337	1,337	-	-	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Gas Savings (Therms)		-	-	-	46	-	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Gas Savings (kWh Equivalent)‡		-	-	-	1,337	-	-	-	-	-	-	-	-
Historic Program Incremental Expiring Gas Savings (kWh Equivalent)‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Gas Savings (kWh Equivalent)‡		-	-	-	1,337	-	-	-	-	-	-	-	-

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 to be found on the IL SAG web site here: 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 Yn.

Source: Evaluation team analysis

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

					Verified Net kWh Savings (Including Those Converted from Gas Savings)										
End Use Type	Research Category	EUL	CY2020 Verified Gross Savings (kWh)	NTG* Savings (kWh)†											
					2018	2019	2020	2021	2022	2023	2024	2025	2026		
Food Service Equipment	Steamers	12.0	33,822	0.80	324,689			27,057	27,057	27,057	27,057	27,057	27,057	27,057	27,057
Food Service Equipment	Combination Ovens	12.0	16,313	0.80	156,603			13,050	13,050	13,050	13,050	13,050	13,050	13,050	13,050
Food Service Equipment	Convection Ovens	12.0	7,436	0.80	71,389			5,949	5,949	5,949	5,949	5,949	5,949	5,949	5,949
Food Service Equipment	Refrigerators	12.0	10,938	0.80	105,006			8,751	8,751	8,751	8,751	8,751	8,751	8,751	8,751
Food Service Equipment	Freezers	12.0	8,286	0.80	79,542			6,628	6,628	6,628	6,628	6,628	6,628	6,628	6,628
Food Service Equipment	Ice Machines	9.0	4,591	0.80	33,054			3,673	3,673	3,673	3,673	3,673	3,673	3,673	3,673
Food Service Equipment	Dishwashers	10.0	4,415	0.80	35,317			3,532	3,532	3,532	3,532	3,532	3,532	3,532	3,532
CY2020 Program Total Contribution to CPAS			85,800		805,599			68,640	68,640	68,640	68,640	68,640	68,640	68,640	68,640
Historic Program Total Contribution to CPAS‡						-	-	-	-	-	-	-	-	-	-
Program Total CPAS						-	-	68,640	68,640	68,640	68,640	68,640	68,640	68,640	68,640
CY2020 Program Incremental Expiring Savings§															
Historic Program Incremental Expiring Savings‡§															
Program Total Incremental Expiring Savings§															

End Use Type	Research Category	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Food Service Equipment	Steamers	27,057	27,057	27,057	27,057	27,057	-	-	-	-	-	-	-
Food Service Equipment	Combination Ovens	13,050	13,050	13,050	13,050	13,050	-	-	-	-	-	-	-
Food Service Equipment	Convection Ovens	5,949	5,949	5,949	5,949	5,949	-	-	-	-	-	-	-
Food Service Equipment	Refrigerators	8,751	8,751	8,751	8,751	8,751	-	-	-	-	-	-	-
Food Service Equipment	Freezers	6,628	6,628	6,628	6,628	6,628	-	-	-	-	-	-	-
Food Service Equipment	Ice Machines	3,673	3,673	-	-	-	-	-	-	-	-	-	-
Food Service Equipment	Dishwashers	3,532	3,532	3,532	-	-	-	-	-	-	-	-	-
CY2020 Program Total Contribution to CPAS		68,640	68,640	64,967	61,436	61,436	-	-	-	-	-	-	-
Historic Program Total Contribution to CPAS‡		-	-	-	-	-	-	-	-	-	-	-	-
Program Total CPAS		68,640	68,640	64,967	61,436	61,436	-	-	-	-	-	-	-
CY2020 Program Incremental Expiring Savings§		-	-	3,673	3,532	-	61,436	-	-	-	-	-	-
Historic Program Incremental Expiring Savings‡§		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Savings§		-	-	3,673	3,532	-	61,436	-	-	-	-	-	-

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 to be found on the IL SAG web site here: https://www.ilsag.info/ntg_2020.

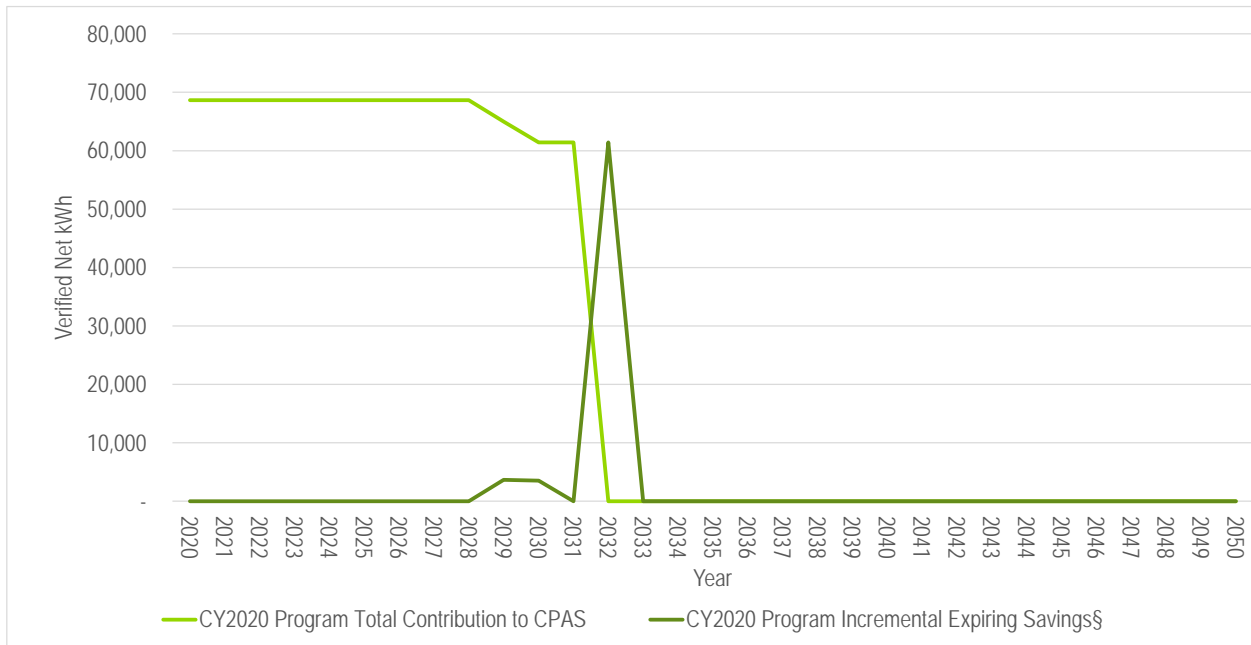
† Lifetime savings are the sum of CPAS savings through the EUL.

