

Farm Energy Audits: Availability, Usefulness, and Cost

A study by the
National Center for Appropriate Technology



September 2009

Funded by the
USDA Risk Management Agency



Research and Development Risk Management Partnership
#06IE08310060-P

Principal Investigator: Mike Morris, Ph.D.

Researchers: Rich Dana, Holly Hill, Al Kurki

Copyright © 2009 **The National Center for Appropriate Technology**

3040 Continental Drive
P.O. Box 3838
Butte, MT 59702-3838

www.ncat.org

1-800-ASK-NCAT

While every precaution has been taken in the preparation of this report, neither NCAT, nor the authors, nor the funders assume any liability for any loss or damage caused, or alleged to be caused, directly or indirectly, to any person or entity by the information and recommendations contained in this report. Reference to any specific commercial product, process, company, individual, or service does not imply endorsement, recommendation, or favoring. The views and opinions expressed in this report do not necessarily reflect those of the funders, the United States government, or any federal or state agency.

Acknowledgments	i
Executive Summary	i
1. Introduction: Why Farm Energy Audits?	1
2. Research Methods	2
2.1 Interviews with energy audit providers	2
2.2 Interviews with agricultural producers	2
2.3 Other interviews.....	3
2.4 Firsthand experience	3
3. What Is a Farm Energy Audit?	3
3.1 What Is an energy audit?.....	3
3.2 Who conducts and pays for energy audits?	4
3.3 How are energy auditors trained and certified?.....	5
3.4 What levels or types of audits are available?	6
3.5 What happens during an energy audit?.....	6
3.6 How is auditing a farm different from auditing a home?	7
3.7 Are there standard procedures for auditing a farm?.....	8
3.8 How much does a farm energy audit cost?	8
3.9 Other energy efficiency methods and approaches.....	9
4. The Role of Energy Audits in USDA Programs.....	10
4.1 What is the Rural Energy for America Program (REAP)?	10
4.2 The role of energy audits in REAP	11
4.3 USDA Natural Resources Conservation Service (NRCS) Programs.....	15
5. How Available Are Farm Energy Audits?	16
5.1 How many states have farm energy audit programs?	16
5.2 What about do-it-yourself energy audits?	17
5.3 REAP awards and accessibility	18
5.4 New programs to improve access to REAP funding.....	18
5.5 A state model of success: Iowa	19
6. How Useful Are Farm Energy Audits?	20
6.1 Comments from agricultural producers	21
6.2 Comments from utilities	22
6.3 Comments from audit providers	23
6.4 How often are audit recommendations implemented?	24
7. Conclusions	25
8. Recommendations	26
References	29
Glossary	31
End Notes	36
Appendix 1: “Audit” vs. “Assessment” in USDA’s Rural Energy for America Program	38
Appendix 2: Audit Program Profiles.....	41

Acknowledgments

This report is one product of the project “Building Farm Energy Self-Sufficiency: Tools for Self-Protection.” The authors would like to thank the USDA Risk Management Agency for providing funding for this project, through a Research and Development Risk Management Partnership. We would especially like to thank Parm Shahi of the USDA Risk Management Agency for his support and involvement.

We are also grateful to the many energy experts who were interviewed for this report. We would especially like to thank:

Stefanie Aschmann (USDA Natural Resources Conservation Service), John Bonitz (Southern Alliance for Clean Energy), Jennifer Brinker (GDS Associates), Phil Broaddus (Pacific Gas & Electric), Brian Buch (USDA Rural Development – Idaho), Rossie Bullock (USDA Rural Development – North Carolina), Neal Elliott (American Council for an Energy Efficient Economy), Dale Finseth (Kennebec County Soil & Water Conservation District), Rich Hackner (GDS Associates), Mary Ann Hayes (Maine Rural Partners), Richard Hiatt (Rural Electricity Resource Council), Stan Hitt (USDA Natural Resources Conservation Service), Craig Metz (EnSave), Darlene Monds (Berkshire-Pioneer Resource Conservation & Development Area), Steve Moore (Center for Environmental Farming Systems), Kelley Oehler (USDA Rural Development), Andy Olsen (Environmental Law & Policy Center), Jennifer Osgood (Efficiency Vermont), Tom Potter (Southwest Energy Efficiency Project), Bob Riding (Pacific Gas & Electric), Scott Sanford (University of Wisconsin Extension), Joe Schultz (GDS Associates), Claudia Smith (Central Iowa Power Cooperative), Gary Suzuki (Southern California Edison), and Dave Warrington (Alliant Energy).

The conclusions and recommendations in this report are solely those of the authors and are not intended to represent the views of the people and organizations above.

Executive Summary

The demand for energy audits at farms and rural small businesses has recently increased, largely because audits are being required and encouraged by an important federal grant and loan program—the Rural Energy for America Program (REAP)—administered by USDA Rural Development.

This is in many ways a welcome trend, since the energy needs of rural people have often been neglected. However, because energy audits are costly to provide in rural areas, availability remains low in most parts of rural America, and a few states have won a disproportionate share of REAP funding. Also, apart from the need for audits that is being created by REAP, the demand for energy audits on the part of agricultural producers appears to be modest at best. Finally, energy audits alone have a weak reputation for saving energy and bringing about changes in behavior, unless audits are complemented with the right combination of promotional efforts and incentives.

USDA Rural Development has recently taken steps to improve the availability of energy audits, including creating a separate grant program to pay for them. Addressing concerns about the cost and usefulness of farm energy audits will be challenging, though. Offering individual professional service to small farms and rural businesses throughout America will be difficult and expensive, and there are lower-cost approaches that would probably do more to promote energy efficiency.

NCAT recommends that Rural Development should

- De-emphasize the role of energy audits in REAP, to the extent that this is consistent with maintaining appropriate accountability;

- Give more weight to energy savings in the REAP scoring criteria;
- Consider allowing utilities to provide audits, with reasonable rules and restrictions;
- More strongly promote the REAP program to non-farm small businesses;
- Continue to streamline and simplify the REAP application procedures;
- Improve the presentation of REAP information on the Rural Development website, so application materials and instructions are made available in a more organized and user friendly way; and
- Make better use of the energy-related technical assistance service that is already being provided by ATTRA, the National Sustainable Agriculture Information Service.

NCAT also recommends better coordination among the various USDA agencies that are offering energy-related programs. The vision that guides this effort should be (1) a rapid reduction in the use of fossil fuels throughout agriculture and the U.S. food system, and (2) a rapid increase in renewable energy generation from farmlands. There is now a broad public consensus on the urgency of these goals, and they are only partially being served by REAP and other USDA programs.

Energy audits should not be over-emphasized in this effort, but should play an appropriate and limited role in a coordinated strategy to encourage new energy practices. This strategy should include low-cost measures, and should consciously imitate the tactics of successful energy efficiency programs working in rural areas—adopting methods and incentives that are user-friendly and designed to win the trust of rural people.

1. Introduction: Why Farm Energy Audits?

There is growing consensus that the way agriculture and the U.S. food system use energy is a matter of urgent national importance. Writer Michael Pollan has summed up the issues this way:

“Most of the problems our food system faces today are because of its reliance on fossil fuels, and to the extent that our policies wring the oil out of the system and replace it with the energy of the sun, those policies will simultaneously improve the state of our health, our environment, and our security.” (Pollan, 2008)

Although the U.S. Department of Agriculture (USDA) has long been interested in energy usage by agriculture, the 2002 Farm Bill was the first ever to include an Energy Title, and gave the department broader energy-related responsibilities. Many new energy programs were consequently introduced by various USDA agencies. One of the largest of these programs was commonly known as the “Section 9006 Program” and was renamed the Rural Energy for America Program (REAP) in 2008. This program required applicants to have an *energy audit* as a condition of eligibility for certain grants and loans.

As explained in Section 3 below, an energy audit is basically a study of energy usage, conducted for the purpose of saving energy and money. An audit normally includes a site visit by an energy professional who inspects energy-consuming processes and equipment and then prepares a report recommending changes that could reduce energy consumption or cost.

REAP has drawn widespread support from both agricultural and energy advocacy groups, as a pioneering federal program that is promoting renewable energy and reducing U.S. dependence on fossil fuels. From 2003 to 2008, the 9006/REAP program awarded over \$140 million in grants and \$97 million in loan guarantees to 2,035 projects in all 50 states. The 2008 Farm Bill more than doubled the funding for REAP, and also introduced a new grant program largely devoted to funding energy audit programs.



NCAT photo

Responding to these opportunities, many states are putting a great deal of effort and money into creating energy audit programs for rural areas. Despite these efforts, the availability of energy audits remains extremely limited in most rural parts of the country, raising concerns about fair access to REAP. A handful of states have won a disproportionate share of REAP funding and there is still a great deal of confusion about what energy audits are, who is qualified to do them, and what they should cost.

The rationale for conducting all these energy audits has also not been very clear. Do audits actually change behavior and bring about energy savings? Is it possible to make professional-quality audits available in rural areas at a reasonable cost? Are agricultural producers and small business owners willing to pay the full cost of these services?

During 2008 and early 2009, the National Center for Appropriate Technology (NCAT) looked into these questions. After reviewing the current status of farm energy audits in the United States, and the role of audits in USDA's programs, this report offers some recommendations for improving their availability and usefulness. Although the report focuses mainly on energy efficiency and on agriculture, we also include more general issues related to renewable energy and non-agricultural businesses, since these are included in REAP and other USDA programs.

This report is intended to be useful to:

- Agencies, especially USDA agencies, that are requiring or encouraging farm energy audits;
- Agricultural organizations that are promoting farm energy audits;
- Utilities and private organizations that are providing farm energy audits;
- Public officials who are launching or coordinating farm energy audit programs;
- Environmental and agricultural groups interested in promoting energy alternatives; and
- Agricultural producers and rural small businesses that are considering an energy audit or looking for energy alternatives.

Italicized terms are defined in a Glossary at the end of the report.

2. Research Methods

Researching energy efficiency programs and methods poses some challenges. Information about these programs is scattered and mostly unpublished. Moreover, published reports from utilities and energy advocacy groups tend to emphasize success stories and impressive-sounding kilowatt-hour savings, and often do not discuss difficulties.¹ NCAT used public statistics and reports on energy audit programs when they were available, but we relied heavily on candid interviews with energy professionals, agricultural producers, and professional auditors.

2.1 Interviews with energy audit providers

During 2008 and 2009, NCAT conducted an initial search for farm energy audit programs and audit providers, choosing several programs and organizations for more detailed investigation. These were mostly well-known, long-lived, had been recognized for their excellence, or were unique in some way.²

We contacted as many of these programs as possible by phone or e-mail, and sent out a questionnaire asking for basic information. We followed up by phone or in person, and conducted interviews with representatives from most of the programs. In some cases we did not receive written replies, but were able to gather information over the phone. When available, we also made use of published information, organizational websites, and conference presentations.

Based on the questionnaires and our follow-up calls, we created brief profiles of several of these programs. These profiles are included in Appendix I.

2.2 Interviews with agricultural producers

NCAT received written comments about energy audits from over 100 agricultural producers in seven states, as well as verbal comments from many others.

NCAT received written comments about energy audits from over 100 agricultural producers in seven states, as well as verbal comments from many others.

In February 2007, we included some questions about farm energy audits on workshop evaluation forms that were completed by 17 producers who attended “Saving Energy on the Farm” workshops in Havre and Great Falls, Montana.

In April 2008, we mailed a short questionnaire to 276 Montana farmers and ranchers who had attended NCAT workshops on biofuels and other energy topics. In May and June 2008, we handed out short surveys to 169 people who attended NCAT-sponsored farm tours.

These surveys included various questions about farm energy management, including what factors were most important in deciding whether or not to have a farm energy audit and how much respondents would be willing to pay for a farm energy audit. We received completed questionnaires from 111 people, with 85 of these being farmers and ranchers.

In October 2008, we interviewed twelve producers from Missouri (4), Iowa (2), Montana (2), Kansas (1), Arkansas (1), Indiana (1), and Wisconsin (1). These producers were chosen randomly, and had volunteered to test and review several Internet-based agricultural energy decision-making tools. During a one-hour interview with each producer at the end of the project, we asked them several questions about their attitudes towards farm energy audits.

2.3 Other interviews

We interviewed representatives from agencies, utilities, energy advocacy organizations, grass-roots farming organizations involved in promoting energy efficiency in agriculture and rural areas. These included:

American Council for an Energy-Efficient Economy	Center for Environmental Farming Systems
Ecological Farming Association	Environmental Law and Policy Center
Iowa Association of Electric Cooperatives	Maine Rural Partners
Rural Electricity Resource Council	Southern Alliance for Clean Energy
Southwest Energy Efficiency Project	USDA Rural Development
USDA-Natural Resources Conservation Service	

2.4 Firsthand experience

Finally, we drew on our own experience. NCAT has conducted over 500 farm and ranch energy audits since 1987. The vast majority of these have focused on irrigation, but we have also recently conducted energy audits for dairies, poultry facilities, rural businesses, and small towns. NCAT currently employs 11 energy engineers who audit commercial, residential, and industrial facilities of all sizes. NCAT is a *RESNET*-accredited HERS Rater Training Provider, offering *Home Energy Rating System (HERS)* training for residential energy auditors. NCAT has also launched an Energy Training for Agriculture Professionals program. (www.entap.org)

Since 1987, NCAT has managed the ATTRA National Sustainable Agriculture Information Service (www.attra.ncat.org), funded by USDA Rural Development. ATTRA's mission includes assisting agricultural producers who are seeking information about reducing input costs, conserving energy resources, and "diversifying operations through new energy crops and energy generation facilities." ATTRA provides technical assistance to agriculture professionals through a toll-free phone service, workshops, newsletters, websites, and over 300 free publications.

3. What is a Farm Energy Audit?

3.1 What is an energy audit?

The term "energy audit" was coined during the 1970s, based on an analogy with financial audits. The word "audit" was chosen, presumably, to emphasize the connection between saving energy and saving money. Energy audits can be extremely simple or highly complex, but all involve two things: (1) a description of current (*baseline*) energy usage, based on an inspection, survey, or inventory of existing energy-consuming processes and equipment, and (2) a description of possible changes or measures that could reduce energy consumption and/or cost.

Perhaps the person who has done most to promote the concept of an energy audit is Albert Thumann, P.E., whose *Handbook of Energy Audits* was written in 1979 and is now in its seventh edition. According to Thumann, an energy audit is basically “a process to evaluate where a building or plant uses energy, and identify opportunities to reduce consumption.” (Thumann, 2008, p. 1)

Thumann currently serves as Executive Director of the Association of Energy Engineers. Since 1981, this organization has trained over 15,000 energy professionals how to perform energy audits, and has certified them as *Certified Energy Managers*.³

Despite these efforts, the term “energy audit” is still unfamiliar to many people. Terms like “energy assessment,” “feasibility study,” and “technical assistance report” are often used interchangeably with “energy audit.” Some energy efficiency programs deliberately avoid the term “audit” altogether, because of negative associations with audits by the Internal Revenue Service.⁴

When people have heard of energy audits, they have most often heard about *home* energy audits offered by many utilities. Throughout its history, the term “energy audit” has been strongly associated with the energy efficiency of buildings. This causes some further confusion about farm energy audits, since many of the energy-consuming processes in agriculture have nothing to do with the buildings on the farm.

