Guidehouse

ComEd Agriculture Impact Evaluation Report

Energy Efficiency / Demand Response Plan: Program Year 2019 (CY2019) (1/1/2019-12/31/2019)

Presented to ComEd

FINAL

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ComEd Agriculture Impact Evaluation Report

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1. Introduction

This report presents the results of the impact evaluation of ComEd's CY2019 Agriculture (Ag) Program. It presents a summary of the energy and demand impacts for the total program, as well as by the relevant measure and program structure details. The appendix presents the impact analysis methodology. CY2019 covers January 1, 2019 through December 31, 2019.

2. Program Description

The Agriculture program targets the full vertical market including farms (dairy, poultry, hogs, cash crops, etc.), greenhouses, indoor agriculture facilities, supply houses, on-site processing facilities as well as farm facilities on residential properties (excluding the residence). It serves both existing facilities and new construction and offers standard and custom The program is internally managed by ComEd and implemented by Franklin Energy. Per the Ag Program's Scope of Work, the program includes the following:

1. Franklin Energy advisors reached out to small to medium agriculture customers through a combination of channels, including direct farmers outreach, industry associations, dealer networks and energy efficiency service providers.
2. Per ComEd's program summary documents, on-going personalized energy advisor support is the cornerstone of the Ag program. Energy advisors are the face and voice of the program to farmers, industry associations, dealer networks and energy efficiency service providers."
3. Once a customer is engaged, they are offered a free walk through assessment appropriate for the facility to identify energy efficiency opportunities.
4. Based on findings from the initial energy audit, the Ag energy advisor worked with the farm owner to determine the optimal program participation level.
5. Based on the projects the farmer was interested in pursuing, they are free to work with the contractor of their choice.
6. All prospects and interactions are tracked within ComEd's Salesforce system.

The Ag Program offers incentives for a wide range of prescriptive and custom energy efficiency measures, including:

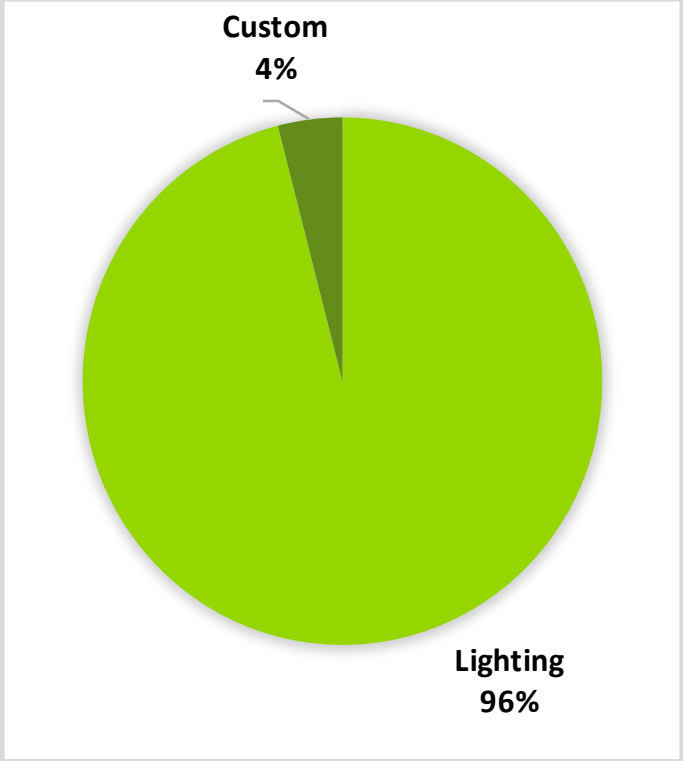
- Indoor and outdoor lighting fixtures and controls
- Variable Speed Drives (VSD)
- High speed exhaust and ventilation/circulation fans
- Air compressors and ancillary equipment
- Engine block timers
- Thermally insulated livestock waters
- Agriculture specific equipment not covered through a prescriptive program.

