

Agricultural Impact Evaluation 2017 - 2020

Executive Summary

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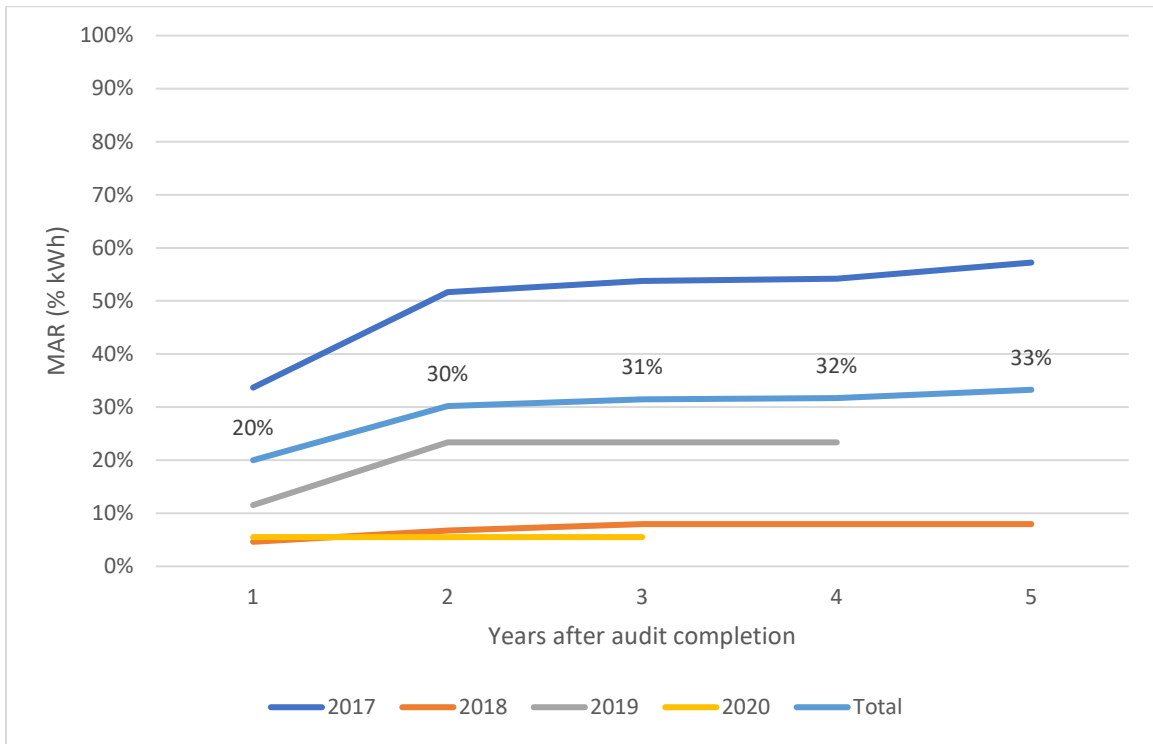
1 Executive Summary

This report summarizes the impact evaluation of NYSERDA's Agricultural Energy Audit Program (AEAP) for audits completed from 2017 through 2020. AEAP is an energy efficiency audit program designed to meet the unique needs of agricultural businesses in New York State. This evaluation assesses the extent to which energy-efficient technologies are implemented through Measure Adoption Rates (MAR) at the program and individual measure levels.

Additionally, this evaluation determines the extent to which self-reported measure adoptions are correct through verification with audit participants. The MAR and verification results provide a benchmark for program performance and the foundation for optimizing future program efforts.

This evaluation used a three-part approach of data collection, billing analysis, and key parameter measurement to a sample of 49 agricultural sites out of a population of 933. The estimated overall program MAR is 33% based on weighted energy savings in kWh/year. Figure 1-1 compares individual audit year MAR to the total for this evaluation period. Audits completed in 2017 show the highest individual year MAR at 57%. Conversely, audits completed in 2020 show the lowest individual year MAR at 6%. However, 2020 audits will continue to be evaluated in the next phase of this evaluation through multiple participant surveys, conducted by the Market Evaluation team of Guidehouse and APPRISE, and the Impact Evaluation, conducted by Michaels Energy Inc.

Figure 1-1 Measure Adoption Rate (% kWh) by Year After Audit



2 Findings and Recommendations

The evaluation team presents four findings and recommendations for the Agricultural Energy Audit Program in this section.

2.1 Finding 1

The five-year measure adoption rate (MAR) for the Agriculture Energy Audit Program - defined as the ratio of kWh/year installed to kWh/year recommended - was estimated to be 33% using data self-reported by audit participants, but the evaluation team expects to report a stronger, verified estimate of the MAR for this program in the next report from of this evaluation in 2025. Lighting upgrades are the most prevalent, with 66% of sites installing the recommended measure. While the lost cost of most LED lighting makes this energy-efficient measure an enticing option for agricultural sites, the cost for liner LEDs present with indoor growing operations is still cost-prohibitive for farms.

The evaluation found the realization rate to be strong: 121% for electricity. While the realization rate for agricultural sites with verified savings under the key parameter measurement method provides a strong indication of success, it's important to note that these sites represent only 5 out of the 21 evaluated sites (Table 21). As with the MAR, the methodology for assessing the realization rate will be reviewed and potentially modified in the next evaluation.