3.2 Who conducts and pays for energy audits?



NCAT photo

Some industrial facilities, energy-intensive businesses, and large institutions such as universities or hospitals find it worthwhile to pay for their own energy studies. Smaller energy users, though, usually receive energy audits through utilities.

Around 20 states currently have created *public benefits funds*. These funds usually require *investor-owned utilities* to undertake energy efficiency efforts, typically paid for through small surcharges on their electric customers. Free or discounted energy audits are often included in the energy efficiency services offered by these programs.⁵

Two limitations of public benefits programs are especially important from the standpoint of farms and rural small businesses: First, many farms and rural businesses are served by *rural electric cooperatives* (RECs). These are usually not included in public benefits fund programs, or else their participation is voluntary. Second, public benefits fund programs offered by electric utilities can generally only pay for efficiency measures that reduce *electric* consumption. On many farms, electric costs are minor in relation to the cost of propane, diesel fuel, and natural gas.

Only a small percentage of utilities have their own in-house audit staffs; most utilities contract with third parties to provide these services. There are thousands of companies and independent contractors nationally who offer energy assessment services, although only a very small percentage of these specialize in agriculture. Until recently, the demand for agricultural energy audits was extremely low.

The cost of providing these services also tends to be high in relation to the potential energy savings. Energy consumption is often not large enough to justify the time and cost of sending energy professionals to the farm, especially when the farm is small or in a remote rural location. For this reason, a common arrangement is for companies to send trained but lower-paid *data gatherers* to the farm to collect information. This information is analyzed and a report is produced remotely—by engineers or other energy specialists who do not personally visit the farm.

EnSave, one of the largest for-profit providers of farm energy audits nationally, has frequently partnered with local organizations, including many *Resource Conservation and Development (RC&D) Councils*, for this purpose. EnSave trains RC&D employees and other consultants who gather data and send it to EnSave for analysis.

Energy consumption is often not large enough to justify the time and cost of sending energy professionals to the farm

A recent trend has been for state and non-profit organizations to create and fund their own energy audit programs specializing in serving farms. Most of these (like the utilities) contract with third parties to provide free or low-cost audits to farmers. Some examples are:

- The On-farm Energy Efficiency & Production investment area funded by the Kentucky Agricultural Development Board's County Agricultural Investment Program.
- The Farm Energy Partners Network Energy Audit Program, coordinated by Maine Rural Partners and Efficiency Maine. The Farm Energy Audit Program run by the Michigan Agricultural Electric Council
- The Massachusetts Farm Energy Program run by the Massachusetts Department of Agriculture
- the Farm Energy Audit Program run by the Michigan Agricultural Electric Council
- The North Carolina Farm Energy Efficiency Program, administered by the North Carolina Farm Bureau and funded by the by North Carolina Tobacco Trust Fund Commission.
- The Texas Agricultural Technical Assistance Program overseen by the Texas State Energy Conservation Office

3.3 How are energy auditors trained and certified?

There are several energy audit certification programs, and training can range from a few hours spent online to weeks spent in a classroom. Some energy audit training programs are listed below. Note that none of these focus specifically on agriculture:

- The BOMA Energy Efficiency Program (BEEP) offered by the Building Owners and Managers Association International (<http://www.boma.org/>).
- The BPI Building Analyst Training and Certification for Residential Energy Auditors and Weatherization Professionals, offered by the Environmental Outreach and Stewardship Alliance (<http://eosalliance.org/>) and the Building Performance Institute (<http://www.bpi.org/>).
- The Certified Energy Manager (CEM) training (mentioned above) offered by the Association of Energy Engineers (<http://www.aeecenter.org/>).
- The Energy Audit Training and Certification offered by the Energy Audit Institute (<http://energyauditinstitute.com/>).
- The Home Energy Rating System (HERS) training offered by RESNET—the Residential Energy Services Network (<http://www.natresnet.org/>).

State agencies and non-profit organizations in a few states have also offered highly compressed, one or two-day training workshops on farm energy audits. (Three examples are Maine, Pennsylvania, and Virginia.) These training efforts have not included any kind of certification. Nonetheless, they may be sufficient to enable energy auditors with limited agricultural experience to expand their services into agriculture.

Only Professional Engineers and Certified Energy Managers are qualified to perform energy audits for USDA's REAP program. However, for smaller energy efficiency proposals (with total eligible costs of \$50,000 or less) an *energy assessment* may be performed by a qualified person without these professional credentials. REAP is explained at length in Section 4, including a discussion of the distinction between an energy audit and an energy assessment.

3.4 What levels or types of audits are available?

Thumann distinguishes three main types of audits, at increasing levels of complexity and cost:

A Level 1 (*walk-through*) audit is a tour of a facility where each energy-using system is visually inspected. The auditor evaluates energy consumption data, sometimes compares this to industry averages or *benchmarks* for similar facilities, and creates a list of low-cost energy saving opportunities, with preliminary estimates of possible dollar savings. When these changes are merely possible or hypothetical they are called *energy conservation opportunities* or ECOs. Once they are implemented, they are called an *energy conservation measure* or ECMs.

A Level 2 (*standard*) audit "goes on to quantify energy uses and losses through a more detailed review and analysis of equipment, systems, and operational characteristics." (Thumann, p. 2) This may include on-site energy measurements and testing, standard engineering calculations, and an economic analysis of the recommended conservation measures.

A Level 3 audit includes some computer simulation and a more comprehensive evaluation of energy use patterns. The computer simulation creates an accurate baseline of current consumption, allowing for weather and other variables. By changing variables, the auditor can look at a great number of possible changes and estimate their effect on energy consumption and cost. Here are some other terms and distinctions commonly used to describe audits:

- A *do-it-yourself audit* is conducted by the owner of the facility. The options for agricultural producers to conduct their own energy audits have recently exploded, with the appearance of many dozens of free do-it-yourself energy analysis tools on the Internet.⁶
- A *whole-farm audit* (also known as a *comprehensive* or *holistic audit*) looks at all the energy consuming systems of a farm, and may be contrasted with *operation- or technology-specific* audits (also known as *single-purpose* or *targeted* audits). A common technology-specific audit is an *irrigation efficiency audit*, one that simply looks at the energy efficiency of the irrigation pump, motor (or engine), and distribution system. But in principle, an audit could focus its attention on lighting, heating, cooling, ventilation, or any other individual energy-consuming system or process.
- Likewise, some audit programs target a *specific farm type* (such as dairies, greenhouses, or poultry farms), and may be contrasted with general programs that audit any type of farm.

The options for agricultural producers to conduct their own energy audits have recently exploded, with the appearance of many dozens of free do-it-yourself energy analysis tools on the Internet.

Many utilities, in fact, offer free or low-cost energy audits to all of their business customers, and would be willing to audit almost any kind of commercial or industrial facility.

- Most audit reports focus mainly on reducing energy consumption and cost. But increasingly, audit reports are including opportunities to save water, reduce greenhouse gas emissions, or take advantage of wind, solar, or other forms of renewable energy. The growing world of *environmental auditors* has its own certification processes and professional associations.⁷

3.5 What happens during an energy audit?

Thumann describes a long sequence of tasks that could be included in a full-blown (and expensive) building audit. Many of these tasks would rarely be performed in the case of a farm, but they are included to give a sense of the variety of audits. Designing a farm energy audit program is largely a matter of deciding which of these tasks to include—adapting to the situation and budget constraints at hand.



Pre-site Tasks

- Collect and review utility energy data (generally one to three year's worth).
- Get mechanical, electrical, and architectural drawings for buildings.
- Draw a floor plan of the building, noting energy-related systems.
- Calculate gross square footage.
- Calculate the Energy Use Index in Btu per square foot per year, and compare it with EUIs of similar building types.
- Put together a preliminary list of likely energy conservation measures (ECMs) and operation and maintenance (O&M) measures.

Site Visit Tasks

- Prior to the visit, meet with the building manager to review energy consumption profiles and discuss occupancy schedules, operation & maintenance procedures, future plants, etc.
- Review the preliminary list of ECMs and O&Ms as you walk through the building, noting problems or additional opportunities.
- Take photographs to document existing conditions.

Post-Site Tasks

- Review and clarify notes and add information.
- Conduct preliminary research on potential conservation measures, noting conditions requiring further evaluation by an engineer or other specialist.
- Organize all charts, graphs, building descriptions, audit data sheets, notes, and photos into a 3-ring binder.

Audit Report

- A full-blown report would include an Executive Summary, building information, a utility summary showing monthly energy consumption, a list of energy ECMs and O&Ms, and appendices with floor plans, site notes, photos, forms, equipment inventories, and so on.

- The explanation of each energy conservation measure would include estimated cost, savings, and at least a simple payback calculation. More detailed financial analysis could include net present value of energy conservation investments or life cycle cost analysis.

3.6 How is auditing a farm different from auditing a home?

Three differences are especially important to keep in mind:

1. Farms are more diverse than residential buildings in their energy-using equipment and methods. Some farm types are much more *energy-intensive* than others. The issues for dairies, poultry houses, greenhouses, and irrigated agriculture (to mention just a few examples) are very different from each other, and auditors would need specialized training and equipment for each of these.
2. Farms are more “holistic” than homes, in their use of energy. In a home, most energy decisions are relatively simple, based on tradeoffs between cost, comfort, and convenience. On a farm, by contrast, changes in any one energy-using system are likely to require changes in other operations. Many factors besides cost come into play. To name one example, some farms are more concerned about energy reliability than they are about energy cost.
3. Farms are business enterprises; people depend on them to make a living. This means, for example, that farms may be less willing than the average homeowner to try unfamiliar or unproven energy alternatives.



3.7 Are there standard procedures for auditing a farm?

Until recently there have been few if any standard procedures or protocols for conducting energy audits on farms and ranches. In the summer of 2009, the *American Society of Agricultural and Biological Engineers* (ASABE) developed and published a standard “to support energy audits of all types of farming operations typically found in North America.” This standard includes minimum and recommended procedures for documenting baseline conditions and presenting recommended alternatives, as well as a discussion of certification. The standard also suggests major energy-consuming activities and components to be evaluated, for at least the following eight different farm enterprises: dairy, swine, poultry, beef/veal, field crops, fruit/vegetables, aquaculture, and nursery/greenhouse.

Conformance to ASABE standards is generally voluntary, and it remains unclear how, if at all, these standards will be incorporated into REAP and other federal programs. For more information about the ASABE standard, visit <http://www.asabe.org/> or contact the American Society of Agricultural and Biological Engineers, 2950 Niles Rd, St. Joseph, MI 49085.

3.8 How much does a farm energy audit cost?

The cost of energy audits varies widely, and is largely determined by the labor hours and skill level of the people employed. In the case of farms in remote rural locations, travel time to and from the facility can be a very significant cost factor. Report preparation time can be as low as zero, for walk-through audits. On the other hand, the cost of preparing a glossy report with lots of photographs, charts, and tables will be substantial.

Most of the programs interviewed for this report did not provide cost-per-audit dollar numbers. And even when these numbers are provided, they may be highly misleading, without a close scrutiny of the services provided and the costs are included in the calculation. Comparing costs between programs raises numerous “apples and oranges”-type problems.

Nonetheless, here are a few points of reference:

- Southern California Edison’s large pump testing program conducted around 6,500 pump tests in 2008, at an average cost of \$320 per test. The company’s “whole farm audit” program is fairly new, and average cost-per-audit numbers are not available.
- The Pacific Gas and Electric Company (PG&E) Agricultural Pumping Efficiency Program reported an average cost of \$150 to \$170 per subsidized pump test.
- PG&E also reported an average cost of \$15,000 - \$20,000 per audit for its Integrated Audit program. Targeted mainly to larger customers with electric demand exceeding 200kW, integrated Audits include energy efficiency opportunities, time of use management, demand response opportunities, and renewable energy information. PG&E has conducted these audits at dairies, wineries, food processors, packing houses, millers and canners.
- According to EnSave’s website, for a REAP audit EnSave currently (in 2009) charges 1.25% of the total project cost, with a minimum charge of \$1,250. 50% of the fee or \$1,250, whichever is greater, is due at time of audit delivery, with any balance due upon grant or loan approval. If the grant or loan is not approved, no further payment is required.
- The scoring for the new (in 2009) REAP *Energy Audits and Renewable Energy Development Assistance* competition awards 15 points to programs that conduct audits at an average cost of \$1,000 or less; 10 points if the average cost is between \$1,000 and \$1,499; and 5 points if the average cost is between \$1,500 and \$2,000.

Based on these reports, it appears that a simple pump test commonly costs a few hundred dollars, while a basic farm energy audit—suitable for the REAP program—would typically cost \$1,000 to \$2,000. The cost of auditing a large farm or rural business would often be much higher, as much as tens of thousands of dollars.

3.9 Other energy efficiency methods and approaches

Farm energy audits are by no means the only way to promote energy efficiency in agriculture. Most efficiency programs also provide other services and incentives. These may include:

- grants
- loans
- tax credits and deductions
- demonstrations
- pilot projects
- rebates for specific pieces of equipment (sometimes called *prescriptive* incentives) sales incentives (also known as *spiffs*) for dealers who sell energy-efficient equipment
- awareness campaigns via radio, television, Internet, or print media
- benchmarking: determining industry-wide averages that allow quick ballpark comparisons
- workshops
- educational publications
- training for agency staff or agricultural organizations
- websites and on-line tools
- toll-free phone technical assistance lines
- recognition and publicity for innovations or outstanding accomplishments

It appears that a basic farm energy audit—suitable for the REAP program—typically costs \$1,000 to \$2,000.

Many of these approaches cost far less than conducting energy audits. In fact, sending a trained professional to visit individual farms is one of the highest-cost approaches. As one utility representative said, “It doesn’t have to be a high cost issue. If you’re a grower, it’s usually sprinklers and pumps. If you’re a food processor: motors, fans, lighting. The issues are very specific but it’s not rocket science.”

“If you’re a grower, it’s usually sprinklers and pumps. If you’re a food processor: motors, fans, lighting. The issues are very specific but it’s not rocket science.”

4. The Role of Energy Audits in USDA Programs

4.1 What is the Rural Energy for America Program (REAP)?

The Rural Energy for America Program (REAP) is a competitive grant and loan program administered by USDA Rural Development. Authorized by the Section 9007 of the 2008 Farm Bill, REAP is a continuation of a program that was created in Section 9006 of the 2002 Farm Bill. Officially titled the Renewable Energy Systems and Energy Efficiency Improvements Program, it was more commonly known as the “Section 9006 Program.”⁸

REAP is a complicated program, whose rules have changed frequently from year to year. The discussion in this report is by no means comprehensive, and potential applicants should always consult the latest instructions from USDA Rural Development. The official REAP web site is at www.rurdev.usda.gov/rbs/farmbill/index.html. For frequently updated information about the program, a highly recommended source of information about REAP is the Farm Energy web site maintained by the *Environmental Law and Policy Center*: <http://farmenergy.org>.