‡ Historic savings go back to CY2018.

§ Incremental expiring savings are equal to CPAS Yn-1 - CPAS Yn

Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



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

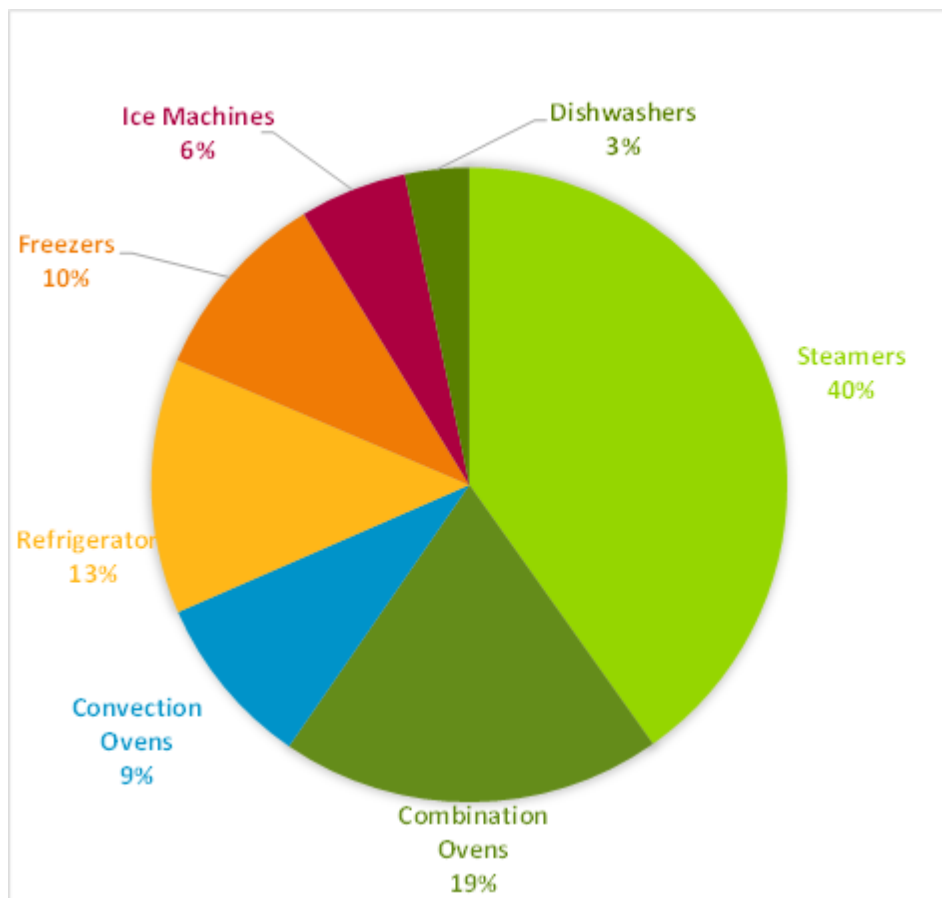
Source: Evaluation team analysis

5. Pilot Savings by Measure

In CY2020, ComEd customers received rebates for seven electric measure types³, as shown in the following figures and tables. Steamers contributed the most savings (see Figure 5-1). Combination ovens contributed the second highest amount, followed by refrigerators, freezers, convection ovens, ice machines, and dishwashers.

³ The pilot includes 10 electric measure types: combination ovens, convection ovens, freezers, fryers, griddles, hand wrap machines, dishwashers, ice machines, refrigerators, and steam cookers. In CY2020, ComEd customers received rebates in seven of the 10 electric measure types.

