Colorado State University Extension

Agricultural Energy Audits

Fact Sheet No. **5.004** Farm and Ranch Series | **Energy**

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An energy audit is a systematic review of a consumer's energy use intended to uncover inefficiencies and cost-effective improvements for the consumer's consideration. When applied to agriculture, an audit can look at the energy use of buildings and other structures as well as field operations. The agricultural energy audit will result in a report with a written set of recommendations for energy upgrades that the consumer can use to make decisions.

Types of Audits

A number of different types of agricultural energy audits are available to producers. Audits can be conducted with vastly different scopes—ranging from a narrow focus on one type of equipment such as irrigation pumps, to an in-depth analysis of all energy uses—both at a producer's facilities and in the field. Audits do not typically look at the potential for renewable energy development, but this service might be provided by some auditors upon request.

Another difference between the various types of audits is that some auditors will only conduct an analysis via a telephone conversation with the producer and not visit the site. Using utility bills provided by the producer (one year's worth is typical) and site maps, these auditors are able to make recommendations to increase the efficiency of the operation. Other auditors employ 'data collectors' that visit the site, collect information about the different kinds of equipment found at the site such as tractor horsepower and lighting types, and relay that data back to the auditor who then makes recommendations. Still other auditors will visit the site themselves in order to talk with the producers and assess the energy using equipment firsthand.

The end result is that audits can provide agricultural producers with varying levels of confidence when considering which recommendations to implement. In-person audits conducted by professionals in the field that go on to conduct in-depth engineering and financial analyses could be considered 'investment-grade' in that the payback periods associated with the recommendations are reliable enough to be acted upon. Telephone audits or quick walk-through assessments may not give producers enough information or confidence to invest in the recommendations.

The different scopes of audits and techniques for conducting them all come with different price tags. Utility company-provided walk-through assessments are sometimes provided free of charge; investment-grade audits covering all aspects of an operation may cost thousands of dollars (before incentives).

Each type of audit has its own set of benefits as well. Aside from giving producers some degree of confidence in making potentially expensive energy investments, it is also important to consider whether the audit will qualify the operator for further funding. This aspect of audits is discussed in more detail in the 'Funding for Audits and Implementation' section of this fact sheet.

The table on page 2 summarizes some of the most defining and important characteristics of agricultural energy audits.

Sample Recommendations

Depending on the type of audit chosen, recommendations may range from a simple list of considerations to a set of energy conservation or efficiency measures, organized by associated costs, savings, and simple payback periods. The sample recommendation provided on page 3 is from an investment-grade audit conducted

Quick Facts

- Audits can be conducted with vastly different scopes, ranging from a narrow focus on one type of equipment to an in-depth analysis of all energy uses at a producer's facilities and in the field.
- Audits can be conducted in different ways, ranging from phone conversations to thorough site visits.
- Depending on the type of audit chosen, recommendations may range from a simple list of considerations to a set of energy conservation or efficiency measures organized by costs, savings, and simple payback periods.
- Aside from giving producers some degree of confidence in making potentially expensive energy investments, some audits can qualify producers for funding to make energy upgrades.

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Table 1. Types and characteristics of agricultural energy audits.

Type of Audit	Description	Auditor Requirement	Phone or Site Visit	Cost	Benefits
NRCS - Headquarters	Assessment of stationary items such as heating and cooling equipment, fans, motors, pumps, and non-residential buildings	An NRCS- certified Technical Service Provider	Varies	Upward from $1,000, largely offset through NRCS cost share	Estimates of costs and savings associated with various efficiency measures and qualifies producers for funding of large implementation projects
NRCS - Landscape	Assessment of field operations such as tractors and implements, pesticide, herbicide, and fertilizer application practices, and irrigation water management	An NRCS- certified Technical Service Provider	Varies	Upward from $1,000, largely offset through NRCS cost share	Estimates of costs and savings associated with various efficiency measures and qualifies producers for funding of large implementation projects
USDA REAP	Typically focuses on one type of stationary equipment such as irrigation pumps or lighting	A Professional Engineer (PE) or Certified Energy Manager (CEM)	Site visit	Generally $1,000 with $250 to $500 out of pocket for producer	Estimates of costs and savings associated with one type of efficiency measure and qualifies producers for funding of large implementation projects
Walk-through	Brief assessment of energy bills and use	Local utility	Site visit	Free	Basic recommendations of energy upgrades to consider
Other	Variable but can include an assessment of every aspect of energy use in the field and in non-residential buildings	Private company or university	Varies	Varies	Variable but can include estimates of costs and savings associated with various efficiency measures and can qualify producers for funding of large implementation projects

by Colorado State University. The recommendation was to replace 168 metal halide light fixtures in outdoor dairy stalls with 6-lamp, high output T5 fluorescent fixtures.

In addition to the estimated costs, savings, and payback periods associated with different financial incentive scenarios, the recommendation also included the specifications of the new light fixtures, a reference make and model (no brands were endorsed although a specific brand was used in order to get realistic cost estimates), and the source of the information used to make the recommendation. Because this was an investment-grade audit, additional calculations and contact information for financial incentive programs were provided so the producer could double check the accuracy of the recommendation if so desired.

Other recommendations from energy audits include: upgrading heating, cooling, and processing equipment; installing heat blankets for greenhouses and other greenhouse upgrades; replacing irrigation pumps and motors with more efficient models; using smaller tractors to pull certain implements; reducing tillage; nutrient, pesticide, and irrigation water management recommendations; and more. The possibilities are as numerous as the number of sites audited.