In each state, Rural Development has designated a Rural Energy Coordinator who can answer questions about REAP. A list of Rural Energy Coordinators is available at www.farmenergy.org, www.rurdev.usda.gov/rbs/farmbill/, or in NCAT’s Directory of Energy Alternatives: <http://attra.ncat.org/dea>.

REAP provides grants and loan guarantees for both energy efficiency projects and renewable energy projects. Grants may be up to 25 percent of total eligible project costs. Energy efficiency grants can range from \$1,500 (the smallest grant) up to \$250,000. Renewable energy grants can range from \$2,500 to \$500,000. Loan guarantees (for either energy efficiency or renewable energy projects) may be up to 75 percent of total eligible project costs, and can range from \$5,000 to \$25 million. It is also possible to receive both a grant and a loan guarantee for the same project—commonly known as a “combo.”

Beginning in 2009, REAP is also offering grants for energy audits, renewable energy *feasibility studies*, as well as other technical assistance provided by third parties such as rural electric cooperatives, conservation districts, colleges, and universities.

USDA Rural Development administers REAP in partnership with the *National Renewable Energy Laboratory (NREL)*, part of the U.S. Department of Energy. NREL conducts technical review of many REAP applications and works with USDA on program design.⁹

The 2008 Farm Bill set mandatory funding for the program at \$255 million over the four-year period from 2009-2012, an average of almost \$64 million per year. This represented a near-tripling of the previous annual funding level for this program.

Eligibility is limited to “agricultural producers” and “rural small businesses.” The exact definition of each category is somewhat complicated.¹⁰ But “rural” generally means a community with fewer than 50,000 people, not located in a larger urban area. “Small businesses” are defined by the number of employees and average annual sales, and vary depending on the type of business (wholesale, retail, service, manufacturing, mining, or construction).¹¹

REAP is often viewed, mistakenly, as strictly an agricultural program. It is true that, of the 2,025 REAP projects funded from 2003 to 2008, 1,305—almost two thirds—were submitted by agricultural producers.¹² On the other hand, according to the U.S. Small Business Administration, over 99 percent of all businesses in America meet the agency’s definition of “small.” So the vast majority of businesses in America’s smaller towns (those with fewer than 50,000 people) are eligible to apply for REAP funding. Out of 27.2 million small businesses in the US in 2007, roughly 20 percent of these—5 to 6 million small businesses—meet this definition of “rural.”¹³

The vast majority of businesses in America’s smaller towns (those with fewer than 50,000 people) are eligible to apply for REAP funding.

4.2 The role of energy audits in REAP

Some frequently asked questions about the role of energy audits in the Rural Energy for America Program (REAP) are addressed below.

What is Rural Development, and why is this agency funding energy projects?

USDA’s Office of Rural Development is one of seven main program areas within USDA, and runs programs intended “to increase economic opportunity and improve the quality of life for all rural Americans.” Rural Development was created through a reorganization of USDA agencies in 1994, and superseded the Rural Development Administration created by the 1990 Farm Bill. Rural Development has three operating units: the Rural Business-Cooperative Service, the Rural Housing Service, and the Rural Utilities Service.

REAP is a Business Program within the *Rural Business-Cooperative Service* (RBS) program area. The mission of RBS is to “provide leadership in building competitive businesses including sustainable cooperatives that can prosper in the global marketplace.”

In understanding REAP, it is important to keep this mission in mind. Environmental organizations have rallied in support of REAP, as a flagship federal program that is promoting energy efficiency and renewable energy. But REAP is, first and foremost, a business development program, intended to increase economic opportunities in rural areas.

When is an audit required?

Under the current (2009) REAP rules, energy audits are required for energy efficiency improvement projects with total eligible project costs greater than \$50,000. For energy efficiency projects with total project eligible project costs of \$50,000 or less, a less rigorous *energy assessment* is required. The difference between an “audit” and an “assessment” is discussed below.

A project with total eligible costs of \$50,000 could receive a REAP grant of, at most, 25 percent of this amount or a loan of, at most, 75 percent of this amount. So in effect, Rural Development requires an audit whenever a grant request for an energy efficiency project exceeds \$12,500, or whenever the agency is being asked to guarantee a loan of more than \$37,500.

Note that energy audits are required for energy efficiency projects only. USDA Rural Development uses a different term—*feasibility study*—for the kind of energy study that is required for renewable energy projects.

Is there an advantage in having an audit for a smaller energy efficiency project, even though only an assessment is required?

Yes. There are three reasons for this. First, the REAP scoring rules automatically award 5 bonus points to energy efficiency applicants who have an audit even though their total eligible project costs are \$50,000 or less. Second, a professional audit would very likely strengthen the applicant's technical report, which is worth up to 35 points. Third, the competition for REAP funds has become more intense.



NCAT photo

What is the basic purpose of energy studies in REAP?

The basic purpose of energy studies within REAP—audits, assessments, and feasibility studies—is to “provide adequate and appropriate evidence of energy savings expected when the system is operated as designed.”¹⁴ In other words, these energy studies are part of the applicant's burden of proof, providing assurance that public money is being spent appropriately.

Note that REAP is, in this respect, quite different from many utility energy efficiency programs. Instead of seeing audits as an obligation for consumers, utilities frequently view audits as a valuable—usually free or subsidized—service provided to customers.

Who pays for the energy audit or assessment?

Applicants are generally responsible for paying for their own energy audits or assessments. There are important qualifications and exceptions to this rule, however:

- The applicant is allowed to include the cost of the energy audit or assessment as an eligible project cost. This means that if the proposal is successful, the applicant may recover up to 25 percent of the cost of the energy study.
- As already noted, a growing number of state and local organizations offer subsidized or free audits that meet the requirements of REAP.
- In 2009, Rural Development added a new technical assistance program to REAP. This competitive grant program funds a variety of public and educational organizations to conduct energy audits. This program funds up to 75 percent of the cost of the energy audit; the recipient is required to pay at least 25 percent.¹⁵
- In 2009, Rural Development also added a new renewable energy feasibility study funding program to REAP. This competitive grant program funds up to 25 percent of the “eligible project cost” of a potential applicant's feasibility study.

How is an energy audit different from an energy assessment?

An energy audit is more rigorous than an energy assessment, and is required for energy efficiency proposals with total eligible costs over \$50,000.

Rural Development defines an *energy audit* this way:

A report conducted by a Certified Energy Manager or Professional Engineer that focuses on potential capital-intensive projects and involves detailed gathering of field data and engineering analysis. The report will provide detailed project costs and savings information with a high level of confidence sufficient for major capital investment decisions. It will estimate costs, expected energy savings from the subject improvements, and dollars saved per year. The report will estimate weighted average payback period in years.¹⁶

Rural Development defines of an *energy assessment* this way:

A report conducted by an experienced energy assessor, certified energy manager or professional engineer assessing energy cost and efficiency by analyzing energy bills and briefly surveying the target building, machinery, or system. The report identifies and provides a savings and cost analysis of low-cost/no-cost measures. The report will estimate the overall costs and expected energy savings from these improvements, and dollars saved per year. The report will estimate weighted-average payback period in years.

The Technical Report worksheets from NREL gives additional clues about the differences between audits and assessments. This explanation is reproduced in full in Appendix I.

Based on these explanations, there appear to be three main differences between an energy assessment and an energy audit:

1. **Qualifications:** An audit must be conducted by a Certified Energy Manager or a Professional Engineer. An energy assessment may be conducted by either of the above, but also by an “experienced energy assessor.”
2. **Field data:** An audit requires “detailed gathering of field data”; an assessment does not.
3. **Engineering analysis:** Required for an audit but not required for an assessment.

Note, however, that many of the key terms above—“field data,” “engineering analysis,” and “situation report”—are not defined precisely by Rural Development. What it means to “conduct” an audit (as opposed to overseeing or supervising one) is not spelled out precisely either. Practically speaking, the clearest requirement is that without a P.E. or CEM signature, a proposal for an energy efficiency project with total eligible costs over \$50,000 would likely be disqualified.¹⁷

Are utility employees who are not P.E.s or CEMs allowed to perform audits?

The answer to this question is not clear. Although the REAP rules state that only P.E.’s and CEMs are allowed to perform audits, the “Small Project Energy Efficiency Technical Worksheet” from NREL (reproduced in Appendix I) appears to describe a third option: “An energy audit may also be performed by the local utility.”¹⁸

Since Professional Engineers and CEMs are clearly eligible to perform audits—whether or not they work for utilities—this statement seems to imply that utility employees without either of these professional credentials may perform audits. Although allowing utilities to conduct audits would immediately improve the availability of REAP funds, not everyone agrees that this would be a good idea. One energy efficiency program manager asked: “Can you trust the utility to do a good energy audit? Are they really in business of saving energy? Many utilities wouldn’t have the knowledge basis to do a good job.”

How does the audit or assessment affect the proposal score?

Every proposal includes a technical report, worth up to 35 out of a total of 130 possible points in an energy efficiency grant proposal, or 115 possible points in an energy efficiency loan proposal.¹⁹ The audit (or assessment) has been called the “backbone” of the technical report: crucial to proving the technical feasibility of the project and establishing beyond doubt that the improvements being proposed are eligible for funding.²⁰

Even though an energy audit is not required for smaller projects, it is recommended by many who are familiar with REAP. For projects costing \$50,000 or less, having a professional energy audit automatically adds 5 bonus points to the applicant’s score, and would also very likely strengthen the technical report.

On the other hand, merely having a signature from a P.E. or CEM obviously does not guarantee a good score if the technical report is poor.

How do energy savings affect the proposal score?

Under the latest (May 2009) guidelines available at the time of this report, “Energy replaced or saved” counts for just 15 points out of 130 possible points in a REAP energy efficiency grant proposal, or out of 115 possible points in an energy efficiency loan proposal. In general, the scoring system gives relatively little weight to the quantity of energy saved or to the energy return on each dollar invested. Scoring is heavily weighted towards well-designed and cost-effective projects that are submitted by applicants who are ready to build.

The low weight given to energy savings may be surprising. Two points help to put this in perspective, however. First, a proposal with low energy savings would likely score poorly in some other categories too (such as “Return on Investment” and “Environmental Benefits.” Second—as already noted—REAP is, first and foremost, a business development program.

“Energy replaced or saved” counts for just 15 points out of 130 possible points in a REAP energy efficiency grant proposal.

Is a comprehensive (whole farm) energy audit required?

No. NREL recommends that the technical analysis section of an audit report should contain “a description of interactions with dependent systems,”²¹ for purposes of accurately estimating technical feasibility, energy savings, and paybacks. But meeting this requirement would not generally (or even usually) require studying all energy flows and systems on the farm.

Does the auditor need to visit the site?

Rural Development says that a REAP energy audit must be “conducted” by a Professional Engineer or Certified Energy Manager, and requires “detailed gathering of field data.” But there is no requirement that the responsible Professional Engineer or Certified Energy Manager must visit the farm or business being audited. As noted earlier, many audit providers use trained *data gatherers* for farm visits. In these cases the P.E. or CEM oversees the data gathering, data analysis, and report production.

Does an auditor who is a Professional Engineer need to be licensed in the state where the audit takes place?

Rural Development has not imposed any such requirement, although states and professional organizations may have their own requirements. Neither does Rural Development require Profes-

sional Engineers to put their professional stamp on the audit report. Engineers commonly sign REAP audit reports for projects taking place in states where they are not licensed.

Are applicants allowed to gather their own data?

Rural Development has not ruled this out, although reviewers would certainly score the technical report lower if they had doubts about the reliability of the data gathered. In the case of energy assessments, it appears to be a common practice for applicants to provide some or even all of their own data. In its guidance, NREL suggests that for an energy assessment, “manufacturer’s specification sheets that show anticipated energy savings” would at least sometimes suffice.²²

Rural Development requires audit reports to be *written* by an “independent third party,” but there is no such requirement for energy assessments.

4.3 USDA Natural Resources Conservation Service (NRCS) Programs

Another USDA agency that has given energy audits a prominent place in its programs is the USDA Natural Resources Conservation Service (NRCS). Unlike REAP, which is primarily an economic development program, NRCS programs are focused on conserving five main kinds of natural resources: soil, water, air, plants, and animals. Energy has recently become more prominent in NRCS programs, and it has often been linked to these five priority areas, especially through connections to air quality and climate change.²³ More broadly, NRCS has taken an interest in maintaining the viability and sustainability of farming operations in a world where fossil fuels are likely to become more scarce and expensive.

From 2004 to 2008, the NRCS Conservation Security Program (CSP) offered one-time Enhancement payments of up to \$500 to eligible agricultural producers who hired a professionally qualified auditor to obtain a farm energy audit.

NRCS has also funded a number of farm energy audit programs and efforts through its Conservation Innovation Grant program. Examples have included the Massachusetts Farm Energy Program (2007), Maine Farm Energy Partners Network (2007), EnSave Farm Energy Audit training efforts in New Jersey and Montana (2008), and development of Internet-based farm energy calculators by a team in Wisconsin.

NRCS has also developed its own series of Energy Consumption Awareness Tools for farmers and ranchers. These tools are available at <http://energytools.sc.egov.usda.gov/>.



NCAT photo

In 2009, the NRCS Environmental Quality Incentives Program (EQIP) in a few states began offering payments to assist agricultural operations in developing Agricultural Energy Management Plans. This program includes payments for certain farm energy audits.

5. How Available Are Farm Energy Audits?

Farm energy audits are still difficult to arrange in most rural parts of America, although availability is improving.

5.1 How many states have farm energy audit programs?

This question is difficult to answer, since there is no clear definition of a “farm energy audit program.” For one thing, the term “farm” blurs over into food processing and other food-related industries. Irrigation efficiency programs are another gray area. Although these programs serve many hundreds of agricultural producers each year, they may or may not be counted as “farm energy audit programs,” since:

1. Irrigation efficiency programs typically do not look at other energy-using systems on the farm. In fact, many of these programs only at the energy efficiency of the *pumping plant*, without considering the efficiency of the irrigation *distribution system*—the sprinklers, piping, and other parts of the delivery system.
2. Utility-run pump testing programs are typically available to a broad range of non-agricultural customers.
3. Some irrigation efficiency programs emphasize water conservation more than energy conservation.

Including irrigation efficiency programs, NCAT identified 27 states with current or recent programs that (a) are exclusively or primarily focused on providing energy audits to agricultural producers and (b) appear to be suitable for the REAP program. These states are Alabama, Arkansas, California, Colorado, Florida, Idaho, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Montana, Nebraska, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Texas, Vermont, Virginia, Washington, and Wisconsin. We heard about other states, such as Missouri, that were organizing farm energy audit programs too.