Table 2-1. CY2019 Volumetric Findings Detail

Participation	Total CY2019 Count
Participants	13
Total Measures	50
Number of Units per Project	14

Source: ComEd tracking data and evaluation team analysis

Figure 2-1. Number of Measures Installed by Type



Source: ComEd tracking data and evaluation team analysis

3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Ag Program achieved in CY2019. There are no gas savings for this program.

Table 3-1. CY2019 Total Annual Incremental Electric Savings

Savings Category	Energy Savings (kWh)	Non-Coincident Demand Savings (kW)	Summer Peak* Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	497,211	122	NR
Program Gross Realization Rate	1.00	1.00	NA
Verified Gross Savings	497,211	122	93
Program Net-to-Gross Ratio (NTG)†	0.83	0.83	0.83
Verified Net Savings	410,675	101	77
Converted from Gas‡			
Ex Ante Gross Savings	NA	NA	NA
Program Gross Realization Rate	NA	NA	NA
Verified Gross Savings	NA	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA	NA
Verified Net Savings	NA	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	497,211	122	NR
Program Gross Realization Rate	1.00	1.00	NA
Verified Gross Savings	497,211	122	93
Program Net-to-Gross Ratio (NTG)	0.83	0.83	0.83
Verified Net Savings	410,675	101	77

NR = Not reported (refers a piece of data that was not reported, i.e., non-coincident demand savings)
NA = Not applicable (refers a piece of data cannnot be produced or does not apply)
* The coincident summer peak period is defined as 1:00-5:00 p.m. Central Prevailing Time on non-holiday weekdays, June through August.
† Program Net-to-gross is a savings (kWh) weighted average. See table 4-1 for further detail.
‡ There are no gas savings associated with the CY2019 Agriculture Program.
Source: ComEd tracking data and evaluation team analysis

4. Cumulative Persisting Annual Savings

Table 4-1 and Figure 4-1 show the measure-specific and total verified gross savings for the Ag Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2019. The ex ante gross energy savings is 497,211 kWh. The electric CPAS across all measures installed in 2019 is 5,968,397 kWh (Table 4-1). There is no CY2019 gas contribution to CPAS. Therefore, the combined gas and electric contributions produces the same CPAS contribution (5,968,397 kWh) as for electric alone. The “historic” rows in each table are zero because CY2019 was the first year of the program. Guidehouse did not evaluate gas savings for this program and as such electric CPAS is equivalent to total CPAS.