Figure 5-1. Verified Net Savings by Measure – 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)
Food Service Equipment	Steamers	28,693	1.18	33,822	0.80	27,057	12.0
Food Service Equipment	Combination Ovens	12,736	1.28	16,313	0.80	13,050	12.0
Food Service Equipment	Convection Ovens	8,800	0.85	7,436	0.80	5,949	12.0
Food Service Equipment	Refrigerators	7,772	1.41	10,938	0.80	8,751	12.0
Food Service Equipment	Freezers	4,707	1.76	8,286	0.80	6,628	12.0
Food Service Equipment	Ice Machines	0	NA	4,591	0.80	3,673	9.0
Food Service Equipment	Dishwashers	2,090	1.31	2,744	0.80	2,195	10.0
	Total	64,798	1.30	84,129	0.80	67,304	NA

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

Note: The savings in this table include 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

Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2020 Summer Peak Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (kW)	NTG*	Verified Net Peak Demand Reduction (kW)
Food Service Equipment	Steamers	4.19	1.26	5.29	0.80	4.23
Food Service Equipment	Combination Ovens	0.93	2.30	2.14	0.80	1.71
Food Service Equipment	Convection Ovens	1.29	1.05	1.35	0.80	1.08
Food Service Equipment	Refrigerators	0.84	1.40	1.17	0.80	0.94
Food Service Equipment	Freezers	0.50	1.76	0.89	0.80	0.71
Food Service Equipment	Ice Machines	0.00	NA	0.86	0.80	0.69
Food Service Equipment	Dishwashers	0.10	1.65	0.17	0.80	0.13
	Total	7.85	1.51	11.86	0.80	9.49

NA = Not applicable (refers to a piece of data that 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: 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)
Food Service Equipment	Steamers	0	NA	0	0.80	0	12.0
Food Service Equipment	Combination Ovens	0	NA	0	0.80	0	12.0
Food Service Equipment	Convection Ovens	0	NA	0	0.80	0	12.0
Food Service Equipment	Refrigerators	0	NA	0	0.80	0	12.0
Food Service Equipment	Freezers	0	NA	0	0.80	0	12.0
Food Service Equipment	Ice Machines	0	NA	0	0.80	0	9.0
Food Service Equipment	Dishwashers	45	1.27	57	0.80	46	10.0
	Total Therms	45	1.27	57	0.80	46	NA
	Total kWh Converted From Therms†	1,319	1.27	1,671	0.80	1,337	NA

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

* 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).

Source: ComEd tracking data and evaluation team analysis

Table 5-4. CY2020 Energy Savings by Measure – Electric 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)
Food Service Equipment	Steamers	28,693	1.18	33,822	0.80	27,057
Food Service Equipment	Combination Ovens	12,736	1.28	16,313	0.80	13,050
Food Service Equipment	Convection Ovens	8,800	0.85	7,436	0.80	5,949
Food Service Equipment	Refrigerators	7,772	1.41	10,938	0.80	8,751
Food Service Equipment	Freezers	4,707	1.76	8,286	0.80	6,628
Food Service Equipment	Ice Machines	0	NA	4,591	0.80	3,673
Food Service Equipment	Dishwashers	2,090	2.11	4,415	0.80	3,532
	Total†	64,798	1.32	85,800	0.80	68,640

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

* 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.

Source: ComEd tracking data and evaluation team analysis

The UCFSE Pilot includes measures that save water. That reduction in water use produces secondary kWh savings from water supply and wastewater treatment. Table 5-5 shows the secondary measure-level savings. The savings in this table are included within the electricity savings in the previous tables in this section. The steamer and dishwasher measures are the only measures in this pilot that have attributable secondary savings.

Table 5-5. Secondary Energy Savings from Water Reduction by Measure – Electric

End Use Type	Research Category	Ex Ante Annual Water Savings (gallons)	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate (RR _{water})	Verified Gross Savings (kWh)	NTG*	Verified Net Savings (kWh)
Food Service Equipment	Steamers	NR	NR	NA	238	0.80	191
Food Service Equipment	Combination Ovens	NR	NR	NA	0	0.80	0
Food Service Equipment	Convection Ovens	NR	NR	NA	0	0.80	0
Food Service Equipment	Refrigerators	NR	NR	NA	0	0.80	0
Food Service Equipment	Freezers	NR	NR	NA	0	0.80	0
Food Service Equipment	Ice Machines	NR	NR	NA	0	0.80	0
Food Service Equipment	Dishwashers	NR	NR	NA	40	0.80	32
	Total	NR	NR	NA	278	0.80	223

NR = Not reported (refers a piece of data that was not reported in the data).

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

Note: The savings in this table reflects only secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd, not those claimed by gas utilities.

* <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

The evaluation team used

Equation 6-1 to verify energy and demand savings for steamers, as specified in Illinois Technical Reference Manual (TRM) v8. The variables in the algorithms are defined in Table 6-1.

Equation 6-1. Commercial Steam Cooker TRM Algorithms

$$\Delta \text{kWh} = (\Delta \text{Idle Energy} + \Delta \text{Preheat Energy} + \Delta \text{Cooking Energy}) * Z$$

Where:

$$\Delta \text{Idle Energy} = (((1 - \text{CSM}_{\% \text{Baseline}}) * \text{IDLE}_{\text{BASE}} + \text{CSM}_{\% \text{Baseline}} * \text{PC}_{\text{BASE}} * \text{E}_{\text{FOOD}} / \text{EFF}_{\text{BASE}}) * (\text{HOURS}_{\text{day}} - (\text{F} / \text{PC}_{\text{Base}}) - (\text{PRE}_{\text{number}} * 0.25))) - (((1 - \text{CSM}_{\% \text{ENERGYSTAR}}) * \text{IDLE}_{\text{ENERGYSTAR}} + \text{CSM}_{\% \text{ENERGYSTAR}} * \text{PC}_{\text{ENERGY}} * \text{E}_{\text{FOOD}} / \text{EFF}_{\text{ENERGYSTAR}}) * (\text{HOURS}_{\text{Day}} - (\text{F} / \text{PC}_{\text{ENERGY}}) - (\text{PRE}_{\text{number}} * 0.25))))$$