Although over half of the 50 states have had some kind of farm energy audit program, it should be noted that the availability of audits in most of these states is limited or nonexistent. Around half of these states do not appear to have an active program, and many of the active programs serve just a few counties. Also, many of these states have extremely limited capacity of their own to conduct farm energy audits. Several states have simply contracted with for-profit companies, mainly the Vermont-based company EnSave, to provide audit services. EnSave has been involved in at least 24 of the 27 states above. As of January 2009, EnSave reported present or pending activities and programs in 13 states and past programs in an additional 11 states.²⁴



NCAT photo

On the other hand, audits are available in many states that do not have an officially designated farm energy audit program. For example, many utilities routinely offer free or discounted energy audits to all of their business customers, including their agricultural customers. Well-known utility-run audit programs with agricultural expertise include Alliant Energy, Bonneville Power, Nebraska Rural Public Power District, Pacific Gas & Electric, and Southern California Edison.

Besides utilities, energy audit programs with a special focus on agriculture are also sometimes organized or coordinated by:

- **State departments of agriculture:** such as the On-farm Energy Efficiency & Production program offered by the Kentucky Governor's Office of Agricultural Policy, or the Massachusetts Farm Energy Program run by the Massachusetts Department of Agriculture
- **State energy offices:** such as the The Texas Agricultural Technical Assistance Program overseen by the Texas State Energy Conservation Office
- **Agricultural organizations:** such as the North Carolina Farm Energy Efficiency Project run by the North Carolina Farm Bureau, or the Farm Energy Audit Program run by the Michigan Agricultural Electric Council
- **State public benefit corporations:** such as the Dairy Farm Efficiency Services program offered by Efficiency Vermont, or the New York Energy Smart Energy Audit Program offered by the New York State Energy Research & Development Authority
- **Regional utility-funded efficiency organizations:** such as the Scientific Irrigation Scheduling Initiative funded by the Northwest Energy Efficiency Alliance, from 1997 to 2000.
- **Resource Conservation Districts** in many states, often in coordination with EnSave.
- **Other non-profit organizations:** such as the Farm Energy Partners Network and energy audit training offered by Maine Rural Partners

As noted earlier, there are thousands of companies and independent contractors nationally who offer energy assessment services. Although only a small percentage of these have experience working with agriculture, many of them could fairly easily move into the agricultural sector. A utility representative from California commented, "It's possible that a state like Georgia doesn't have expertise. But there *have* to be consultants with the expertise. In California, every third person is a consultant."

5.2 What about do-it-yourself energy audits?

As an alternative to a site visit by an energy professional, do-it-yourself energy assessment and decision-making tools have an obvious appeal. Dozens of these tools have recently appeared on the Internet. In 2007 and 2008, NCAT identified about 75 Internet-based do-it-yourself energy tools relevant to agriculture. NCAT staff studied 32 of these in detail and chose 23 for testing and review by agricultural producers.

The agricultural producers who served as reviewers found most of the tools user friendly and useful, but they were skeptical about the reliability of the tools and tended to use them in a casual and exploratory way. For many reasons—including the lack of reliable cost and payback information and the complexity of farming operations—the reviewers generally viewed these tools as inadequate to motivate or justify changes in their own behavior.

Among other limitations, do-it-yourself tools have a hard time taking a broad look at farming operations, getting beyond a snapshot in time, encouraging innovation, and providing current costs. In all of these ways they tend to be inferior to an on-site audit by an energy professional. Nonetheless, NCAT found that, when appropriately focused and skillfully designed, agricultural energy calculators are promising awareness and educational tools that perform some tasks extremely well and deserve further exploration and development. For full discussion, see the 2009 NCAT report "Farm Energy Calculators: Evaluations and Recommendations." (Morris, 2009)

5.3 REAP awards and accessibility

The difficulty of arranging farm energy audits is often cited as a major factor limiting access to REAP grants and loans. This raises concerns about whether REAP is meeting the basic requirement of fairness that federal grant and loan programs should be available to all who are eligible.

In the first several years of the REAP program, a handful of states have won the vast majority of grants and loans awarded. For example, from 2003 to 2008, Nebraska won about 481 grants, Iowa won 245, Minnesota won 171, and Mississippi won 115. During the same six-year period, some other important agricultural states won very few awards. For example, Florida won only 1 grant, Texas won 6, and California won 13.²⁵

In the first several years of the REAP program, a handful of states have won the vast majority of grants and loans awarded.

The poor availability of energy audits has certainly been one barrier limiting access to REAP, but there are other barriers too. These include:

- The lengthy and extremely complicated application process. For example, the basic instructions are 159 pages long. The application process—even in the case of “simplified” applications—requires submitting at least 11 forms. Some application materials are extremely difficult to find, and USDA Rural Development’s website is not very user friendly.
- The limited availability of grant writers.
- Low familiarity with the program. Rural Development offices in some states are far more aggressive and effective than others.
- The up-front cost of paying for an energy study and/or a grant writer, frequently amounting to thousands of dollars.
- The availability of utility-run incentive programs that are easier to access than REAP. For example, a representative from PG&E commented that the utility has been offering free energy audits for around 30 years. Customers tend to see PG&E as “the default place to find money,” while REAP is viewed as “onerous to apply for.” Likewise, an audit provider in Wisconsin commented that funding was much easier to get through the Focus on Energy program than through REAP.

5.4 New programs to improve access to REAP funding

In 2009, Rural Development took significant steps to increase the availability of energy audits and to help states that have historically had low success rates.

First, USDA allocated almost half of all REAP funds (46 percent) to the states. Previously, all applicants competed against each other in a single national competition. Under this new arrangement, each state’s Rural Development office will control its own allocation of funds.

Second, Rural Development set aside 20 percent of all REAP funds for small grants of \$20,000 or less, and awarded 10 extra points to grant proposals meeting this size limit.

Third, Rural Development rolled out a new Energy Audit and Renewable Energy Development Assistance program that, among other things, will directly fund organizations to provide energy audits.²⁶ These grants are awarded on a competitive basis and can be up to \$100,000. Recipients of an energy audit are required to pay at least 25 percent of the cost of the audit. Four kinds of organizations are eligible to apply for funding to provide audits: (i) units of State, tribal or local government; (ii) land-grant colleges, universities, or other institutions of higher education; (iii) rural electric cooperatives; or (iv) public power entities.

5.5 A state model of success: Iowa

Iowa has been one of the most successful states in competing for REAP funds. For example, in 2008, 173 applications were submitted to Iowa Rural Development and 167 of these were selected for funding—a 96.5 percent success rate. Iowa's success in the REAP competition has depended on several ingredients, and on the cooperation of various organizations. Other states could certainly learn imitate Iowa's approach.

In 2008, 173 applications were submitted to Iowa Rural Development and 167 of these were selected for funding—a 96.5% success rate.

Investor-Owned Utilities

Iowa's two investor-owned utility companies, MidAmerican Energy and Alliant Energy IPL (Iowa Power and Light), both offer audits to their residential and non-residential customers. Alliant serves more rural communities than MidAmerican, and since 2004 Alliant has had two to four staff members trained to perform farm energy audits.

Alliant did just eight or nine audits for the Section 9006/REAP program in 2005, and 15 in 2006. But in the third year (2007), the audit program took off. Alliant conducted over 90 REAP audits in 2007 and around 100 in 2008.

As an electric utility, Alliant is generally not allowed to audit LP gas systems. One key to Alliant's success has been finding a way to include calculations of LP gas usage in its audits, in order to make the audits suitable for REAP. The Iowa Utilities Board has allowed Alliant to charge customers for the gas portion of the audit only. Alliant has also developed relationships with experienced REAP grant writers, so that it can send a copy of the audit directly to the grant writer.

The result has been an extremely valuable and popular service for Alliant agricultural customers, making it much easier for them to apply for REAP funding. An Alliant representative commented: "If we can help them get a 25 percent grant, and it costs us very little to do it, and we can follow up with a rebate (which may cover the audit cost), it's a great way for us to promote energy efficiency."

Municipal Utilities and Rural Electric Cooperatives

Each of Iowa's Rural Electric Cooperatives (RECs) and *municipal utilities* has its own efficiency program. The 39 RECs, which serve most of Iowa's farmers, offer a wide range of programs, but most of their audit programs are organized under the seven *generation and transmission cooperatives* (G & Ts) of which the RECs are members.

Audit Providers

Although, as noted, Alliant Energy has its own auditors, a handful of firms handle the on-site audits for most Iowa utilities. These include two consulting firms based in Des Moines, the Energy Group and A-Tec, as well as the national company EnSave. Some smaller companies also offer these services, as do a few RECs like Consumers Coop in Marshalltown.

Kelly Needles, Vice President of the Energy group, reports that his company conducts nearly 100 farm audits each year, focusing primarily on electric and gas usage. These projects are mostly referrals from RECs, with some referrals also coming from county economic development offices or banks.

Iowa USDA Rural Development

The Iowa office of USDA Rural Development has been extremely aggressive in promoting the Section 9006/REAP program. On its website, Iowa USDA Rural Development offers:

- A list of Iowa energy auditors: www.rurdev.usda.gov/ia/rbcs_Energy_Auditors.pdf
- A list of Iowa energy consultants: www.rurdev.usda.gov/ia/rbcs_Energyconsultants.pdf
- A thorough explanation of REAP rules, application procedures, and scoring: www.rurdev.usda.gov/ia/rbcs_RE-EE_Section_9006.html
- Templates to simplify the application process
- A list of successful Iowa applicants from previous years
- A list of grant writers: www.rurdev.usda.gov/ia/rbcs_grant_writers.pdf
32 grant writers were listed, as of July 2009.
- Sources of matching funds, technical assistance, and help preparing financial information

State Organizations

Because they understand the need for energy audits to qualify for the Rural Energy for America Program, organizations like the Iowa Department of Natural Resources, Iowa State University Extension, Iowa Farm Bureau, the Iowa Farmers Union and the Iowa Energy Center all work with farmers to promote farm energy audits.

“Cookie-Cutter” Proposals

The majority of the energy efficiency projects funded through REAP in Iowa have been grain dryer upgrades. In 2008, 125 of the 173 REAP applications submitted to Iowa Rural Development were for energy efficient grain dryers. Because most grain dryer proposals are fairly similar, grant writers in Iowa know what information to include and are able to cut and paste the same information into many of their proposals.



NCAT photo

6. How Useful Are Farm Energy Audits?

In 2004, the American Council for an Energy Efficient Economy surveyed agricultural energy efficiency programs nationally and found only two “audit-only” programs that were “targeted at, or largely used, by agriculture.” The authors noted that audits, in and of themselves, had an unimpressive track record for saving energy:

“Program reviewers reported few tangible savings resulting from these programs on their own...Although farm audits offer a lot of opportunity, an audit program without structured follow-up and/or financial incentives will not make its value clear to farmers.”²⁷

Five years later, there are dozens of “audit-only” programs nationally focusing on the agricultural sector, and the number is growing. In interviews, NCAT asked agricultural producers, utility representatives, and energy program managers to comment on the usefulness of farm energy audits: Do agricultural producers actually want energy audits? Will they pay for them? And how often do they act on the recommendations they receive?

Perhaps because of the recent flurry of news stories about a “farm energy crisis,” many people seem to assume that farmers and ranchers are desperate to have professional energy audits. The people interviewed for this report painted a very different picture, however. Consistently, they portrayed the demand for farm energy audits as modest or weak, driven largely by a desire to seek federal grants and loans through the REAP program.

6.1 Comments from agricultural producers

In the fall and winter of 2008, NCAT gathered some limited and anecdotal information from agricultural producers.

First, we conducted one-hour interviews with twelve agriculture producers from seven states, as described on pages 3-4. The comments from this small sampling of agricultural producers consistently reflected a low interest in having a professional energy audit. For example, all twelve producers said they would rather use a do-it-yourself tool than have a professional audit that included a site visit.



NCAT photo

A few representative comments:

- “An auditor would not be especially helpful. The changes are too big. It depends on what this engineer is capable of doing and if he can look at the whole operation as one unit or only look at one piece of it.”
- “I have been in this business since 1977 and I have learned things by the seat of my pants. And in some ways that’s better than having someone try to tell you what to do.”
- “I think a lot of farmers maybe feel like when a professional comes out that they’re telling them how to run their operation.”
- “We try to keep up to date and know what we’re doing. We would never pay someone to come out to do that (an energy audit).”
- “Part of the problem with the energy audit is that they would have to focus on certain types of farming operations. Since my operation would be entirely different (small scale vegetable and poultry), they wouldn’t be able to give me the types of details that I want.”
- “From my perspective farmers are very independent. The ones who wouldn’t go online to begin with wouldn’t care to throw money at an audit.”

“We try to keep up to date and know what we’re doing. We would never pay someone to come out to do that (an energy audit).”

In the spring and summer of 2008, NCAT included a number of questions about energy audits in a survey that was mailed to 276 Montana farmers and ranchers. One question asked, “What would be the most important factor to you in deciding whether to have a farm energy audit?” Of the 28 people who answered this question, 18 said “Cost,” 13 said “Qualifications and skill of the audit provider,” 11 said “Convenience,” and 4 said “Under no circumstances would I consider a farm energy audit.”

Another question asked, “If an energy audit could provide you information on any of the items you marked important or very important [in response to an earlier question], how much would you be willing to pay for an energy audit?” Of the 24 people who replied to this question, six marked “Zero,” four marked “Less than \$100,” 11 marked “\$100-\$299,” and three marked “\$300-\$499.” No one marked any of the following options: \$500-\$799, \$800-\$999, \$1,000-\$1,199, or \$1,200-\$1,500.

As noted earlier, professional audit providers commonly charge \$1,200-\$1,500 for a basic farm energy audit. So these results suggest that there is a wide gap between what Montana farmers and ranchers are willing to pay and what an energy audit actually costs.

6.2 Comments from utilities

Even if many agricultural producers are not especially eager to have energy audits, over time programs that establish a reputation for excellent services can become popular. Utility-run audit programs have become quite successful in certain parts of the country, and for certain kinds of agricultural operations. For example:

Over time farm energy audit programs that establish a reputation for excellent services can become popular.

- GDS Associates reports doing hundreds of farm visits and agricultural projects each year for Wisconsin's Focus on Energy program, mainly (but not exclusively) to dairy farms. A 2007 survey found that 76 percent of customers were "very satisfied" with the program.²⁸
- Alliant Energy reports conducting around 250 farm energy audits from 2005 to 2008, with a staff of four agricultural energy efficiency specialists. The great majority of these audits were conducted for farms interested in applying for REAP funding.
- As noted earlier, Southern California Edison's pump testing program conducted around 6,500 pump tests in 2008—although this number includes many non-agricultural customers.
- From 2002 through 2008, PG&E's Agricultural Pumping Efficiency Program performed 12,900 subsidized pump efficiency tests: an average of 1,840 per year.

