Agricultural Impact Evaluation 2017 - 2020

Appendices

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1   Appendix A. Phone Interview Questions

Thank you for taking the time to complete this survey. We appreciate your assistance!

This survey is being conducted on behalf of the New York State Energy Research and Development Authority (NYSERDA). You or someone at your facility likely responded to a survey in the Fall of 2022 administered by Guidehouse and APPRISE. This phone interview is part of an independent but related effort to validate energy savings. Your input and information will help NYSERDA better understand the types of energy-efficient technologies and resources used in New York State's agricultural sector and improve its programs and resources that support the agricultural industry in New York State. As part of this research, NYSERDA is contacting past participants of their Agriculture Energy Audit Program. You may also know this NYSERDA program by the names of FlexTech and FlexTech Ag Services.

This survey should take about 15 minutes to complete. We seek to confirm utility account information, identify any changes in production levels, and verify the energy efficiency measures installed at your facility.

1.1   Introduction

1. Our records show that your farm participated in the NYSERDA Agriculture Energy Audit Program in MONTH of YEAR for your facility at PARTICIPANT ADDRESS. Is that correct?

2. Are you the person at your organization most involved in the NYSERDA Agriculture Energy Audit Program and with the technologies in the facility that consume energy (e.g., lights, heating systems, or cooling systems)?

1.2   Utility Data Collection

Throughout your participation in NYSERDA's Agriculture Energy Audit Program, you have provided authorization for NYSERDA to access your electrical or natural gas usage data from your utility. Unfortunately, your utility is unable to provide data from 2017 through 2019.

3. Does your farm store its historical utility bills and usage data?

4. As your audit was conducted in MONTH of YEAR, would you be willing to provide utility bills to this evaluation for one year before the audit date and one year after the audit date?

1.3 Agricultural Segment Confirmation

5. Our records show that your farm is a COMMODITY farm; is that correct?

6. Which of the following types of farm/agriculture best describes the operations at this location?

   a. Dairy cows
   b. Beef cattle
   c. Chickens
   d. Pigs
   e. Vineyard
   f. Greenhouse
   g. Vegetable farm (not a greenhouse)
   h. Other, please specify: _____
   i. None

1.4 Production Level Confirmation

The next set of questions will touch on the production levels at your agricultural site. We are interested in confirming the [Acres of land or counts of animals] present at your location. We are also interested in any changes to production levels that have occurred over the duration of this project.

7. According to our records, _____ (Animals or acres of land, dependent on COMMODITY) are dedicated to agricultural production at this site. Is this information correct?

Table 1-1 Production Levels by Commodity

Commodity	Count (#heads/acres)
Dairy Cows	
Beef Cattle	
Chickens	
Pigs	
Acres of Land (Vineyard, greenhouse, cropland)	
Other:	

8. Have there been any changes to the number of animals or area of land since the audit was performed?

9. Regarding your operations since the audit was performed, how many (Animals dependent on COMMODITY) were present at this location?

10. How many gallons of milk does your dairy farm produce in a typical month? Probe for information on seasonal variations.

1.5   Equipment Verification

In the next section of this survey, I will ask questions regarding equipment installed at this location recommended through NYSERDA's Agriculture Energy Audit Program. To the best of your memory, please confirm the equipment installation and the season and year it was installed.

11. Our records show that you installed MEASURE in the SEASON of YEAR. Is this correct?

Table 1-2 Measure Installation Verification

Measure	Season	Year
Import from Survey	*Import from Survey*	*Import from Survey*

12. Our records show that you uninstalled the following equipment. Can you confirm the following information?

Table 1-3 Measure Uninstallation Verification

Measure	Season	Year
Import from Survey	*Import from Survey*	*Import from Survey*

13. Can you provide a reason why the previous equipment was uninstalled?

14. Do you recall installing, replacing, or upgrading any additional equipment at this location?

1.6   Operational Schedules

The data analysis performed by this impact analysis considers specific operational schedules.

15. Is your farm or business fully operational every month of the year, or do you have season periods of partial operation, no operation, or a change in the type of operations?

16. What months of the year does your farm have peak or full operations? Repeat for partial operations, no operations, or changes in the type of operation for each month. Approximate ratio or % increase/decrease in a given month.

1.7   Potential Non-Routine Events

17. Have there been any additional changes in your operation or production that would affect energy consumption? Aside from what we already covered.

18. When did this change occur? (Month? Quarter? Year?)

1.8   Other Fuel Source Information

19. Our survey records show that you use additional fuel sources besides electricity and natural gas for your agricultural operation. Is this information correct?

20. What additional fuel types, other than natural gas or electricity, are used to heat a primary space or used in an agricultural process?