It is also important to note that not all recommendations have good paybacks– audits can be just as valuable in eliminating poor investment options as they are in illuminating good ones.

Funding for Audits and Implementation

Funding is available to assist producers in offsetting some of the costs involved both to get an audit and also to implement recommendations from the audit. The U.S. Department of Agriculture's Rural Energy for America Program (REAP) provides funding for auditors to conduct the audits. This, in turn, is used to lower the cost of the audit to the producer, although the producer is still required to pay 25% of the total cost of the audit. In many cases, REAP audits have a total cost of around $1,000 so the cost to producers is around $250. The Natural Resource Conservation Service (NRCS) under USDA provides a fixed amount of money to the auditors to offset the costs of an audit. For headquarters audits, the cost share is based upon either the number of animal units on the farm or gross farm income. For landscape audits the cost share is based upon the number of acres in production.

To implement recommendations from the audit, REAP can fund up to 25% of the total project cost and/or provide a guaranteed loan or grant/loan combination for up to 75% of the total project cost

CURRENT ENERGY USAGE	
Current Electric Energy Usage:	337,000 kWh/yr
Current Electric Energy Cost:	$19,510/yr
Current Estimated Peak Electric Demand:	923 kW-mo/yr
Current Estimated Peak Electric Demand Cost:	$16,610/yr
Current Recurring Costs for Lamp Replacement:	$370/yr - material $550/yr - labor
Current Total Costs:	$37,040/yr
RESULTS SUMMARY	
Estimated Electric Energy Savings:	160,400 kWh/yr
Estimated Electric Energy Cost Savings:	$9,290/yr
Estimated Peak Demand Savings:	439 kW-mo/yr
Estimated Peak Demand Cost Savings:	$7,900/yr
Recurring Savings for Lamp Replacement:	($40)/yr - material $250/yr - labor
Estimated Total Savings:	$17,400/yr
Estimated Implementation Capital Cost:	$39,500
Other Estimated Implementation Costs:	$2,520
Utility Rebate:	$9,160
Total Estimated Implementation Cost:	$32,860
Simple Payback Period:	1.9 years

Total costs for current lighting system: $37,040/yr

Estimated savings from lower electricity use and decreased lamp replacement: $17,400/yr

Estimated costs after a utility rebate: $32,860 for a 1.9 year payback period

PAYBACK WITHOUT REBATES

Total Estimated Implementation Cost:	$42,020
Simple Payback Period:	2.4 years

Estimated costs assuming no rebate: $42,020 for a 2.4 year payback period

PAYBACK WITH NRCS REIMBURSEMENT & REBATES

Estimated NRCS Reimbursement	$27,313
Total Estimated Implementation Cost:	$5,550
Simple Payback Period:	0.3 years

Estimated costs assuming a cost share from NRCS: $5,550 for a 0.3 year payback period

Figure 1. Sample investment-grade energy audit recommendation for efficient lighting.

of making energy efficient upgrades or installing renewable energy systems. An energy audit must be completed in order to qualify for REAP energy projects over $50,000. NRCS's Environmental Quality Incentives Program can fund an average of 65-75% of the cost of energy efficiency improvements related to headquarters equipment. Similar to REAP, an Agricultural Energy Management Plan (AgEMP)—the result of an NRCS-qualified audit—must have been completed within the past five years in order to qualify for these funds.

An AgEMP may also help producers meet the minimum requirements for participating in NRCS's Conservation Stewardship Program. This program provides financial assistance to agricultural producers via annual payments based on their conservation performance. Further, Conservation Innovation Grants (CIG) through NRCS may be available to assist in the implementation of agricultural energy projects but require a 50% match of funds.

The Colorado Department of Agriculture (CDA) provides funding through its Advancing Colorado's Renewable Energy (ACRE) program for various energy efficiency and renewable energy projects. Funding for agricultural energy projects may be available through one's local utility and/or the Colorado Energy Office. In addition, agricultural producers may be able to take advantage of the federal government's tax credits for renewable energy projects.

Highlighted funding opportunities are summarized in the table on the following page.

Funding opportunities and financial incentives can change rapidly, so it is best to contact the entity from which funding is to be solicited before undertaking an agricultural energy project.

Table 2. Funding opportunities for agricultural energy audits and projects.

Source	Funds Audits?	Funds Energy Efficiency Projects?	Funds Renewable Energy Projects?	Audit Required for Project Funding?
USDA REAP	Indirectly (funds auditors)	25% grant 75% guaranteed loan	25% grant 75% guaranteed loan or grant/loan combination	Yes for projects for over $50,000
NRCS - EQIP	Cost-share	Cost-share	Cost-share for solar PV groundwater pumping	Yes
NRCS - CIG	No	Cost-share	Cost-share	No
CDA ACRE	If requested in grant application	Yes	Yes	Yes

Conclusion

An agricultural energy audit is a unique tool that can help producers make confident, sound decisions on how best to invest in equipment and practices that could save energy and money. Various types of audits have different scopes, are conducted in different ways, and may or may not make producers eligible for funds to implement the audit recommendations. For these reasons it is important to select the type of audit carefully. For more information on agricultural energy audits and agricultural energy in general, contact the entity that will potentially provide funding for the audit or Colorado State University's Center for Agricultural Energy (www.cae.colostate.edu).