On the other hand, the utility representatives interviewed for this report voiced many concerns about farm energy audits:

- Compared to programs in other sectors, agricultural efficiency programs are viewed as expensive and time-consuming. Reaching the farm may require a lot of "windshield time." Communication is often difficult too, since farmers and ranchers are extremely busy and hard to reach, especially during the growing season.
- Agricultural customers are seen as having a low-to-moderate level of interest in energy efficiency. Utilities typically charge their agricultural customers little if anything for conducting an energy audit; it is usually a free service. One California utility representative said, "For our agricultural customers, energy efficiency is not a big deal to them...absolutely not a priority." Another utility representative from California said, "Ag is a hard market to reach....Energy efficiency is not a high priority for these customers. Markets are everything. Unless you are very energy intensive (such as a winery with extensive refrigeration or a tomato processor), energy is a secondary concern."
- Available energy-savings are seen as modest. Especially in the case of smaller farms, energy consumption may be too low to justify the expense of a full-blown professional audit. Other kinds of commercial and industrial facilities frequently often offer greater energy savings per dollar or unit of effort than farms do.
- The rate of follow-through and implementation is perceived as low, at least in the absence of coordinated efforts that accompany the audit itself. Agricultural customers are often described as cash-strapped and conservative. One energy efficiency program representative told us, "We used to do farm energy audits but we finally came to our senses and put a stop to it. When I started here we had boxes of audit reports that were completely worthless...They resulted in hardly any measures being implemented at all."
- While acknowledging the problem of low rates of follow-through and implementation, one utility representative pointed to the longer term educational benefits of audits: "You never

"For our agricultural customers, energy efficiency is not a big deal to them...absolutely not a priority."

"We used to do farm energy audits but we finally came to our senses and put a stop to it."

know...even if they don't do something that year, you've got that thought process started in their mind. When they financially get a little stronger or decide to do some remodeling, you may not see the results for a couple years or longer. It's an education thing...getting them to think about energy efficiency."

- Some electric utilities mentioned, as a problem, that they are typically limited to studying electrical usage only. But from the perspective of many farms, propane, diesel, natural gas, and gasoline are much bigger concerns and have seen larger fluctuations and increases. According to some studies, nitrogen fertilizer represents the single largest energy input in U.S. agriculture as a whole.²⁹ One energy efficiency researcher commented, "Guys look around, and the only electricity-consuming equipment they have is a grain dryer. So that's what they focus on."
- Others voiced doubts about the motivation of utilities: "A lot of utilities really don't encourage energy efficiency. Maybe USDA can encourage utilities to provide audits. That makes a lot of sense."



NCAT photo

6.3 Comments from audit providers

One experienced industrial and residential auditor described farm energy audits in bluntly negative terms: "Expense is the barrier. The energy savings are generally meager [and] it doesn't make sense to bother with it...There's not much [energy] there, and it's hard to get to....There's also tremendous diversity in operations themselves. They're all 'first ones'."

EnSave and GDS Associates are the two largest for-profit providers of farm energy audits in the United States. EnSave works exclusively in the agricultural sector and has performed farm energy audits for over 2,000 agricultural producers across the United States since 1991. Active mainly in Wisconsin, GDS Associates does 1,200 to 1,500 farm-related energy projects per year for Wisconsin's Focus on Energy Program, with a staff of 10 to 12 people who are trained to perform audits.

Representatives from both companies emphasized that audit programs are needed in rural areas, but these programs often fail because utilities and other providers do not understand how to communicate with rural and agricultural clients. Building an audit program requires an appreciation for the needs and information networks of rural people, as well as skillful and deliberate efforts to win their trust. Both companies also emphasized "market segmentation." Energy efficiency is a high priority for some farm types and an extremely low priority for others.

A representative from GDS Associates compared farm energy efficiency efforts to "hitting for singles" in baseball. A good program may generate a steady stream of projects that save modest amounts of energy, but you are rarely going to hit a "home run."

Another audit provider emphasized the value of targeted audits and "prescriptive" incentives, instead of audit programs that visit and study each farm separately: "If we can focus on investing in specific things, you save a lot of time and headaches, instead of trying to provide an all-encompassing program. In the case of dairies, look at a few things that all farms should have and make sure that all farms have these things. You can offer 500 incentives for different technologies, but it's hard to manage a program when you're trying to run a pro-

"If we can focus on investing in specific things, you save a lot of time and headaches, instead of trying to provide an all-encompassing program."

gram for multiple measures. This makes no sense when there's a few things that would get you just as far or further."

A representative from EnSave described the company's multi-pronged approach to building awareness and trust. The first step typically includes meetings with equipment manufacturers who are active in the targeted area. Next, EnSave talks to equipment dealers, especially those identified by manufacturers as some of their best. At the same time, EnSave informs the broader agricultural community about its programs, including traditional farm organizations such as the Farm Bureau. Finally—after all this groundwork has been laid—EnSave does its promotional campaign and direct mailings to farmers. "Our goal is that, by the time they get a flyer in the mail, they've already heard about our program from two or three other places."

6.4 How often are audit recommendations implemented?

Anecdotal evidence—especially from utility representatives—suggests that audits, in and of themselves, result in a low rate of project completion. One energy researcher said, "The audit is great but telling people what they could do has very little impact...You have to have the infrastructure in place to make the whole thing happen...an integrator (in livestock) or someone in a position to assist...An audit by itself is not particularly useful, but audits are a useful part of a comprehensive program."

"Telling people what they could do has very little impact... You have to have the infrastructure in place to make the whole thing happen."

Solid evidence about the impact of audits is hard to come by, however. Many energy audit programs do not report energy savings at all, and for those who do, "apples and oranges" problems often make comparison between programs difficult. It is also often impossible to know whether an audit caused someone to implement energy efficiency measures. Was it the audit? Was it the financial incentive? Was the person planning to implement these measures anyway?

Utilities often use the term "*free rider*" to refer to a person who is paid to do something that they would have done anyway, even without a subsidy. The topic of how to identify and handle free riders is a major topic of discussion among energy efficiency advocates and program administrators.

In interviews, NCAT asked audit providers how often their recommendations were implemented:

- PG&E reported that "During the period 2006-2008, approximately 16 percent of subsidized pump tests led to pump retrofits."
- Efficiency Vermont offers a flexible range of services and does not run an audit program per se. So they were unable to answer this question. However, they completed approximately 60 agriculture projects in 2008, and had "interaction" (sometimes as minimal as a phone call) with about 140 farms. They also acknowledged that getting recommendations implemented takes work: "People who look at our program are horrified at how much hand-holding we do, and can't believe that we make phone calls and get quotes on equipment for the farmer. But my answer is that if we didn't do these things the project simply would not take place."
- A representative from Alliant Energy said, "Maybe 70 percent of the time. Part of that comes from where you put your efforts...which audits you go on."
- GDS Associates replied: "Up until the last year or so, our completion rate was very high, around 90 percent, since we worked mainly with projects that were already in the planning stages. With the new year, we've been asked to become more proactive: getting out on the farm prior to planning or even interest on the part of the producer. We expect this to cause a dramatic decrease in our completion rate."

7. Conclusions

Energy efficiency is not (yet) a high priority for many farms, and the growing demand for farm energy audits is being driven largely by the demands of USDA's Rural Energy for America Program (REAP). Within REAP, audits and other energy studies are generally part of the applicant's burden of proof, giving an assurance that federal funds are being spent appropriately.



Most agricultural producers appear to be unwilling to pay anything like the true cost of a professional energy audit, unless they need one for a REAP application.

Although over half of all states have had some kind of farm energy audit program, the availability of farm energy audits in most parts of rural America remains limited and participation in REAP by non-agricultural rural small businesses has been low. Providing more equitable access to REAP remains a great challenge, although USDA Rural Development should be commended for its strong efforts to address this problem. Some of the remaining problems are being caused by misunderstandings. Four of the biggest misconceptions are: (1) Every REAP applicant needs to have a professional energy audit; (2) An audit requires a professional engineer to visit the premises; (3) The audit must be a "comprehensive" or "whole farm" energy study; and (4) REAP is mainly an agricultural (as opposed to a rural small business) program.

According to the REAP rules, smaller applicants do not have to bear the cost and inconvenience of arranging an energy audit. But as the competition for REAP funds has become more intense, there has been a creeping tendency towards a de facto audit requirement—even for small energy efficiency proposals costing \$50,000 or less. This defeats the purpose of the energy assessment option, which is to allow reasonable access to the program by smaller applicants. A full-blown audit also seems unnecessary for small projects.

The availability of audits would be greatly enhanced if utilities were allowed to provide them, although Rural Development has not clearly explained whether, and under what circumstances, audits conducted by utilities would be acceptable for a REAP proposal. Despite some improvements, the REAP application process is also still exceedingly complicated and beyond the reach of the average farmer or rural small business owner. This poses a barrier to access that is just as significant as the difficulty in arranging an energy audit.

Apart from the requirements of the REAP program, it is hard to see an urgent need for a national campaign to increase the availability of farm energy audits. Although there is no substitute for an on-site visit from a skilled and experienced energy professional, energy audits are one of the most labor-intensive and expensive approaches to saving energy—just as having doctors make house calls to every home would be one of the most expensive ways of promoting public health.

Farm energy audits alone also seem to result in a low rate of project completion, unless they are targeted to farms that are already planning projects, and unless they are complemented with appropriate financial incentives and promotional campaigns. There are many simple, low-cost ways of encouraging energy efficiency in agriculture and rural communities that deserve to be explored.

Energy audits are a labor-intensive and expensive approach to saving energy—like promoting public health by having doctors make house calls.

8. Recommendations

1. Rural Development should de-emphasize the role of energy audits in REAP, to the extent that this is consistent with maintaining appropriate accountability

Discussion

An “energy assessment” seems adequate for small energy efficiency proposals with project cost of \$50,000 or less. Rural Development should firmly oppose the creeping tendency towards a de facto audit requirement for smaller projects. For example, Rural Development should consider eliminating the 5-point bonus for smaller energy efficiency proposals that have an energy audit, even though they are not required to do so.

Two other rules encourage small applicants to have audits that they may not need: (1) Audit costs (unlike assessment costs) are eligible for 25% reimbursement, since they can be included in “total eligible project costs.” (2) Rural Development’s new technical assistance program pays up to 75% of the cost of having an audit, but does not (apparently) pay for the cost of an assessment.

2. Rural Development should give more weight to energy savings in REAP scoring.

Discussion

This would align the program better with the vital public interest in energy conservation and reducing our use of fossil fuels. REAP assigns a relatively low priority to the amount, or dollar value, of energy savings. This would be reasonable if REAP were purely an economic development program, but becomes problematic if REAP is shouldering the weight of being a major federal energy program serving rural areas.

3. Rural Development should consider allowing utilities to provide energy audits, with reasonable rules and restrictions.

Discussion

Many utilities are already conducting audits that either meet the requirements of REAP or could do so, with slight modifications. Encouraging these utilities to become involved as REAP audit providers would immediately improve access to the program, and would also leverage REAP dollars by combining them with incentives offered by utilities.

4. Rural Development should more strongly promote REAP to non-farm small businesses.

Discussion

Around two thirds of REAP funding recipients to date have been farms. A vast number of small businesses in America are eligible for this program, and a tiny fraction realize these funds are available to them. Reaching these businesses would align the program better with Rural Development’s mission and with the legitimate public interest in rural development and revitalization.

5. Rural Development should continue to streamline and simplify the REAP application process.

Discussion

The REAP application process is exceptionally difficult, even in comparison with other federal grant and loan programs. Rural Development has taken steps to make the program more accessible to smaller applicants, such as dedicating 20 percent of program funds to grants of \$20,000 or less. At present, however, the application process is well beyond the capabilities of

the average farm or rural small business, presents many risks of being disqualified, and most applicants will require professional grant-writing assistance. This increases the cost to applicants and discourages smaller applicants from applying.

6. Rural Development should improve its website. Application materials and instructions should be presented in a more organized and user friendly way.

Discussion

It is extremely difficult to find basic application materials on the main Rural Development website. The website of Iowa Rural Development is an excellent model that could be imitated or simply adapted for a national audience.

7. Rural Development should make better use of the energy-related technical assistance service already being provided by ATTRA.

Discussion

Rural Development is currently funding the National Sustainable Agriculture Information Service (ATTRA) to provide technical assistance to agricultural producers, including toll-free phone assistance. ATTRA staff members are familiar with REAP, have considerable energy-related expertise, and could be integrated better into Rural Development's efforts. At a minimum, Rural Development should make sure that its staff and state offices know about this service, and that they are encouraging applicants to use it. ATTRA may also be able to help with other needs, such as providing energy-related training to state Rural Development staff.

8. NCAT recommends better communication and coordination among the USDA agencies with energy-related programs.

Discussion

The shared vision that guides this effort should be (1) a rapid reduction in the use of fossil fuels throughout agriculture and the U.S. food system, and (2) a rapid increase in renewable energy generation from farmlands. The urgency of these goals is now a matter of national consensus.

The current REAP scoring system makes sense from the standpoint of promoting economic development in rural areas. But the program is not set up to deliver rapid and cost-effective energy savings and renewable energy production. REAP needs to be complemented by other federal programs.

The efforts by NRCS to promote energy alternatives and energy audits have been admirable, but have resulted in the public getting some mixed and confusing signals. NCAT heard more than once the comment that "NRCS and Rural Development aren't talking to each other." Other USDA agencies have also started funding energy projects, but these have not always been clearly connected to REAP or to urgent national energy priorities.

9. USDA should continue to develop and promote low-cost measures, such as do-it-yourself energy calculators and decision-making tools.

Discussion

Although these tools do not substitute for a professional energy audit, they can be made available at little or no cost to the user, and have shown promise for educational and awareness purposes.

10. As they develop a better-coordinated strategy, Rural Development and other USDA agencies promoting new energy practices should consciously imitate the tactics of successful energy efficiency programs working in rural areas of America—adopting methods and incentives that go far beyond grants and loan guarantees.

Discussion

The hallmarks of these successful programs include:

- Delivering consistently excellent services over a period of years—fully expecting a startup period that may take years until the program is known and trusted.
- Strongly involving equipment dealers, installers, and integrators. These business persons know their rural customers and enjoy their trust. As a representative from EnSave put it, “Equipment dealers have a built-in incentive to promote energy efficiency, because it helps spur sales of their energy efficient products.” EnSave, Alliant Energy, and GDS Associates have all been exemplary in involving dealers, installers, and integrators. Alliant Energy’s successful “spiff” program deserves to be studied and imitated.
- An appreciation for how rural people learn—including the importance of word-of-mouth information and trusted relationships. As a representative from PG&E put it, “It’s about trust and relationships. If their neighbor is doing it and successful, that’s a way better validation of the technology and measures than anything else.”
- Cultivating the involvement of established and trusted agricultural organizations, such as the Farm Bureau, Farmers Union, Corn Growers, the university Extension system, state departments of agriculture, and others—complementing the existing infrastructure.
- Rebates and other targeted “prescriptive” incentives that are inexpensive to administer, known to save energy, and do not involve any guesswork about whether the energy saving measure will be installed.
- Flexible approaches, phone assistance, “walk-through audits,” and other cost-effective alternatives to full-blown audit with a written report.