21. For the other fuel source(s) previously listed, are you willing to share billing records with the evaluation team?

22. For the other fuel sources previously listed, can you provide how much of other fuel sources your site uses in a typical month? Probe for seasonal variations in the use of other fuel sources.

1.9   Conclusion

23. The answers you provided today will be used to perform an energy savings analysis at your location. Even with the additional details you provided, we may want to conduct an in-person site visit to collect more detailed information about your energy-using equipment. If so, are you interested in participating in the in-person data collection?

24. That concludes my prepared questions. Do you have any questions, or is there anything about your farm's energy use or participation in the audit program that you would like to mention that we have not discussed?

2 Appendix B: Key Parameter Measurement Calculation Example

2.1 Lighting Questions for Participant

Table 2-1 Existing Lighting Verification

Area	Quantity	Old fixture type:	New fixture type:	Old fixture watts [W]:	New fixture watts [W]:
Residence	7	23W CFL bulb	A-lamp LED	23	14
Grow Lighting	16	4' fluorescent T8	4' LED T8	59	28
Barn 1	6	100W incandescent	A-lamp LED	100	14
Barn 1	8	23W CFL bulb	A-lamp LED	23	14
Shed	4	100W incandescent	A-lamp LED	100	14
Shed	4	23W CFL bulb	A-lamp LED	23	14
Shed	1	4' fluorescent T8	4' LED T8	59	28
Barn 2	4	23W CFL bulb	A-lamp LED	23	14
Barn 2	3	100W incandescent	A-lamp LED	100	14

1. To the best of your ability, could you confirm the fixture quantities and wattages listed in the table (above)?

2. Are all the fixtures in the table ON/OFF controlled? If not, could you describe the operation of the lights that are not ON/OFF?

3. Could you describe the lighting schedule for each space?

4. I am aware that some of the spaces around the farm are heated by radiant heating. Does this apply to any of the spaces listed?

5. Are any of the areas cooled?

2.2 Lighting Equations

Annual Electric Energy Savings

$$\Delta kWh = \left[\frac{(W * units)_{baseline} - (W * units)_{ee}}{1,000} \right] * hours * (1 + HVAC_C)$$

Annual Electric Demand Savings

$$\Delta kW = \left[\frac{(W * units)_{baseline} - (W * units)_{ee}}{1,000} \right] * (1 + HVAC_C) * CF$$

Where:

ΔkWh = Annual electric energy savings

ΔkW = Annual electric demand savings

units = Number of measures installed under the program

baseline = Characteristic of baseline condition

ee = Characteristic of energy efficient condition

W = Rated wattage of lap or fixture (Watts)

hours = lighting operating hours

CF = Coincidence factor

1,000 = Conversion factor, one kW equals 1,000 watts

2.3 Lighting Results

Table 2-2 Implementor Calculations for Existing Equipment

Area	Quantity	Old fixture type:	New fixture type:	Old fixture watts [W]:	New fixture watts [W]:	Operating hours:	Annual Energy Savings [kWh]	Annual Demand Savings [kW]
Residence	7	23W CFL bulb	A-lamp LED	23	14	3650	229.95	0.063
Grow Lighting	16	4' fluorescent T8	4' LED T8	59	28	3650	1810.4	0.496
Barn 1	6	100W incandescent	A-lamp LED	100	14	1460	753.36	0.516
Barn 1	8	23W CFL bulb	A-lamp LED	23	14	1460	105.12	0.072
Shed	4	100W incandescent	A-lamp LED	100	14	1460	502.24	0.344
Shed	4	23W CFL bulb	A-lamp LED	23	14	1460	52.56	0.036
Shed	1	4' fluorescent T8	4' LED T8	59	28	1460	45.26	0.031
Barn 2	4	23W CFL bulb	A-lamp LED	23	14	1460	52.56	0.036
Barn 2	3	100W incandescent	A-lamp LED	100	14	1460	376.68	0.258
						Total:	3928	1.9

Table 2-3 Validated Savings of Installed Equipment

Area	Quantity	Old fixture type:	New fixture type:	Old fixture watts [W]:	New fixture watts [W]:	Operating hours:	Annual Energy Savings [kWh]	Annual Demand Savings [kW]
Residence	7	23W CFL bulb	A-lamp LED	23	14	3650	229.95	0.063
Grow Lighting	16	4' fluorescent T8	4' LED T8	59	15	4380	3083.52	0.704
Barn 1	6	100W incandescent	A-lamp LED	100	14	1460	753.36	0.516
Barn 2	8	23W CFL bulb	A-lamp LED	23	14	1460	105.12	0.072
Shed	4	100W incandescent	A-lamp LED	100	14	1460	502.24	0.344
Shed	4	23W CFL bulb	A-lamp LED	23	14	1460	52.56	0.036
Shed	1	4' fluorescent T8	4' LED T8	59	59	1460	0	0
Barn 2	4	23W CFL bulb	A-lamp LED	23	14	1460	52.56	0.036
Barn 2	3	100W incandescent	A-lamp LED	100	14	1460	376.68	0.258
Exterior	4	Unknown Metal Halide	Unknown LED	100	43	4303	981.084	0
						Total:	6137	2.0
						Realization Rate	156%	110%