$$\Delta \text{Preheat Energy} = (\text{PRE}_{\text{number}} * \Delta \text{Preheat})$$

$$\Delta \text{Cooking Energy} = ((1 / \text{EFF}_{\text{BASE}}) - (1 / \text{EFF}_{\text{ENERGYSTAR}})) * \text{F} * \text{E}_{\text{FOOD}}$$

$$\Delta \text{kW} = (\Delta \text{kWh} / (\text{HOURS}_{\text{day}} * \text{Days}_{\text{Year}})) * \text{CF}$$

$$\Delta \text{kWh}_{\text{water}} = \Delta \text{Water (gallons)} / 1,000,000 * \text{E}_{\text{water supply}}, \text{ where}$$

$$\Delta \text{Water (gallons)} = (\text{W}_{\text{BASE}} - \text{W}_{\text{ENERGYSTAR}}) * \text{HOURS}_{\text{day}} * \text{Days}_{\text{Year}}$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the Effective Useful Life (EUL) for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0 and confirm values provided in the tracking data. Table 6-1 shows the steamer savings parameters.

Table 6-1. Commercial Steam Cooker Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Deemed	Illinois EE Policy Manual†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
CSM% _{Baseline}	0.9	%	Deemed	TRM v8.0 – Section 4.2.3
CSM% _{ENERGYSTAR}	0	%	Deemed	TRM v8.0 – Section 4.2.3
IDLE _{BASE}	Varies	kW	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
IDLE _{ENERGYSTAR}	Varies	kW	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
PC _{BASE}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
PC _{ENERGY}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
E _{FOOD}	0.0308	kW/lb	Deemed	TRM v8.0 – Section 4.2.3
EFF _{BASE}	0.26	%	Deemed	TRM v8.0 – Section 4.2.3
EFF _{ENERGYSTAR} [®]	0.5	%	Deemed	TRM v8.0 – Section 4.2.3
F	100	Lbs/day	Deemed	TRM v8.0 – Section 4.2.3
PRE _{number}	1	No. per day	Deemed	TRM v8.0 – Section 4.2.3
Pr _{heat}	0.5	kWh/preheat	Deemed	TRM v8.0 – Section 4.2.3
HOURS _{day}	Varies	Hours	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
Days _{Year}	Varies	Days/year	Evaluated	Tracking Data
CF	Varies	-	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
W _{BASE}	40	Gal/hr	Deemed	TRM v8.0 – Section 4.2.3
W _{ENERGYSTAR} [®]	Varies	Gal/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.3
E _{water supply}	2,571	kWh/mil. Gal	Deemed	TRM v8.0 – Section 4.2.3
EUL	12	Years	Mixture	TRM v8.0 – Section 4.2.3

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: Evaluation team analysis

The evaluation team verified energy and demand savings for combination ovens using Equation 6-2, as specified in the TRM v8.0. The variables in the algorithms are defined in Table 6-2.

Equation 6-2. Combination Oven TRM Algorithms

$$\Delta kWh = (\Delta CookingEnergy_{ConvElec} + \Delta CookingEnergy_{SteamElec} + \Delta IdleEnergy_{ConvElec} + \Delta IdleEnergy_{SteamElec}) * Days / 1,000$$

Where:

$$\Delta CookingEnergy_{ConvElec} = LB_{Elec} * (EFOOD_{ConvElec} / ElecEFF_{ConvBase} - EFOOD_{ConvElec} / ElecEFF_{ConvEE}) * \%Conv$$

$$\Delta CookingEnergy_{SteamElec} = LB_{Elec} * (EFOOD_{SteamElec} / ElecEFF_{SteamBase} - EFOOD_{SteamElec} / ElecEFF_{SteamEE}) * \%Steam$$

$$\Delta IdleEnergy_{ConvElec} = [(ElecIDLE_{ConvBase} * ((HOURS - LB_{Elec}/ElecPC_{ConvBase}) * \%Conv)) - (ElecIDLE_{ConvEE} * ((HOURS - LB_{Elec}/ElecPC_{ConvEE}) * \%Conv))]$$

$$\Delta IdleEnergy_{SteamElec} = [(ElecIDLE_{SteamBase} * ((HOURS - LB_{Elec}/ElecPC_{SteamBase}) * \%Steam)) - (ElecIDLE_{SteamEE} * ((HOURS - LB_{Elec}/ElecPC_{SteamEE}) * \%Steam))]$$

$$kW = \Delta kWh / (HOURS * DAYS) * CF$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0, and confirm values provided in the tracking data. Table 6-2 shows the combination oven savings parameters.

Table 6-2. Combination Oven Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Deemed	Guidehouse Memo to ComEd†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
LB _{Elec}	Varies	Lbs/day	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
EFOOD _{ConvElec}	73.2	Wh/lb	Deemed	TRM v8.0 – Section 4.2.1
ElecEFF _{ConvBase}	0.72	%	Deemed	TRM v8.0 – Section 4.2.1
ElecEFF _{ConvEE}	Varies	%	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
% _{Conv}	0.5	%	Deemed	TRM v8.0 – Section 4.2.1
EFOOD _{SteamElec}	30.8	Wh/lb	Deemed	TRM v8.0 – Section 4.2.1
ElecEFF _{SteamBase}	0.49	%	Deemed	TRM v8.0 – Section 4.2.1
ElecEFF _{SteamEE}	Varies	%	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
% _{Steam}	0.5	%	Deemed	TRM v8.0 – Section 4.2.1
ElecIDLE _{ConvBase}	Varies	W	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
ElecIDLE _{ConvEE}	0.08	W	Deemed	TRM v8.0 – Section 4.2.1
ElecPC _{ConvBase}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
ElecPC _{ConvEE}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
ElecIDLE _{SteamBase}	Varies	W	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
ElecIDLE _{SteamEE}	Varies	W	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
ElecPC _{SteamBase}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
ElecPC _{SteamEE}	Varies	Lbs/hr	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
CF	Varies	-	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.1
HOURS	Varies	Hours/day	Evaluated	Tracking Data
DAYS	Varies	Days/yr	Evaluated	Tracking Data
EUL	12	Years	Mixture	TRM v8.0 – Section 4.2.1