References

- ACEEE, "Compendium of Champions: Chronicling Exemplary Energy Efficiency Programs from Across the U.S." American Council for an Energy-Efficient Economy, February 2008. Sourced from <http://www.aceee.org/pubs/u081.htm>
- Brown, Elizabeth, R. Neal Elliott, and Steven Nadel, "Energy Efficiency Programs in Agriculture: Design, Successes, and Lessons Learned." American Council for an Energy-Efficient Economy, Report #IE051, January 2005.
- Brown, Elizabeth, and R. Neal Elliott, "On-Farm Energy Use Characterizations." American Council for an Energy-Efficient Economy, Report #IE052, March 2005.
- Brown, Elizabeth, and R. Neal Elliott, "Potential Energy Savings in the Agricultural Sector." American Council for an Energy-Efficient Economy, Report #IE053, April 2005.
- Gulkis, Amelia, "Farm Energy Audits: Challenges and Opportunities." ACEEE Ag Forum, February 22, 2008. Sourced from <http://www.aceee.org/conf/08ag/agenda.htm>.
- Heller, M.C. and G.A. Keoleian. "Assessing the sustainability of the US food system: a life cycle perspective," *Agricultural Systems*, 76, (2003) 1007-1041.
- Hiatt, Richard, P.E., "A Suggested Approach to Farm Energy Audits." Rural Electric Resource Council, undated. Sourced from www.mainerural.org/energy/fieldguide/.
- Landt, Dorothy, "A Comprehensive Approach to Improving Agriculture Programs," ACEEE Ag Forum, February 22, 2008. Sourced from <http://www.aceee.org/conf/08ag/agenda.htm>.
- Metz, Craig, "Energy Audits, Saving Energy and Money on the Farm," talk given at the Harvesting Clean Energy conference in Billings, Montana, January 25-27, 2009. Sourced from <http://www.harvestcleanenergy.org/conference/conferencearchives.htm>.
- Miranowski, John, "Energy Consumption in US Agriculture." In *Agriculture as a Producer and Consumer of Energy*, CABI Publishing, 2005.
- Moore, John, "Major Federal Policies Driving Energy Efficiency in Agriculture," ACEEE Ag Forum, February 22, 2008. Sourced from <http://www.aceee.org/conf/08ag/agenda.htm>.
- Morris, Mike, "Energy Calculators: Evaluations and Recommendations." National Center for Appropriate Technology, 2009. Available from <http://www.ncat.org>.
- National Renewable Energy Laboratory (NREL), "Section 9006, Small Project Energy Efficiency Technical Worksheet." Sourced from http://www.rurdev.usda.gov/ia/rbcs_Eng_TechnicalWorksheetSmallEnergyEfficiency.doc, undated.
- Pollan, Michael. "Farmer In Chief." *New York Times Magazine*, October 9, 2008.
- Thumann, Albert and William J. Younger, *Handbook of Energy Audits*, Seventh Edition. Lilburn, GA: The Fairmont Press, Inc., 2008. ISBN 0-88173-577-9.
- USDA Rural Development, "Instructions 4280b - Renewable Energy Systems and Energy Efficiency Improvement Program," 2005. Sourced from www.rurdev.usda.gov/regs/regs/pdf/4280b.pdf.

USDA Rural Development, "Notice of Solicitation of Applications (NOSA) for Inviting Applications for Renewable Energy Systems and Energy Efficiency Improvements Grants and Guaranteed Loans and Renewable Energy Feasibility Studies Grants Under the Rural Energy for America Program," Federal Register Vol. 74, No. 99, Tuesday, May 26, 2009.

U.S. Small Business Administration Office of Advocacy, "Advancing Rural America," undated. Sourced from http://www.sba.gov/advo/research/rural_sb.html.

Glossary

Agricultural producer — Defined within USDA's Rural Energy for America Program as follows: "An individual or entity directly engaged in the production of agricultural products, including crops (including farming); livestock (including ranching); forestry products; hydroponics; nursery stock; or aquaculture, whereby 50 percent or greater of their gross income is derived from the operations."

Agricultural Pumping Efficiency Program (APEP) — A large pump testing program in California sponsored by Pacific Gas & Electric Company, also offering cash incentives and educational seminars.

American Society of Agricultural and Biological Engineers (ASABE) — Educational and scientific organization (www.asabe.org) that published a standard for farm energy audits in 2009. Conformance to ASABE standards is generally voluntary.

Association of Energy Engineers (AEE) — One of the oldest and largest energy audit training organizations (www.aeecenter.org), AEE has trained over 15,000 *Certified Energy Managers*.

ATTRA — The National Sustainable Agriculture Information Service (www.attra.ncat.org), managed by the *National Center for Appropriate Technology (NCAT)*. ATTRA offers free technical assistance on a wide variety of topics, including one of the most comprehensive websites on energy alternatives for agriculture.

Baseline energy usage — Current or prevailing energy usage, assuming no changes in existing processes or equipment. Energy audits almost always look at a *base* or *baseline case* and various hypothetical *change cases*, where energy-saving measures are implemented.

Benchmark — An industry-wide average for similar facilities.

Certified Energy Manager (CEM) — An energy audit certification offered by the *Association of Energy Engineers*. Focused mainly on building energy systems. Energy audits for USDA's REAP program must be conducted by either a Certified Energy Manager or a *Professional Engineer*.

Comprehensive audit — See *whole farm audit*.

Data gatherer — A person who visits a facility and collects information about energy usage, but does little data analysis or evaluation. Data gatherers are often used to reduce the cost of providing energy audits to farms.

Do-it-yourself audit — An audit that does not include a site visit by a third party. Dozens of do-it-yourself energy audit tools, decision-making tools, and calculators are available on the Internet, including many designed for use by farms and ranches.

Energy assessment — Term used by USDA Rural Development to refer to the kind of energy study required for REAP energy efficiency applications with total project cost of \$50,000 or less. Less rigorous than an *energy audit*.

Energy audit — A study of energy usage conducted for the purpose of improving energy efficiency and saving money. USDA Rural Development uses the term "energy audit" to refer to the kind of energy study required for REAP energy efficiency applications with total project cost over \$50,000. An audit is more rigorous than an *energy assessment*, and must generally be conducted by a *Professional Engineer* or *Certified Energy Manager*.

Energy Audits and Renewable Energy Development Assistance — A competitive grant program initiated by USDA Rural Development in 2009, as part of the *Rural Energy for America Program*. Offers funding to organizations that provide energy audits to farms and rural small businesses.

Energy conservation measure (ECM) — An *energy conservation opportunity* (ECO) that has been implemented.

Energy conservation opportunity (ECO) — A possible or hypothetical energy-saving change or practice identified during an energy audit. When an ECO is implemented, it becomes an *energy conservation measure*.

Energy intensity — The energy required per unit of economic output. Farms vary tremendously in how energy intensive they are.

Energy use index (EUI) — A measure of the energy usage in a building, commonly calculated in Btu per square foot per year.

EnSave — Vermont-based company (www.ensave.com) specializing in energy efficiency services for agriculture, including farm energy audits, agricultural consulting, and program implementation. One of the largest providers of farm energy audits nationally.

Environmental audit — An audit of environmental performance and impacts, including, for example, air quality, water quality and quantity, greenhouse gases, soil erosion, biodiversity, and other environmental impacts.

Environmental Law & Policy Center (ELPC) — Non-profit environmental organization whose Farm Energy website (<http://farmenergy.org>) is an excellent source of information about USDA's *Rural Energy for America Program*.

Feasibility study — A study of the economic, market, technical, financial, and management feasibility of a proposed project or business. At times (but not always) USDA Rural Development uses the term "feasibility study" more specifically, to refer to the type of study that is required for REAP *renewable energy* projects.

Free rider — A person who is given an incentive or subsidy to do something that they would have done anyway, even without the payment. Frequently used in discussions of paying financial incentives for energy efficiency and renewable energy measures.

GDS Associates, Inc. — A national, consulting and engineering firm (www.gdsassociates.com) whose services include agricultural energy efficiency services. One of the largest providers of farm energy audits nationally, GDS is administrator for Wisconsin Focus on Energy's Agricultural and Rural Business Program.

General audit — See *standard audit*.

Generation and transmission cooperative (G&T) — An organization owned by several rural electric cooperatives, enabling them to pool their resources, purchase and own their own generating plants and transmission lines, and supply power to their members.

Home Energy Rating System (HERS) — A relative energy use index developed by the Residential Energy Services Network (RESNET, www.natresnet.org). A HERS Index of 100 represents the energy use of the "American Standard Building."

Holistic audit — See *whole farm audit*.

Investment-grade audit — A high-quality energy audit: detailed, accurate, and reliable enough to support investments by commercial, industrial, or institutional facilities. See *Level Three Audit*.

Investor-owned utility — A utility that is privately owned by investors, normally regulated by a public utilities commission.

Irrigation distribution system — The piping, sprinklers, and other parts of an irrigation system that deliver water from the pump to the field.

Level One Audit — A tour of a facility where each energy-using system is visually inspected. The auditor evaluates energy consumption data, sometimes compares this to industry averages or *benchmarks* for similar facilities, and creates a list of low-cost energy saving opportunities, with preliminary estimates of possible dollar savings. Also called a *simple audit*, *preliminary audit*, *clipboard audit*, *screening audit*, and many similar names.

Level Two Audit — More detailed, rigorous, and comprehensive than a *Level One* or *walk-through* audit. Quantifies energy uses and losses through detailed review and analysis of equipment and systems, often including on-site energy measurements and testing, standard engineering calculations, as well as an economic analysis of recommended conservation measures. Also called a *general audit*, *mini-audit*, *site energy audit*, *complete site energy audit*, *standard audit*, and many similar names.

Level Three Audit — More detailed, rigorous, and comprehensive than a Level Two Audit. Includes some computer simulation and a more comprehensive evaluation of energy use patterns. Also called an *integrated audit*, *investment-grade audit*, *detailed audit*, *maxi audit*, *technical analysis audit*, and many similar names.

Municipal utility — A utility owned by a city or town. In some cases, the utility's service territory may include only part of the city or may extend beyond its boundaries.

National Sustainable Agriculture Information Service — See *ATTRA*.

National Center for Appropriate Technology (NCAT) — A national non-profit organization (www.ncat.org) with technical assistance programs in sustainable energy and sustainable agriculture. One of the oldest and most experienced energy conservation organizations in America.

National Renewable Energy Laboratory (NREL) — Part of the U.S. Department of Energy, NREL works with USDA Rural Development on program design for the Rural Energy for America Program and conducts technical review of many applications to the program.

Net present value — An estimate of the current value of an investment that discounts future benefits and costs using an appropriate discount rate. A more sophisticated measure of cost-effectiveness than *simple payback*.

NRCS — The Natural Resources Conservation Service (www.nrcs.usda.gov), an agency within the U.S. Department of Agriculture. NRCS has developed web-based farm energy tools and has funded a variety of farm energy audit programs and efforts.

O&M — Operation and maintenance measures. Often identified during an energy audit, along with *energy conservation measures*.

Operation-specific audit — An audit that focuses on a single energy-using system. Also called a *technology-specific*, *single-purpose*, or *targeted audit*, and many similar names.

Preliminary audit — See *Level One Audit*.

Prescriptive incentive — A rebate for a specific piece or kind of equipment. Generally, prescriptive incentives are appropriate where some energy saving measure is known to be cost-effective in almost all situations. Energy audits, by contrast, are most appropriate where observation, analysis, and judgment are required to decide if a measure is cost-effective.

Professional engineer (P.E.) — A registered or licensed engineer who is permitted to offer his or her professional services directly to the public. Professional Engineers have the legal authority to sign and seal or “stamp” engineering documents (such as reports, drawings, and calculations), taking legal responsibility for them. Energy audits for USDA’s REAP program must be conducted by either a Professional Engineer or *Certified Energy Manager*.

Public benefits fund — Funds established, usually at the state level, to support energy efficiency, renewable energy, or low-income programs. Most funds are supported by a small surcharge (“public purpose charge”) on customers of investor-owned electric distribution utilities. (Some funds also collect surcharges from natural gas customers.) Only customers who pay into the fund are eligible for assistance through the programs it funds.

Pumping plant — The pump and motor or engine, considered together, as in an irrigation system.

Pump testing program — A program that focuses on estimating and improving the energy efficiency of *pumping plants*.

REAP/FEASIBILITY — An acronym sometimes used by USDA Rural Development to refer to the program, introduced in 2009, that provides grants for renewable energy feasibility studies.

REAP/EA & REDA — An acronym sometimes used by USDA Rural Development to refer to the Energy Audit and Renewable Energy Development Assistance program within the Rural Energy for America Program (REAP). Introduced in 2009, this program provides funding for grants for energy audits and renewable energy development assistance.

REAP/RES/REEI — An acronym sometimes used by USDA Rural Development to refer to the Renewable Energy Systems/Renewable Energy Efficiency Improvement Program within the Rural Energy for America Program (REAP). This is the main grant and loan program within REAP.

Resource Development and Conservation (RC&D) Council — Non-profit, volunteer councils committed to resource conservation and community development, coordinated by the National Association of Resource Development and Conservation Councils (www.rcdnet.org). RC&D councils often include representatives from county governments, municipalities, and state agencies. RC&D Councils in many states have launched energy audit programs, often in partnership with the company *EnSave*.

Rural — Defined as follows, within USDA’s Rural Energy for America Program: “Any area of a State not in a city or town that has a population of more than 50,000 inhabitants, according to the latest decennial census of the United States, and the contiguous and adjacent urbanized area.”

Rural Business-Cooperative Service (RBS) — One of three main operating units within USDA's Office of Rural Development. Offers the Rural Energy for America Program.

Rural electric cooperative (REC) — A cooperatively-owned (member-owned) business delivering electricity to rural areas. Historically, most RECs were created during the New Deal, to provide electricity to areas that investor-owned utilities would not serve, because there were too few customers to justify the required capital investment.

Rural Electricity Resource Council (RERC) — A national association of electric companies, cooperatives, public power districts, and allied groups (<http://www.nerc.org/>) offering training courses, conferences, and a wide variety of educational materials. These have recently included training courses on farm energy audits.

Rural Energy for America Program (REAP) — USDA program offering grants and loan guarantees for energy efficiency and renewable energy projects on farms and in rural areas. Authorized in Title IX, Section 9007 of the 2008 Farm Bill and administered by USDA Rural Development. A continuation of the Renewable Energy Systems and Energy Efficiency Improvements Program, authorized in Title IX, Section 9006 of the 2002 Farm Bill.