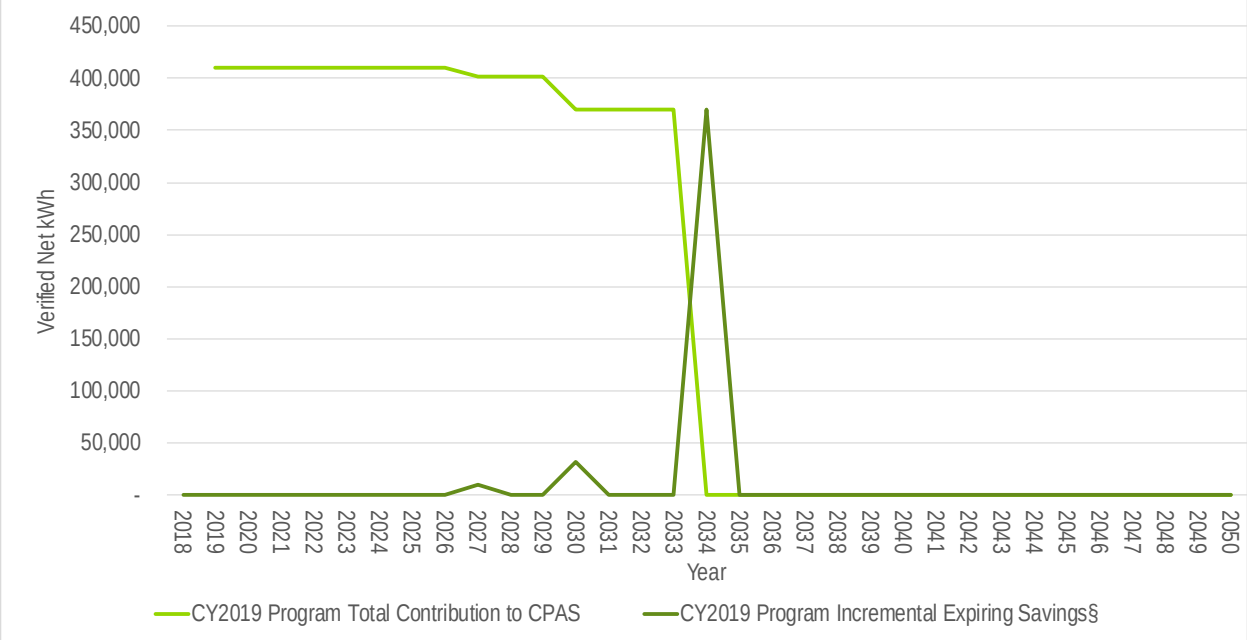
Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2019 Verified Gross Savings (kWh)	NTG*	Lifetime Net Savings (kWh)†	Verified Net kWh Savings 2018	2019	2020	2021	2022	2023	2024	2025	2026
Lighting	Lighting Fixtures	15.0	445,596	0.83	5,547,676		369,845	369,845	369,845	369,845	369,845	369,845	369,845	369,845
Custom	Non-Lighting	11.0	40,207	0.78	344,976		31,361	31,361	31,361	31,361	31,361	31,361	31,361	31,361
Lighting	Lighting Controls	8.0	10,990	0.83	72,975		9,122	9,122	9,122	9,122	9,122	9,122	9,122	9,122
Lighting	Lighting Custom	8.0	417	0.83	2,770		346	346	346	346	346	346	346	346
CY2019 Program Total Electric Contribution to CPAS			497,211		5,968,397		410,675	410,675	410,675	410,675	410,675	410,675	410,675	410,675
Historic Program Total Electric Contribution to CPAS‡						-	-	-	-	-	-	-	-	-
Program Total Electric CPAS						-	410,675	410,675	410,675	410,675	410,675	410,675	410,675	410,675
CY2019 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
Lighting	Lighting Fixtures	369,845	369,845	369,845	369,845	369,845	369,845	369,845					
Custom	Non-Lighting	31,361	31,361	31,361									
Lighting	Lighting Controls												
Lighting	Lighting Custom												
CY2019 Program Total Electric Contribution to CPAS		401,207	401,207	401,207	369,845	369,845	369,845	369,845	-	-	-	-	-
Historic Program Total Electric Contribution to CPAS‡		-	-	-	-	-	-	-					
Program Total Electric CPAS		401,207	401,207	401,207	369,845	369,845	369,845	369,845	-	-	-	-	-
CY2019 Program Incremental Expiring Electric Savings§		9,468	-	-	31,361	-	-	-	369,845	-	-	-	-
Historic Program Incremental Expiring Electric Savings:		-	-	-	-	-	-	-	-	-	-	-	-
Program Total Incremental Expiring Electric Savings§		9,468	-	-	31,361	-	-	-	369,845	-	-	-	-

Note: The green highlighted cell shows program total first year electric savings. The gray cells are blank, indicating values irrelevant to the CY2019 contribution to CPAS.
* A deemed value - Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
† 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
Source: Evaluation team analysis

Figure 4-1. Cumulative Persisting Annual Savings



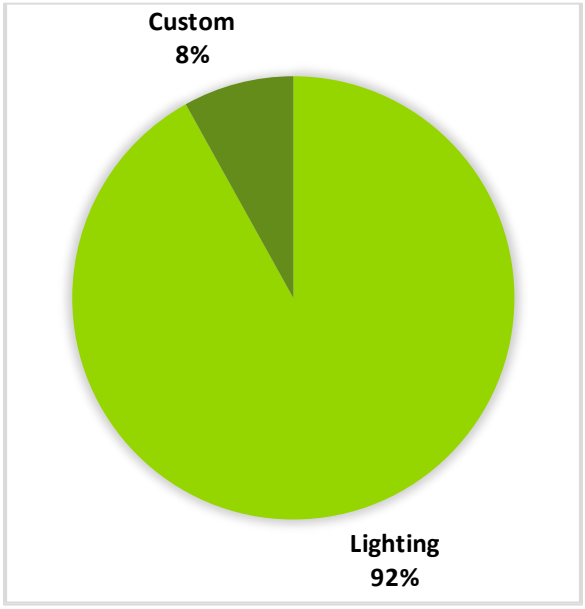
* Expiring savings are equal to CPAS Y_{n-1} - CPAS Y_n.
Source: Evaluation team analysis