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: *Evaluation team analysis*

The evaluation team verified energy and demand savings for convection ovens using Equation 6-3, as specified in the TRM v8.0. The variables in the algorithms are defined in Table 6-3.

Equation 6-3. ENERGY STAR Electric Convection Oven TRM Algorithms

$$\Delta kWh = kWh_{base} - kWh_{eff}$$

Where:

$$kWh_{base} = [(LB * E_{FOOD}/EFF_{base}) + (IDLE_{base} * (HOURS_{DAY} - LB/PC_{base} - PRE_{TIME}/60)) + PRE_{ENERGY Base}] * DAYS$$

$$kWh_{eff} = [(LB * E_{FOOD}/EFF_{eff}) + (IDLE_{eff} * (HOURS_{DAY} - LB/PC_{eff} - PRE_{TIME}/60)) + PRE_{ENERGY Eff}] * DAYS$$

$$\Delta kW = (\Delta kWh / (HOURS_{DAY} * DAYS)) * CF$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0, and confirm values provided in the tracking data. Table 6-3 shows the convection oven savings parameters.

Table 6-3. ENERGY STAR Electric Convection Oven Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Deemed	Guidehouse Memo to ComEd†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
LB	100	Lb/day	Deemed	TRM v8.0 – Section 4.2.19
E _{FOOD}	0.0732	kWh/lb	Deemed	TRM v8.0 – Section 4.2.19
EFF _{base}	0.65	%	Deemed	TRM v8.0 – Section 4.2.19
EFF _{eff}	Varies	%	Evaluated	Tracking Data
IDLE _{base}	2	kW	Deemed	TRM v8.0 – Section 4.2.19
IDLE _{eff}	Varies	kW	Evaluated	Tracking Data
PC _{base}	70	Lb/hr	Deemed	TRM v8.0 – Section 4.2.19
PC _{eff}	79	Lb/hr	Deemed	TRM v8.0 – Section 4.2.19
PRE _{TIME}	15	Min/day	Deemed	TRM v8.0 – Section 4.2.19
PRE _{ENERGY Base}	1.5	kWh	Deemed	TRM v8.0 – Section 4.2.19
PRE _{ENERGY Eff}	1	kWh	Deemed	TRM v8.0 – Section 4.2.19
CF	Varies	-	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.19
HOURS _{DAY}	Varies	Hours/day	Evaluated	Tracking Data
DAYS	Varies	Days/yr	Evaluated	Tracking Data
EUL	12	Years	Mixture	TRM v8.0 – Section 4.2.19

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: Evaluation team analysis

The evaluation team verified energy and demand savings for refrigerators and freezers using Equation 6-4, as specified in the TRM v8.0. The variables in the algorithms are defined in Table 6-4.

Equation 6-4. Commercial Solid and Glass Door Refrigerators and Freezers TRM Algorithms

$$\Delta \text{kWh} = (\text{kWh}_{\text{base}} - \text{kWh}_{\text{eff}}) * 365.25$$

$$\Delta \text{kW} = \Delta \text{kWh} / \text{HOURS} * \text{CF}$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0, and confirm values provided in the tracking data. Table 6-4 shows the refrigerator and freezer savings parameters.

Table 6-4. Commercial Solid and Glass Door Refrigerators & Freezers Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Evaluated	Guidehouse Memo to ComEd†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
kWh _{base}	Varies	kWh	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.2
kWh _{ee}	Varies	kWh	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.2
CF	0.937	-	Deemed	TRM v8.0 – Section 4.2.2
HOURS	8766	Hours/year	Deemed	TRM v8.0 – Section 4.2.2
EUL	12	Years	Mixture	TRM v8.0 – Section 4.2.2

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: Evaluation team analysis

The evaluation team estimated verified energy and demand savings for ice machines using Equation 6-5, as specified in the TRM v8.0. The variables in the algorithms are defined in Table 6-5.

Equation 6-5. Ice Maker TRM Algorithm

$$\Delta kWh = [(kWh_{base} - kWh_{ee}) / 100] * (DC * H) * 365.25$$

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0, and confirm values provided in the tracking data. Table 6-5 shows the ice machine savings parameters.

Table 6-5. Ice Maker Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Evaluated	Guidehouse Memo to ComEd†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
kWh _{base}	Varies	kWh	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.10
kWh _{ee}	Varies	kWh	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.10
DC	0.57	-	Deemed	TRM v8.0 – Section 4.2.10
H	Varies	Lbs ice/day	Evaluated	Tracking Data
CF	0.937	-	Deemed	TRM v8.0 – Section 4.2.10
HOURS	8766	Hours/year	Deemed	TRM v8.0 – Section 4.2.10
EUL	9	Years	Mixture	TRM v8.0 – Section 4.2.10

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: Evaluation team analysis

The evaluation team estimated verified electric energy, therms, and demand savings for the single dishwasher measure using Equation 6-6, as specified in the TRM v8.0. The variables in the algorithms are defined in Table 6-6.