Small business — Defined as follows, within USDA's Rural Energy for America Program: "An entity considered a small business in accordance with the U.S. Small Business Administration's (SBA) small business size standards found in Title 13 CFR part 121."

USDA Rural Development — An agency within the U.S. Department of Agriculture (www.rurdev.usda.gov). Rural Development administers the *Rural Energy for America Program*.

Screening audit — See *Level One Audit*.

Section 9006 Program — The Renewable Energy Systems and Energy Efficiency Improvements Program, authorized in Title IX, Section 9006 of the 2002 Farm Bill. See the *Rural Energy for America Program*.

Simple audit — See *Level One Audit*.

Simple payback — An estimate of the amount of time it will take to recover an investment in energy savings. Calculated by dividing the cost of a measure by the annual energy cost savings produced by the measure.

Spiff — A sales incentive for a dealer who sells products or equipment.

Standard audit — See *Level Two Audit*.

USDA — The United States Department of Agriculture. The Department's mission is to "provide leadership on food, agriculture, natural resources, and related issues based on sound public policy, the best available science, and efficient management." USDA includes 19 services and agencies, involved in natural resource conservation, forest management, rural development, nutrition, food safety, and agricultural research, education, risk management, and marketing.

Walk-through audit — See *Level One Audit*.

Whole-farm audit — An energy audit that looks at all the energy consuming systems of a farm. Also called a *comprehensive audit*, *integrated audit*, *holistic audit*, and similar names.

End Notes

1. There are many reasons why energy program managers may be reluctant to openly discuss these difficulties. For example, energy professionals often see efficiency and conservation as under-appreciated, and understandably want to emphasize the value of these programs.
2. In identifying these programs, we were fortunate to have access to a 2005 report from the American Council for an Energy-Efficient Economy: "Energy Efficiency Programs in Agriculture: Design, Successes, and Lessons Learned" (Brown et al, 2005).
3. Web site of the Association of Energy Engineers, <http://www.aeecenter.org/certification/CEMpage.htm>.
4. Wisconsin Focus on Energy is one such program that uses the term "energy assessment" instead of "energy audit."
5. Public benefits programs vary considerably. Some utilities collect surcharges from their natural gas customers as well as their electric customers. A few public benefits funds have been funded through utility merger settlements or in return for storing nuclear waste. Some municipal utilities have their own programs. Municipal utilities and electric cooperatives sometimes have the option of voluntary participation in a state-administered program.
6. For a survey of these tools, see the 2009 NCAT report "Farm Energy Calculators: Evaluations and Recommendations." (Morris, 2009)
7. An example is the Certified Professional Environmental Auditor certification offered by the Board of Environmental, Health & Safety Auditor Certifications. (<http://www.beac.org/>)
8. Somewhat confusingly, REAP was assigned a different section number in the 2008 Farm Bill. Whereas the 2002 program was often called the "Section 9006 Program," REAP (the continuation of the same program) is sometimes called the "Section 9007 Program."
9. Until 2009, NREL reviewed and scored all applications for technical merit. Beginning in 2009, however, Rural Development's state offices will review and score applications for wind energy, solar energy, ethanol, biodiesel, and solid fuel, as well as all energy efficiency proposals. NREL will continue to review and score applications for anaerobic digesters, geothermal, hydrogen, hydro-power, and ocean projects, as well as other biomass technologies.
10. Note, for example, that the vast majority of U.S. farms and ranches could apparently also qualify under the "rural small business" category, although most choose to apply as agricultural producers.
11. The complete size standards are on the web site of the U.S. Small Business Administration, at <http://www.sba.gov/contractingopportunities/officials/size/index.html>.
12. Personal communication from Kelley D. Oehler, Loan Analyst, USDA Rural Development Energy Division.
13. See "Advancing Rural America," U.S. Small Business Administration Office of Advocacy, undated. Sourced from http://www.sba.gov/advo/research/rural_sb.html.
14. Instructions 4280-B, Appendix A, p. 29.
15. The situation is different for renewable energy projects. In 2009, Rural Development added a renewable energy feasibility study funding program to REAP. This competitive grant program pays up to 25 percent of the "eligible project cost" of a feasibility study.
16. The definitions in this paragraph and the following one come from "Instructions 4280b - Renewable Energy Systems and Energy Efficiency Improvement Program, USDA Rural Development," 2005. Although these program rules were published in 2005, they remain (as

of 2009) the “final word” on many of the definitions and rules for the REAP program. Many potential applicants are frustrated by the difficulty of finding these program rules, which are not at all easy to find on USDA Rural Development’s website. They are available at <http://www.rurdev.usda.gov/regs/regs/pdf/4280b.pdf>

17. Even this is not completely clear. At times Rural Development has left open the possibility that an energy audit could be performed by someone with a combination of training and experience “equivalent to” a P.E. or a CEM.
18. The option of having a utility perform the audit does not appear in the 4280b instructions from Rural Development.
19. There are 130 possible (maximum) points for a REAP energy efficiency grant proposal, 125 possible points for a renewable energy grant proposal, 115 possible points for an energy efficiency loan proposal, and 110 points for a renewable energy loan proposal. (Confirmed by Kelley Oehler of USDA Rural Development, personal communication.)
20. For example, residential improvements, efficiency improvements related to new construction, and vehicles are generally not eligible to receive REAP energy efficiency funding. There are many other limitations, restrictions, and eligibility conditions too.
21. National Renewable Energy Laboratory (NREL), “Section 9006, Small Project Energy Efficiency Technical Worksheet,” pp. 5-6.
22. National Renewable Energy Laboratory (NREL), “Section 9006, Small Project Energy Efficiency Technical Worksheet,” p. 1.
23. At times NRCS has implied that energy may be considered a sixth natural resource of concern. For example, a 2008 description of the Conservation Stewardship Program said that the program promoted “the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes.” (www.nrcs.usda.gov/programs/CSP/)
24. EnSave reports “active or pending” programs in Alabama, Arkansas, California, Colorado,, Florida, Indiana, Maryland, Montana, New Jersey, North Carolina, Oregon, Texas, and Virginia, as well as “past programs” in Iowa, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New York, Pennsylvania, Vermont, Washington, and Wisconsin. See Metz, “Energy Audits, Saving Energy and Money on the Farm.”
25. More statistics are available at the Farm Bill Clean Energy website maintained by the Environmental Law & Policy Center, www.farmenergy.org.
26. In 2009, Rural Development also introduced a grant competition to partially fund renewable energy feasibility studies.
27. Brown et al, “Energy Efficiency Programs in Agriculture: Design, Successes, and Lessons Learned,” pp. 13-14.
28. ACEEE, “Compendium of Champions,” 2008, p. 1-3.
29. For example, John Miranowski, “Energy Consumption in US Agriculture.” In *Agriculture as a Producer and Consumer of Energy*, CABI Publishing, 2005.

**Appendix I:
“Audit” vs. “Assessment” in USDA’s Rural Energy for America
Program (REAP)**

The following explanation of the difference between an “energy audit” and an “energy assessment” in USDA’s Rural Energy for America Program is reproduced verbatim from the document “Section 9006, Simplified Application Energy Efficiency Technical Worksheet (Total Eligible Project Costs of \$200,000 or less),” prepared by the National Renewable Energy Laboratory (NREL)

Please note that the document contains the following disclaimer:

“This worksheet is provided by the National Renewable Energy Laboratory (NREL) to assist applicants in meeting technical requirements contained in Appendix A of 7 CFR Part 4280. This worksheet is meant for guidance purposes only, and is not considered a requirement of the program. The above rule is the final authority for application requirement.”

Energy assessments

All energy efficiency improvement projects with total eligible project costs of \$50,000 or less must provide an energy assessment. The energy assessment must include adequate and appropriate evidence of energy savings expected when the proposed system is operated as designed. This assessment should be conducted by an experienced energy assessor, certified energy manager or professional engineer from an independent firm or the local utility.

The energy assessment must cover the following:

Situation report

Provide an assessment of current energy cost and efficiency by analyzing energy bills and briefly surveying the target building, machinery, or system.

Potential improvements

Identify and provide a savings and cost analysis of low-cost/no-cost measures. Estimate the overall costs and expected annual energy and cost savings from these improvements.

Energy audits

An energy audit must be conducted for all energy efficiency improvement projects with total eligible project costs greater than \$50,000. An energy audit is a written report by an independent, qualified party that focuses on potential capital-intensive projects and involves detailed gathering of field data and engineering analysis. The audit provides detailed project costs and savings information with a high level of confidence sufficient for major capital investment decisions. Typically, Certified Energy Managers and Professional Engineers qualify as independent qualified parties; *however the vendor and the applicant do not qualify*. An energy audit may also be performed by the local utility. The methodology of the energy audit must meet professional and industry standards.

The energy audit must cover the following:

Situation report

Provide a narrative description of the facility or process, its energy system(s) and usage, and activity profile. Also include price per unit of energy (electricity, natural gas, propane, fuel oil, renewable energy, etc.) paid by the customer on the date of the audit. Any energy conversions should be based on use rather than source.

Potential improvements

List specific information on all potential energy-saving opportunities and their costs.

Technical analysis

Discuss the interactions among the potential improvements and other energy systems.

- Estimate the annual energy and cost savings expected from each improvement identified in the energy audit.
- Calculate all direct and indirect costs of each improvement.
- Rank potential improvement measures by cost-effectiveness.

Potential improvement description

Provide a narrative summary of the potential improvement(s) and its ability to provide needed benefits, including a discussion of nonenergy benefits.

- Provide preliminary specifications for critical components.
- Provide preliminary drawings of project layout, including any related structural changes.
- Document baseline data compared to projected consumption, together with any explanatory notes. When appropriate, show before-and-after data in terms of consumption per unit of production, time or area. Include at least 1 year's bills for those energy sources/fuel types affected by this project. Also submit utility rate schedules, if appropriate.
- Identify significant changes in future related operations and maintenance costs.
- Describe explicitly how outcomes will be measured.

Appendix II: Audit Program Profiles

Alliant Energy Agricultural Energy Efficiency Program (Interstate Power & Light)

1. Name of the program and contact information:

Agricultural Energy Efficiency Program
Alliant Energy
P.O. Box 351
Cedar Rapids, IA 52406-0351
<http://www.alliantenergy.com>

2. How is the program funded? Can you provide an approximate annual funding amount?

We charge most of our audit cost against a fund collected from our customers.

The budgets for the Iowa Ag Program were as follows:

Year	\$\$Budget	\$\$ Spent	\$\$ Incentive to Customers	# Participants
2004	100,000	281,185	69,098	87
2005	102,302	418,417	220,815	172
2006	350,000	476,832	296,465	264
2007	358,050	530,062	384,647	316

Dollar savings realized by the ag customers would be approximately \$.08 per kwh X the yearly totals in the first chart.

3. What geographic area do you serve, and who is eligible to participate?

Alliant Energy provides electricity and natural gas to more than 1.4 million customers in Iowa, Minnesota and Wisconsin. Energy audits are available to farmers in Iowa and Minnesota.

Interstate Power and Light Company (IPL) is a utility serving Iowa and Minnesota, and is a subsidiary of Alliant Energy Corporation.

4. In what year did the program start? Does it have a known ending date?

2002 was Alliant's first year offering ag-specific rebates. Audits were first offered in 2004.

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

See question #12 below. The audit program started in 2002 and had "no participation to speak of," but has grown to around 100 audits per year. In 2004, we added ag reps to make it available and better known to customers. People are very aware of the program now. We are finding better ways to reach our customer.

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

Alliant has four ag reps who conduct all the audits. (One of these does mainly stray voltage work.) They need to have an ag background and "gradually learn generalities of savings."

7. *What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?*

Generally we go on site. We have a screening process and handle requests on the phone if we can. Sometimes a request turns out to be just a high bill complaint, a misread meter, or demand charge issues. Sometimes the need is for education that we can do on the phone.

Generally we prepare a written report, although this may be just a letter...it depends on what we looked at, and we have a variety of reports depending on the situation. We do a report for confinement facilities (lighting, ventilation, recommendations, paybacks). We are connected with an engineering firm that we'll send out to do calculations for us. We know enough about any of the technologies to know if they are going to save some energy.

We offer audits to farm customers. In order to qualify, more than 50 percent of use has to be for farm use. Ag group limited to electric side. But a few years ago they got into 9006 auditing. Have done ~250 in the past 3-4 years. Also look at gas savings for those. Biggest request lately has been for the 9006 (REAP) program.

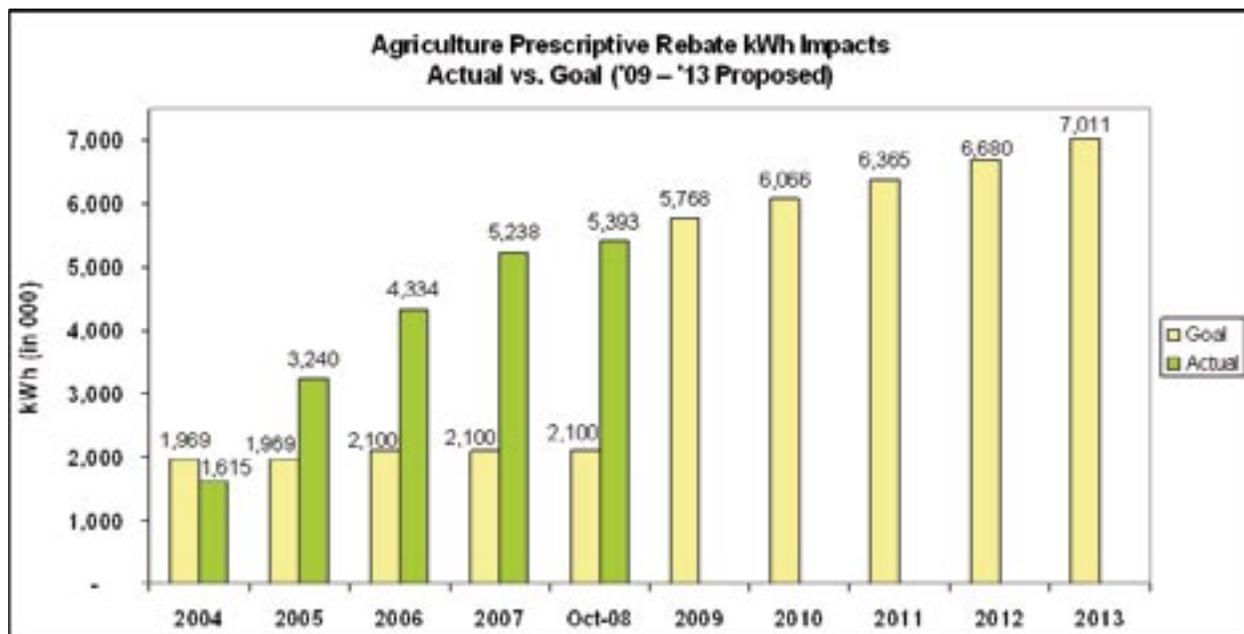
8. *What are the most common energy saving measures included in your recommendations?*

We do a lot of prescriptive rebates on energy efficient equipment. Ventilation, lighting, dairy equipment, and grain handling are some top projects. Dairies: vacuum pumps, transfer systems, compressors, water heaters.