Table 21 Realization Rates

Savings Period	All Sites (n = 21)	Key Parameter Measurement (n = 5)
Direct	(0.19)	1.21

The infrequent recommendation of PV solar in audit reports is attributed to its unfavorable cost-to-benefit ratio and lengthy ROI periods. For example, one AEAP recommendation involves a 9 kW PV system with an upfront cost of over \$31,000 and a payback period of 23 years is not feasible for a small farming operation with profit margins estimated at less than 10%. Additionally, choices in the level of energy audits (comprehensive and targeted) affect installations and energy savings; some participants chose a targeted audit that looked only at PV systems when other, most financially viable options would have benefited their operations. During phone interviews, a lack of awareness about energy-efficient alternatives was apparent,

suggesting that participants might benefit from more economically feasible solutions such as lighting and refrigeration upgrades.

For motors, the absence of installations is linked to generic advice provided in audits. In contrast, specific suggestions, such as installing a Variable Frequency Drive (VFD) on milk transfer pumps, have increased implementation rates. Furthermore, within the agricultural sector, particularly in dairy production, there is a hesitancy in installing VFDs due to their adverse effects on livestock. The electrical noise generated by VFDs is believed to negatively impact dairy cows, prompting producers to forgo installing these drives near the animals to protect their well-being and maintain productivity.

Recommendation 1

NYSERDA should report a stronger estimate of the audit program's measure adoption rates, as well as realization rates, in the next report-out from this evaluation in 2025.

Initial NYSERDA Response to Recommendation: Rejected. While NYSERDA will work with the evaluator to reassess and potentially modify its MAR and realization rate approach for the next round of evaluation, MAR and realization rate findings estimated through this study will be applied to reporting to reflect the current analysis conducted.

2.2 Finding 2

Feedback from participants indicates that agricultural audits are most effective at driving the adoption of energy efficiency measures if they provide recommendations that meet the specialized needs of agricultural operations.

Recommendation 2a

NYSERDA should consider advertising solutions to common concerns raised by agricultural sites in the audit program evaluations (for example, cattle disliking the sound of electrical motors) in its Energy-Related Agricultural Best Practices guides.

Initial NYSERDA Response to Recommendation: Pending. This recommendation is under consideration for implementation.

Recommendation 2b

Impact evaluators should ask participants' reasoning as to why recommended equipment is not installed.

Initial NYSERDA Response to Recommendation: Pending. NYSERDA will consider adding this data question to future scopes of work.

2.3 Finding 3

Self-reported measures in the 2023 market evaluation of the Agriculture Energy Audit Program participant survey under-represent the actual installation of equipment. Participants are more likely to forget about installing an energy-efficient measure than to falsely claim installation. This information is represented in Table 2-1.

The positive predictive value, the probability that a self-reported measure is installed, is 93%. The sensitivity, also known as the True Positive Rate (TPR), reflects the likelihood that an installed measure is self-reported through the participant survey. The calculated sensitivity for this study is 29%.

The purpose of this finding is not to increase the positive predictive value through improved survey design. The participant survey successfully presented a simple approach to answering the complicated data collection process of measure installations. Instead, this finding highlights the importance of installation validation in capturing accurate energy savings that are contributable to this program.

Table 2-1 Survey Performance Metrics

	Actual Positive	Actual Negative
Survey Positive	26 (True +)	2 (False +)
Survey Negative	10 (False -)	63 (True -)

Recommendation 3

To strengthen evaluation results, NYSERDA should attempt outreach to conduct impact evaluation as soon as possible following the performance period after audit completion, to ensure

respondents have recent memory of the measures installed and other details following their audits.

Initial NYSERDA Response to Recommendation: Implemented. The impact evaluation team will conduct outreach to collect primary data as an input for this evaluation one year after audit completion where possible, instead of following the previous plan of waiting a full 2 years after audit completion to follow up.

2.4 Finding 4

The variety of conditions of agricultural sites pose challenges to conducting billing analysis to evaluate energy impacts, whereas key parameter measurement using data obtained from phone interviews and on-site visits has been found to be more effective in many cases.

Bottom-up calculations, following the guidelines of IPMVP Option A – Retrofit Isolation: Key Parameter Measurement, determine savings through engineering calculations of data points collected via email, phone interviews, or site visits. These calculations do not require participants to provide authorization for the use of utility energy consumption data. Additionally, energy savings deemed from engineering calculations are not influenced by external factors such as the use of on-site fossil fuels, changes in production levels, and energy use due to behavior changes, new construction, or other unpredictable events.

Recommendation 4

NYSERDA evaluation staff should prioritize bottom-up calculations over regression analyses. Bottom-up calculations require additional data collection from program participants, but this effort is worth the benefit of increased precision of energy savings attributable to the program. Regression analyses' reliance on utility data authorization and the profound impact of non-routine events and external variables on statistical models make this approach imprecise. It is not a viable option for evaluating savings from the agricultural sector.

Initial NYSERDA Response to Recommendation: Implemented. The next phase of this evaluation will employ Key Parameter Measurement as central to the study's methodology.

2.5 Finding 5

Survey fatigue from multiple touchpoints with evaluators and the absence of an incentive for responding to outreach inhibit response rates. Responses could be increased through stronger

coordination between the market and impact evaluation teams and through use of incentives for respondents.

Recommendation 5

NYSERDA should facilitate closer coordination between the market and impact evaluation teams evaluating the audit program to streamline and expedite outreach and should implement incentives for interview and on-site visit participation in the next updated to this evaluation.

Initial NYSERDA Response to Recommendation: Implemented. The impact evaluation team will coordinate more closely with the evaluation team on the related market evaluation of the NYSERDA Agriculture programs to better advertise the impact evaluation team's outreach requests and to incentivize responses from agricultural sites with monetary incentives, in the next update of this impact evaluation.