Equation 6-6. Dishwasher TRM Algorithms

$$\Delta kWh = \Delta \text{BuildingEnergy} + \Delta \text{BoosterEnergy} + \Delta \text{IdleEnergy}$$

$$\Delta kWh \text{ BuildingEnergy} = 0$$

since the building water was heated by natural gas based on the deemed savings in the tracking database.

$$\Delta kWh \text{ BoosterEnergy} = [(\text{WaterUseBase} * \text{RacksWashed} * \text{Days}) * (\Delta \text{Tin} * 1.0 * 8.2 \div \text{EffHeater} \div 3,412)] - [(\text{WaterUseESTAR} * \text{RacksWashed} * \text{Days}) * (\Delta \text{Tin} * 1.0 * 8.2 \div \text{EffHeater} \div 3,412)]$$

$$\Delta kWh \text{ IdleEnergy} = [\text{IdleDrawBase} * (\text{Hours} * \text{Days} - \text{Days} * \text{RacksWashed} * \text{WashTime} \div 60)] - [\text{IdleDrawESTAR} * (\text{Hours} * \text{Days} - \text{Days} * \text{RacksWashed} * \text{WashTime} \div 60)]$$

$$\Delta kWh_{\text{water}} = \Delta \text{Water (gallons)} / 1,000,000 * E_{\text{water total}}$$

$$\Delta \text{Water} = (\text{WaterUseBase} * \text{RacksWashed} * \text{Days}) - (\text{WaterUseESTAR} * \text{RacksWashed} * \text{Days})$$

$$\Delta \text{Therms} = \Delta \text{BuildingEnergy} + \Delta \text{BoosterEnergy}$$

$$\Delta \text{Therms BuildingEnergy} = [(\text{WaterUseBase} * \text{RacksWashed} * \text{Days}) * (\Delta \text{Tin} * 1.0 * 8.2 \div \text{EffHeater} \div 100,000)] - [(\text{WaterUseESTAR} * \text{RacksWashed} * \text{Days}) * (\Delta \text{Tin} * 1.0 * 8.2 \div \text{EffHeater} \div 100,000)]$$

Δ Therms BoosterEnergy = 0 since the booster used electric energy based on the deemed savings in the tracking database.

The evaluation team estimated the lifetime energy and demand savings by multiplying the verified savings by the EUL for each measure.

The evaluation followed the methodology provided in the TRM v8.0. The evaluation team conducted research to validate the parameters that were not specified in the TRM v8.0, and confirm values provided in the tracking data. Table 6-6 shows the dishwasher savings parameters.

Table 6-6. Dishwasher Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	No. of measures	Evaluated	Tracking Data
NTG	0.80	%	Evaluated	Guidehouse Memo to ComEd†
Measure Type and Eligibility			Evaluated	ENERGY STAR QPL
WaterUse _{base}	Varies	gal	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.6
WaterUse _{ESTAR}	Varies	gal	Evaluated	Tracking Data, TRM v8.0 – Section 4.2.6
RacksWashed	Varies	-	Deemed	TRM v8.0 – Section 4.2.6
Days	365.25	Days per year	Deemed	TRM v8.0 – Section 4.2.6
Δ T _{in}	70	Inlet water temperature °F	Deemed	TRM v8.0 – Section 4.2.6
Eff _{Heater}	0.98- electric, 0.8 gas	%	Deemed	TRM v8.0 – Section 4.2.6
IdleDraw _{Base}	Varies	kW	Deemed	TRM v8.0 – Section 4.2.6
IdleDraw _{ESTAR}	Varies	kW	Evaluated	Tracking data, TRM v8.0 – Section 4.2.6
WashTime	Varies	(min)	Deemed	TRM v8.0 – Section 4.2.6
CF	0.41	-	Deemed	TRM v8.0 – Section 4.2.6
HOURS/day	18	Hours/day	Deemed	TRM v8.0 – Section 4.2.6
EUL	10	Years	Deemed	TRM v8.0 – Section 4.2.6

*TRM is the Illinois Statewide Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

Source: Evaluation team analysis

6.2 Other Impact Findings and Recommendations

The evaluation team developed several recommendations based on findings from the CY2020 evaluation. These findings suggest ways to improve the measure-level realization rates. Table 6-7 presents the measure-level realization rates and pilot savings percentages to give context to

the team's recommendations. Steamers contributed half of the pilot's CY2020 savings and combination ovens contributed about a fourth of the savings.

Table 6-7. Measure-Level Savings and Realization Rates

End Use	Gross Realization Rate (excluding therms savings)	Percentage of Verified Net Savings (excluding therms savings)
Steamers	1.18	40%
Combination Ovens	1.28	19%
Convection Ovens	0.85	9%
Refrigerators	1.41	13%
Freezers	1.76	10%
Ice Machines	NA	6%
Dishwashers	1.31	3%

Source: Evaluation team analysis

6.2.1 Steamers

Steamers contributed 40% of the pilot's savings with a realization rate of 1.18.

Finding 1. The implementer did not include secondary kWh savings from water supply and wastewater treatment for steamers.

Recommendation 1. The evaluation team recommends that the implementer consider claiming secondary energy savings associated with water supply and wastewater treatment for steamers. The evaluation team included these secondary kWh savings in the total savings. Additionally, the implementer should provide their measure savings calculator to aid in evaluation efforts.