5. Program Savings by Measure

The program includes four measures which were implemented in 2019, as shown in the following tables. The Lighting Fixtures measure contributed the majority of program savings (90%); with two custom, non-lighting measures contributing the second largest portion (8%). The remaining two measures are both lighting accessories, of which only the Lighting Controls (occupancy sensors) contributed a meaningful portion of the program savings (2%). Given that three of the four measures are linked to the primary LED Fixture measure, the savings from all lighting measures are combined in to a single Lighting category for purposes of Figure 5-1, distribution of verified net savings.

The Lighting Fixtures measure is for retrofit of existing lighting using LED fixtures. The non-lighting measures are a VFD and a grain dryer. The remaining two measures are lighting affiliated, with the third most significant portion of program savings coming from occupancy sensors added to the LED retrofits.

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



Source: ComEd tracking data and evaluation team analysis

Table 5-1. CY2019 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)
Lighting	Lighting Fixtures	445,596	1.00	445,596	0.83	369,845	15.00
Custom	Non-Lighting	40,207	1.00	40,207	0.78	31,361	11.0
Lighting	Lighting Controls	10,990	1.00	10,990	0.83	9,122	8.0
Lighting	Lighting Custom	417	1.00	417	0.83	346	8.0
	Total	497,211	1.00	497,211	NA	410,675	NA

NA = Not applicable
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Note: The savings in this table includes secondary electric energy (kWh) savings from water supply and wastewater treatment plants for measures claimed by ComEd.
Source: ComEd tracking data and evaluation team analysis

Table 5-2. CY2019 Non-Coincident Demand Savings by Measure

End Use Type	Research Category	Ex Ante Gross Non-Coincident Demand Reduction (kW)	Verified Gross Realization Rate	Verified Gross Non-Coincident Demand Reduction (kW)	NTG*	Verified Net Non-Coincident Demand Reduction (kW)
Lighting	Lighting Fix	113.83	1.00	113.83	0.83	94.48
Custom	Non-Lightin	0.00	1.00	0.00	0.78	0.00
Lighting	Lighting Co	8.65	1.00	8.65	0.83	7.18
Lighting	Lighting Cu	0.00	1.00	0.00	0.83	0.00
	Total	122.48	1.00	122.48	NA	101.66

NA = Not applicable
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

Table 5-3. CY2019 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)
Lighting	Lighting Fixtures	NR	NA	92.20	0.83	76.53
Custom	Non-Lighting	NR	NA	0.00	0.78	0.00
Lighting	Lighting Controls	NR	NA	1.30	0.83	1.08
Lighting	Lighting Custom	NR	NA	0.00	0.83	0.00
	Total	NR	NA	93.50	NA	77.60

NA = Not applicable
NR = Not reported
* A deemed value. Source: is to be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019.
Source: ComEd tracking data and evaluation team analysis

6. Impact Analysis Findings and Recommendations

6.1 Impact Parameter Estimates

Energy and demand savings are estimated using Excel based analysis templates developed specifically for this program. These tools were reviewed by the evaluator in advance of their use in the program and confirmed to be robust, transparent and reasonable. Also, lifetime energy and demand savings are estimated by multiplying the verified savings by the effective useful life for each measure.