3 Appendix C: Regression Variable Performance

Table 3-1 Regression Variables and Performance Statistics

Reservation Number	Regression Status	NRE (Yes/No)	NRE Description	Successful Variables	Failed Variables	FSU (<50%)	R-Squared	Bottom-Up Analysis (Yes/No)
877	Pass	Yes	Cow headcount increase by 25%.	1. Actual CDD 2. NRE 3. Days in billing period	1. Drybulb>50F and Drybulb<50F 2. Relative humidity 3. Actual CDD and days in billing period w/o the NRE	-9.7% & 34%	85% & 86%	Complete
962	Pass	No	N/A	1. Drybulb<60F 2. Drybulb>60F 3. Days in billling period	1. Drybulb<60 on its own	25%	90%	
218	Pass	No	N/A	1. Actual CDD 2. Actual HDD	1. Enthalpy (and enthalpy ranges) 2. Combination of other variables (drybulb, Actual CDD w/ a different balance point, enthalpy, days in billing period) that did not tield as good of a result	44%	96%	Complete
132	Pass	No	N/A	1. Actual CDD 2. Relative humidity	N/A	5%	95%	

590	Pass	No	N/A	1. Actual CDD 2. Days in billing period 3. Relative humidity	1. Actual CDD 2. Actual HDD 3. Days in billing period	2%	91%	
978	Pass	No	N/A	1. Relative humidity 2. Actual HDD	1. Days in billing period 2. Actual HDD (unknown balance point) 3. Wetbulb	6%	85%	
789	Pass	No	N/A	1. Actual CDD 2. Relative humidity (<65)	1. Days in billing period 2. Relative humidity <65%	7%	80%	
275	Pass	Yes	Increase in number of chickens by 50%	1. Actual CDD 2. Actual HDD	1. NRE	1%	97%	
957	Pass	No	N/A	1. Actual CDD	N/A	14%	95%	
955	Pass	Yes	Capacity increase by 100% (Unknown variable)	1. Actual CDD 2. Actual HDD	1. NRE	2%	97%	
423	Pass	No	N/A	1. Actual CDD 2. Actual HDD	1. Drybulb >55 & <55 2. Days in billing period 3. Milk production data	4%	83%	Complete
238	Pass	No	N/A	1. Days in billing period 2. Drybulb >50F 3. Average drybubl	Not tracked	4%	88%	

607	Pass	No	N/A	1. Drybulb<55F 2. Drybulb>55F 3. Relative humidity 4.Days in billing period	No real fails, but a variables to the left w/o the Days in billing period	2%	83%	Complete
1043	-	-	-	-	-	-	-	Complete
652	Pass	No	N/A	1. Actual HDD 2. Days in billing period	N/A	2%	98%	
399	Pass	Yes	50% increase in cow headcount	1. Drybulb 2. Wetbulb <38F 3. Days in billing period	1. NRE	23%	90%	
1077	Pass	No	N/A	1. Actual CDD 2. Days in billing period	N/A	7%		
408	-	-	-	-	-	-	-	Complete
5	Pass	No	N/A	1. Actual CDD	N/A	6%	96%	
829	Pass	Yes	Acreage increase 780 -> 800	1. Actual CDD 2. Average Monthly Outdoor Air Enthalpy	1. Drybulb tempratures ranges 2. Relative humidity 3.Actual CDD 4. Enthalpy	28%	78%	

286	Pass	No	N/A	1. Actual CDD 2. Days in billing period	N/A	6%	92%	
323	Pass	Yes	Increase in cow headcount 1800 -> 3900	1. Actual CDD 2. NRE	1. Days in billing period 2. Enthalpy ranges 3. Drybulb temperature ranges	2%	80%	
173	Pass	No	N/A	1. Actual CDD	N/A	5%	98%	
889	Pass	No	N/A	1. Drybulb 2. Drybulb >40 3. Days in billing period	N/A	1%	95%	
1071	Pass	Yes	Added vault tank and updated heat system	Dry Bulb >40	RH, CDD, HDD, RH>65	-21%	92%	