Finding 2. The steamer CEE Tier information was not recorded in the tracking data. The CEE Tier informs the water consumption rate to calculate the secondary electric energy savings associated with water supply and wastewater treatment.

Recommendation 2. The evaluation team recommends that the implementer collect the CEE Tier in the tracking data to aid in calculating secondary water savings.

Finding 3. The implementer used values for hours/day and coincidence factor (CF) associated with an unknown business type. The evaluation team used differing values to match the correct business type in accordance with the TRM v8.0.

Recommendation 3. The evaluation team recommends that the implementer collect the business type information and use that to determine the hours/day and CF variables.

Finding 4. The implementer used the default value of 365.25 days/year as the deemed annual days of operation value for steamers. The evaluation team researched the business schedule using the customer's address and determined that the business regularly closes for a full day per week. This information was used to calculate the number of days per year. For example,

after researching the location of Project ID 15, the team determined that it was closed every Sunday reducing the days/year value to 313.25.

Recommendation 4. The evaluation team recommends that the implementer consider adding a field in the application form for operating days/week to capture the number of days out of the year the business is open to calculate savings more accurately.

6.2.2 Combination Ovens

Combination ovens contributed 19% of the pilot's savings with a realization rate of 1.28.

Finding 5. Project IDs 39 and 51 used default deemed savings values for electric energy and demand. The evaluation team instead used custom values based on the equipment installed, the specific building type, and business operating schedule as shown in Table 6-8. The evaluation team verified and updated as necessary the equipment specification information listed in the tracking data with specification sheets for the pan capacity and the cooking and steamer efficiencies used in the savings algorithm. The custom days per year and hours/day were calculated based on the business's schedule. The CF is based on the building type and comes from the TRM v8.0.

Table 6-8. Electric Combination Oven Parameters with Custom Values

Project ID	Pan Capacity	Convection Cooking Efficiency	Steamer Cooking Efficiency	Custom Days/Year	Hours/day	CF
39	12	78%	64%	261	12	0.51
51	14	81%	70%	365	12	0.41
Deemed TRM v8.0 Values	10	76%	55%	365	12	0.32

Source: TRM v8.0 and evaluation team analysis

Recommendation 5. The evaluation team recommends that the implementer collect and leverage project-specific values rather than default values to calculate savings for the combination oven measure. This will help to reduce the differences between the claimed and verified savings.

6.2.3 Convection Ovens

Convection ovens contributed 9% of the pilot's savings with a realization rate of 0.85.

Finding 6. Project IDs 26, 27, 108, and 119 used default deemed savings values for electric energy and demand. Per the TRM v8.0 guidance and to calculate verified savings, the evaluation team used the actual values instead of deemed values for the efficiency, the idle consumption rate, the days per year, and the hours per day and CF associated with the building type, as Table 6-9 shows. The evaluation team used specification sheets to verify and update as necessary data in the tracking database for the cooking efficiency and the idle consumption rate values used in the savings algorithm. The custom days per year were calculated based on the business's operating schedule based on information from their website. The team sourced the hours per day and CF from the TRM v8.0 based on the business type.

Table 6-9. Electric Convection Oven Parameters with Custom Values

Project ID	Cooking Efficiency	Idle Consumption Rate (kW)	Custom Days/Year	Hours/day	CF
26	76%	1.34	261	6	0.41
27	74%	1.36	217.5	6	0.39
108	76%	1.34	365	13.29	0.46
119	76%	1.34	365	6	0.51
Deemed TRM v8.0 Values	74%	1	365	6	0.32

Source: TRM v8.0 and evaluation team analysis

Recommendation 6. The evaluation team recommends that the implementer collect and leverage project-specific values for the convection oven measure for parameters such as cooking efficiency, idle consumption rate, and operating days/week rather than default or deemed values to calculate savings.

6.2.4 Refrigerators and Freezers

Refrigerators contributed 13% of the pilot's savings with a realization rate of 1.41, and freezers contributed 10% of the pilot's savings with a realization rate of 1.76.

Finding 7. The implementer used an assumed default value for the volume or energy consumption when calculating the measure savings. The evaluation team calculated the savings using the information provided for reach-in refrigerator/freezer model numbers on the ENERGY STAR website.

Recommendation 7. The evaluation team recommends that the implementer use the volume from manufacturer specification sheets or the ENERGY STAR website to calculate savings for the reach-in refrigerator/freezer measure. In addition, the implementer should clarify which source was used to calculate the ex ante energy savings. This is important as the internal volume and energy consumption values could vary between the manufacturer's own specification sheets, websites, and the information listed on the ENERGY STAR website.

Finding 8. The implementer reported positive savings for Project ID 83 whereas the evaluation team determined that the installed freezer had a higher energy consumption rate than the assumed baseline based on the TRM v8.0 specification. The evaluation team sourced the freezer's daily energy consumption specification using the model number information on the ENERGY STAR website. The evaluation team included the -315 kWh and -0.03 kW for Project ID 83 in the total energy savings and peak demand savings for the program.

Recommendation 8. The evaluation team recommends that the implementer confirm that the freezers and refrigerators use less energy than the assumed baseline before approving the rebate.

6.2.5 Ice Machines

Ice machines contributed 6% of the pilot's savings and did not have a realization rate because the implementer did not estimate any energy and demand savings for this measure.

Finding 9. The field Ice Maker Type (IMH, RCU, SCU) was not recorded in the tracking data. The evaluation team researched the model number to determine the ice maker to calculate savings.

Recommendation 9. The evaluation team recommends that the implementer collect the ice maker type to aid in calculating savings.