Table 6-1. Savings Parameters

Gross Savings Input Parameters	Value	Units	Deemed or Evaluated?	Source *
Quantity	Varies	# measures	Evaluated	Project Application
NTG	Varies	%	Deemed	SAG Consensus
Hours of Use	Varies	Hours/year	Evaluated	Participant Self-Reported
Gross Savings per Unit, Sampled Non-Deemed Measures	Varies	kWh	Evaluated	Program Specific Analysis Tools
Verified Realization Rate on Ex Ante Gross Savings (Lighting)	Varies	NA	Evaluated	Guidehouse Evaluation
Verified Realization Rate on Ex Ante Gross Savings (Non-Lighting)	Varies	NA	Evaluated	Guidehouse Evaluation
Effective Useful Life (EUL) – Lighting Fixtures	15	Years	Deemed	TRM v7.0 – Section 4.5.4
Effective Useful Life (EUL) – Lighting Controls	8	Years	Deemed	TRM v7.0 – Section 4.5.10

NA = Not applicable
* TRM is the State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html. The NTG values can be found on the Illinois SAG web site here: https://www.ilsag.info/ntg_2019. EUL values

6.2 Other Impact Findings and Recommendations

The evaluation team developed the following recommendations based on findings from the CY2019 evaluation.

Finding 1. CY2019 was the first year for the Ag Program. Fourteen projects were completed, generating ex ante program impact savings of 497 MWh. Average savings per project is 35.5 MWh; supported by an average incentive of $0.15 per kWh, or 55.5 cents per Watt reduced.
Recommendation 1. Guidehouse recommends continuing to develop and expand this program through increased marketing and strategic partnerships with local agriculture equipment outlets.

Finding 2. The program team has developed analysis tools for at least nine agriculture measures; however, 92% of the energy savings from the AgrEE Program stem from lighting measures. Only two projects were submitted with non-lighting measures; of which only one was a VFD.
Recommendation 2. As ComEd continues to develop and promote this program, Guidehouse recommends tracking adoption by measure year-over-year in order to identify measures that may be lagging due to lack of exposure and customer awareness.

Finding 3. The program database provided for evaluation does not include measure quantities nor incremental cost data.
Recommendation 3. Guidehouse recommends adding measure quantity, the associated units (fixture, HP, Watts Controlled, etc.), and incremental cost data to the query used to generate the program's measure database.

7. Appendix 1. Impact Analysis Methodology

Project savings are determined by measure-specific program calculators which were reviewed by the evaluation team during the program year prior to the evaluation. Site and project specific details are input to this semi-custom analysis process by the implementer. These tools are robust, yet transparent; and provide consistent, reputable, verifiable results.

8. Appendix 2. Total Resource Cost Detail

Table 8-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later.

Table 8-1. Total Resource Cost Savings Summary

End Use Type	Research Category	Units	Quantity	EUL (years)*	ER Flag†	Verified Gross Electric Energy Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Gas Savings (Therms)	Gross Heating Penalty (kWh)	Gross Heating Penalty (Therms)	NTG (kWh)	NTG (kW)	NTG (Therms)	Verified Net Electric Energy Savings (kWh)	Verified Net Peak Demand Reduction (kW)	Verified Net Gas Savings (Therms)	Net Heating Penalty (kWh)	Net Heating Penalty (Therms)
Lighting	Lighting Fixtures	Fixture	40	15.0	No	445,596	NR	0	0	0	0.83	0.83	0.00	369,845	76.53	NA	NA	NA
Custom	Non-Lighting	Each	2	11.0	No	40,207	NR	0	0	0	0.78	0.78	0.00	31,361	0.00	NA	NA	NA
Lighting	Lighting Controls	Watts Controlled	4	8.0	No	10,990	NR	0	0	0	0.83	0.83	0.00	9,122	1.08	NA	NA	NA
Lighting	Lighting Custom	Each	4	8.0	No	417	NR	0	0	0	0.83	0.83	0.00	346	0.00	NA	NA	NA
	Total			14.5		497,211	0	0	0	0	NA	NA	NA	410,675	78	NA	NA	NA

NA= Not applicable
NR = Not reported
Note: To avoid double counting, the verified gross kWh and net kWh used in the TRC analysis excludes secondary energy savings from water reduction measures.
* The total of the EUL column is the weighted average measure life (WAML), and is calculated as the sum product of EUL and measure savings divided by total program savings.
† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.