Finding 10. The tracking data recorded a daily ice harvest rate of 95 lbs/day for Project ID 8. The evaluation team researched the model number to determine the ice maker's daily harvest rate was 125 lbs./day.

Recommendation 10. The evaluation team recommends that the implementer record the daily ice harvest as reported on the specification sheets.

Finding 11. The evaluation team found that the implementer did not estimate any savings for any of the seven ice makers rebated, even though they are all CEE Tier 2 Advanced ice makers. Equation 6-7 and Equation 6-8, taken from the TRM v8.0, shows the maximum CEE Tier 2 Advanced consumption rate standard that the ice maker must be at or below to qualify. The specification sheets for all the ice makers rebated showed that all of them had energy consumption rates below the baseline assumed energy consumption values per 100 lbs. of ice, based on the TRM v8.0. The evaluation team calculated the verified savings for the ice makers using the energy consumption rate in the specification sheets.

Equation 6-7. ENERGY STAR Ice Maker Energy Consumption Rate for CEE Tier 2 Air Cooled Ice Makers

$$\left(\frac{\text{kWh}}{100 \text{ lbs ice}} \right) \leq 14 - 0.0347H$$

Where, H is actual Harvest Rate (pounds of ice made per day) and H is <175.

Equation 6-8. ENERGY STAR Ice Maker Energy Consumption Rate for CEE Tier 2 Air Cooled Ice Makers

$$\left(\frac{\text{kWh}}{100 \text{ lbs ice}} \right) \leq 9.6 - 0.0098H$$

Where, H is actual Harvest Rate (pounds of ice made per day), $H \geq 175$ and $H < 450$.

Recommendation 11. The evaluation team recommends that the implementer claim savings for ice makers that meet the minimum ENERGY STAR or CEE Tier 2 Advanced efficiency level standards.

6.2.6 Dishwashers

Dishwashers contributed 3% of the energy savings with a realization rate of 1.31.

Finding 12. Project ID 9 reported energy savings that matched the deemed savings values for electricity and therms for the combination “Natural gas building and electric booster water heating” in the TRM v8.0. Based on the information provided in the tracking database, there was no way for the evaluation team to confirm that this accurately represents the water heating of the building where the dishwasher was installed. Given that this was the only indication available on the type of water heating, the evaluation team leveraged this for the verification of savings.

Recommendation 12. The evaluation team recommends that the implementer collect information on the application form on the fuel type used for building water heating and the fuel type used for the booster water heating such that the evaluation team can confirm that the appropriate algorithms are used to estimate electricity and therms savings.

Finding 13. The implementer did not include secondary kWh savings from water supply and wastewater treatment for dishwashers. The evaluation team included these secondary kWh savings in the total savings.

Recommendation 13. The evaluation team recommends that the implementer estimate secondary energy savings associated with water supply and wastewater treatment for dishwashers.

Appendix A. Impact Analysis Methodology

The evaluation team determined verified gross savings for each pilot measure by:

- Reviewing the savings algorithm inputs in the measure databook for agreement with the Illinois Technical Reference Manual (TRM) v8.0 and Errata.
- Verifying measure specifications with the ENERGY STAR website to adjust any values that were incorrect in the reported data. Also determining custom hours of operation for locations with custom hours per day and days per year for savings inputs.
- Validating savings algorithms were applied correctly.
- Cross-checking per-unit savings values in the tracking data with the verified values in the measure databook or in the team's calculations if the databook did not agree with the TRM v8.0.
- Using model numbers, checking if the individual measures are still on the qualified products lists. Removing their savings from the tally if any are no longer qualified.
- Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

The team calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio of 0.8. For CY2020, the UCFSE Pilot's NTG estimate was determined in a memo to ComEd.⁴

⁴ <https://ilsag.s3.amazonaws.com/ComEd-CFSE-NTG-research-memo-2020-12-10.pdf>

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, pilot level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

Table B-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity (years)*	EUL	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)
Food Service Equipment	Steamers	Each	1	12.0	NO	33,563	5.29	0	238	0	0	0.80	0.80	0.80	26,867	4	0	191	0	0
Food Service Equipment	Combination Ovens	Each	2	12.0	NO	16,313	2.14	0	0	0	0	0.80	0.80	0.80	13,050	2	0	0	0	0
Food Service Equipment	Convection Ovens	Each	4	12.0	NO	7,436	1.35	0	0	0	0	0.80	0.80	0.80	5,949	1	0	0	0	0
Food Service Equipment	Refrigerators	Each	28	12.0	NO	10,938	1.17	0	0	0	0	0.80	0.80	0.80	8,751	1	0	0	0	0
Food Service Equipment	Freezers	Each	9	12.0	NO	8,286	0.89	0	0	0	0	0.80	0.80	0.80	6,628	1	0	0	0	0
Food Service Equipment	Ice Machines	Each	7	9.0	NO	4,591	0.86	0	0	0	0	0.80	0.80	0.80	3,673	1	0	0	0	0
Food Service Equipment	Dishwashers	Each	1	10.0	NO	2,704	0.17	57	40	0	0	0.80	0.80	0.80	2,163	0	46	32	0	0
Total				NA		83,851	12	57	278	0	0	0.80	0.80	0.80	67,081	9	46	223	0	0

Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis exclude secondary energy savings from water reduction measures. Table B-1 represents the kWh savings from Table 5-1 minus those shown in Table 5-3.

*The total of the EUL column is the weighted average measure life (WAML) and is calculated as the sum product of the EUL and measure savings divided by total pilot 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