9. *Can you provide statistics on how often your recommendations are implemented?*

Maybe 70 percent of the time. Part of that comes from where you put your efforts...which audits you go on.

10. *Can you provide energy and dollar savings estimates for recent years?*



11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.

We speak at some of the energy conferences. We've spoken with banking groups, Farm Bureau, economic development, and USDA-sponsored events. We attend a lot of the ag shows with a booth. We try to stay in touch with the banking industry, educational institutions, and farm groups. We always want to do more and there's never time.

Our Participating Dealer Network has been a key to our success, and includes a dealer spiff program. Every time the dealer sells equipment, they get a percentage of our rebate. The dealer gets 20 percent of whatever the farmer gets. Really helped promote the program. Dealers started telling us when they planned to build, and convinced a lot of dealers to use better fans and lighting. Then it kind of took off word or mouth.

Our ag reps make it a point to stop and visit dealers. The dealers will provide lists of who's building. Next time we stop we bring copies of the rebate form...a continual reminder that they have an opportunity to get paid. We stay in communication with dealers. If you don't do that, you tend to get off the radar screen.

12. To what extent has demand for your audits been related to the USDA Rural Energy/Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)?

How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

When we started (2005), we did just a few audits for 9006 applications. (8-9). We did 15 of these in 2006. We developed our own spreadsheet and process. In 2007 demand went wild. We did over 90 audits for 9006 applications. This year (2008) we did about 100. These are primarily grain dryers. We've also done a few poultry remodels, a farm shop, a couple irrigation systems, and a handful of windmill audits.

We're connected with some grant writers that respect our work and we respect theirs. We do the audit and send a copy to the customer and their grant writer. We provide the savings report and do it for both electric and gas. Otherwise, we don't get involved in the application process.

Year	Audits Completed	Audits in Iowa	Grant/Loan Assistance	Audit Types
2006	20	20	\$300,000	Grain, Wind
2007	80	43	\$3,088,202	Grain
2008	93 ¹ <i>*113 anticipated</i>	66	TBD in 2009	Grain, Farm Shop, Irrigation, Turkey Bldgs

We struggled the first year or two. We realized that producers couldn't find anyone to do the gas part of the audit. Since almost all proposals involve calculations of LP gas, we do charge for the gas portion. We give them credit for the electric part. If we can help them get a 25 percent grant and it costs us very little to do it, and we can follow up with a rebate (which may cover the audit cost), it's a great way for us to promote energy efficiency.

If we can make our customers more efficient, they're going to be a better/stronger customer.

Our customers have a 97 percent success rate getting grants.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

"We've had a lot of calls for audits that were hobby farms...no savings potential there. It's not cost-effective, and the rate-payers pay for it, you know...We've learned to try to make our audits specific to something that is a fairly substantial energy user."

Efficiency Vermont

1. Name of the program and contact information:

Efficiency Vermont
Business Energy Services
Dairy Farm Services
255 South Champlain Street
Burlington, VT 05401
Attn: Jennifer Osgood, Project Manager - Dairy Farms
888-921-5990, x1053 (toll-free)
<http://www.encyvermont.com>

2. How is the program funded? Can you provide an approximate annual funding amount?

Public benefits funds.

For funding and other Efficiency Vermont service info please see:

2007 Annual Highlight Summary

http://www.encyvermont.com/stella/filelib/2007%20Highlights%20Piece%20FINAL_09_08.pdf

All other years' summaries and annual reports can be found here:

<http://www.encyvermont.com/pages/Common/AboutUs/AnnualReport/>

3. What geographic area do you serve, and who is eligible to participate?

All of Vermont is served.

The city of Burlington is not served by Efficiency Vermont, but by their local electric utility – The Burlington Electric Department. However, I do not know of any farms in their territory.

All commercial and residential rate payers are eligible for services.

4. In what year did the program start? Does it have a known ending date?

Efficiency Vermont started in the year 2000. There is no known end date.

Efficiency Vermont is required to exist by state legislation. Legislation would need to be revoked or rewritten to end or change Efficiency Vermont services.

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

Efficiency Vermont averages 35 to 55 farm visits per year; the vast majority of these are dairies. Often we just talk over the phone. "We're not as official as some other programs." Vermont utilities formerly did audits but they "never went anywhere." "We're not going to waste paper and time."

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

Currently it's just one person. The program is likely to hire 1-2 additional people this winter.

7. What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?

"We don't do audits. We do a modified version of an assessment. We don't create an official report."

We are happy to do a walk-through with the farmer or manager and look for opportunities. We'll go farther if the farmer is interested, making estimates and getting quotes. There is no official report. We call or e-mail recommendations to the farmer with a savings estimate. We say, "Efficiency Vermont can offer this rebate."

We offer site visits, preliminary analysis of energy efficiency improvements (including cost-effectiveness analysis), equipment recommendations, provisions for service contracts, and cash incentives typically covering 70 percent of the cost of recommended measures.

8. What are the most common energy saving measures included in your recommendations?

Plate coolers
Variable Frequency Drives on milk vacuum pumps
Electric heat or hot water fuel switches
Lighting
Variable Speed Drives on milk-transfer systems
Heat recovery units

9. Can you provide statistics on how often your recommendations are implemented?

We don't keep official records on this. During 2008, Efficiency Vermont completed 60 agriculture projects. We had "interaction" (sometimes minimal) with 140 farms. 99 percent of these were dairy, although there were also some horse and chickens farms. Because of the importance of dairy farms to Vermont tourism, history, and economy, we try to "go a step beyond" in our incentives, to keep dairies in business.

10. Can you provide energy and dollar savings estimates for recent years?

Farm savings and incentives only:

Yr. 2005 – 612,000 kWh saved, \$152,000 in incentives

Yr. 2006 – 334,500 kWh saved, \$87,500 in incentives

Yr. 2007 – 282,500 kWh saved, \$90,000 in incentives

11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.

- Cash incentives for qualifying equipment (typically 40-60% of the project cost).
- Technical assistance (recommendations, pointing people in the right direction (to the most energy efficient choice), and savings calculations, etc.).
- Loan program – for dairy farms, if the farmer qualifies, Efficiency Vermont will buy down the interest rate to 0% for a 2 year loan, or down to 2% for a 4 year loan.

For the last 8 yrs, we've offered "prescriptive" rebates. The farm fills out and mails in a form for lighting, variable-speed milk transfer, etc. Next year we will begin rebating scroll compressors. These are simple calculations, e.g. \$\$ per fixture. The rebate form is available on Efficiency Vermont's website.

Other equipment: plate coolers, variable-speed drives on vacuum pumps, etc. are treated as "custom." If cost-effective, the rebate is custom—usually 60% of cost but sometimes only 40%. In calculating cost-effectiveness, we take into account factors such as water cost, but not outcomes like increased milk production or health & safety, etc.

12. To what extent has demand for your audits been related to the USDA Rural Energy/ Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)? How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

Efficiency Vermont has recommended USDA grants to quite a few customers. But not many of these have been on farms because projects costs have typically been too small. Efficiency Vermont "hasn't gotten anyone to bite." The application is "tedious" and it's a bad timeline. (The deadline comes around once a year and then it's a long wait.) A rough estimate is that Efficiency Vermont has been involved in one quarter of the 9006 projects in Vermont.

We are now in our 4th or 5th year of assisting with the REAP/9006 program. In the first year we were not involved at all in audits. In the second year our USDA office asked us to help and we performed a few audits (electrical only). This lasted 1-2 years and was "a big strain on staff." We did not complete many applications (maybe only 5) but these took a huge amount of time. "The project managers couldn't do it and keep up with their regular duties."

Next year, we plan to begin just pointing applicants to an auditor list. We've agreed to pay half of audit cost up front. If a project happens, we would reimburse the applicant for the other half. We plan to keep up this arrangement for 2009. Mostly architects or engineers around the state perform audits: small 1-2 person operations. Some have specialties (e.g. lighting). Mostly they work on small commercial facilities.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

Vermont is so small...60 projects may seem puny but for Vermont it takes three hours to drive from one corner of the state to the other. "If you took our population, we probably have a better success rate than many other bigger states/programs."

The reason we've been successful is "Really because we don't waste a lot of time. We've become very efficient. We know exactly what equipment to look at. We are happy to look at other things if the farmer wants...We have some good spreadsheet tools. In general, our incentives (usually 60%) are pretty darned good."

"People ask why we offer so much, and our answer is, 'It won't get done unless we pay 60% of it.' Most farms are so small that they're barely operating on a day-to-day basis. We do things quickly. We have standard tools to make it easy. We have a loan program...that helps. About 5 farmers in 2008 got loans."

"Frankly we do a heck of a lot of hand-holding." People are amazed that Efficiency Vermont gets quotes from vendors. "We won't do the whole project, but if they don't get the quotes it won't happen." We don't consider this a waste of staff time, since we are getting 50-60 projects done each year.

EnSave, Inc.

Name of the program and contact information:

EnSave, Inc.
65 Millet Street, Suite 105
Richmond, VT 05477
800-732-1399
www.ensave.com

How is the program funded? Can you provide an approximate annual funding amount?

EnSave has assisted a wide range of clients. Clients have included USDA, state departments of agriculture, the United States Environmental Protection Agency, investor-owned utilities, rural electric cooperatives, public benefit corporations, public utility commissions, and Resource Conservation and Development Councils.

What geographic area do you serve, and who is eligible to participate?

EnSave has current or pending projects in Alabama, Arkansas, California, Colorado, Florida, Indiana, Maryland, Montana, New Jersey, North Carolina, Oregon, Texas, and Virginia. EnSave has past projects in Iowa, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New York, Pennsylvania, Vermont, Washington, and Wisconsin.

In what year did the program start? Does it have a known ending date?

Since 1991. There is no known ending date.

How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

EnSave has performed farm energy audits for over 2,000 agricultural producers across the United States.

Who conducts audits, and how are your auditors trained?

We split the auditing process between two distinct phases: data collection and auditing. Data collectors may be our own employees or subcontractors. We have developed a thorough training plan for data collectors, and review qualifications prior to training data collectors.

Having EnSave analyze and process the data helps ensure the quality of the audit, by leaving the more technical aspects of the work to more highly-trained staff people. We are able to keep costs down by not having a professional engineer involved in all aspects of the energy audit, but only in the steps that require high-level technical expertise.

We provide extensive training to our own staff and encourage them to participate in ongoing professional development. EnSave is currently part of the team developing the American Society of Agricultural and Biological Engineers/NRCS Energy Audit Practice Standard. Activities such as this help keep us at the forefront of developments related to agricultural energy audits.

What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?

EnSave uses a five-step process for audits:

1. Pre-site visit interview
2. Site visit (data collection)
3. Data analysis
4. Report generation
5. Follow-up interview

Sample audit reports are available on our website, www.ensave.com.

When we have a data collector available, EnSave's staff completes all steps except the site visit. The information EnSave gathers during the pre-site visit interview helps support the data collector and ensures the accuracy of the information collected, because the data collection serves as a verification of information already provided to the farmer.

- We have traditionally focused on agriculture and food processing only, not other rural small businesses.
- We can look at electricity, propane, diesel, natural gas, gasoline, and any other fuels.
- We can look at embedded energy (in crop production, transportation, etc.) as part of our "level 3" (most comprehensive) audit.
- We can provide a renewable energy survey as part of an energy audit, which gauges a farmer's interest in different types of renewable energy and then recommends resources for more information. We can also provide a renewable energy analysis to determine the energy savings from converting to a renewable energy source, depending upon the type of renew-

able technology (example: quantifying non-renewable energy saved by converting to a corn stove). Some types of renewable energy, such as wind turbines or digesters connected to a power grid, need a full feasibility study that is beyond the scope of our services.

In addition to energy audits, we also design and implement energy efficiency programs, and offer energy efficiency consulting services. This broader experience helps us be aware of the bigger picture of energy efficiency; and an overall knowledge of what approaches have been successful in reaching agricultural producers. In addition, the stringent requirements of utility energy efficiency programs have required a great deal of documentation and accountability, and we have brought this emphasis on quality control to the rest of our clients.

Our greatest strengths are:

- Exclusive focus on agriculture and food processing means that we have the ability to tailor our approach exclusively to agriculture and to invest significant time into agricultural energy efficiency research.
- Recommendations are only made based upon vetted, sound and verified research.
- Ability to deliver energy audits nationwide. Because we have worked throughout the U.S., we bring a national perspective and an understanding of what works in other markets to our work.
- Length of time in the industry (since 1991), and the knowledge developed over years of working with producers.

What are some of the main challenges you face in delivering high quality audit services to all who could benefit from them?

Fortunately, we work in an industry with a very large market—there are tens of thousands of producers across the U.S. who can benefit from an energy audit. To augment direct marketing to farmers, we rely on entities promoting energy audits to spread the word about our services.

Most government agencies have recognized that the expertise to perform audits comes from private industry, but it can be challenging for private industry to operate within the existing governmental framework.

What are some of your biggest challenges in working with agricultural and rural clients?

We have a good understanding of the farm and are very aware of the issues that affect a farmer's ability to participate in an audit program (seasonal availability, cash flow). We feel the largest challenge to working with farm clients is not the farmers themselves, but the ambiguity of some of the financial assistance programs for audits. Some USDA programs provide financial assistance for agricultural energy audits, but they have not set up the mechanism to allow service providers to access that market. For example, NRCS has set up the "Technical Service Provider" Registry (called "TechReg") to allow private businesses to register and provide conservation program technical assistance to producers. However, NRCS has made the policy decision not to allow any businesses to register to provide technical service unless there is a "practice standard" for that service. Currently there is no NRCS practice standard for farm energy audits even though NRCS provides financial assistance for energy audits through the Conservation Security Program (CSP).

Therefore, businesses such as EnSave cannot register with NRCS under their TechReg process. The only other means for spreading information about our ability to complete audits for the CSP is to call each individual program manager and energy contact within each state to let them know about our services.

Farm management is inevitably “holistic” and every farm is somewhat unique. What is EnSave’s strategy for coping with the variability and complexity of farming operations?

Every farm manager or operation is individually assessed, and every one of EnSave’s energy audits is tailored to each individual farming operation. This assures that each farm’s needs are met.

Are producers themselves willing to pay the real cost of an audit? If not, who should pay?

- Sometimes yes, sometimes no. It depends upon each farming operation and the potential for energy savings. Larger or more complex farming operations have a greater likelihood of significant energy savings and therefore more incentive to pay for it themselves, especially as energy costs continue to rise. There is a direct correlation between the size and complexity of the operation and their willingness to pay for the real cost of an audit because they realize greater direct benefits from the audit.
- An energy audit is just like any other investment decision on the farm—even if an audit identifies some very good investment opportunities with quick paybacks, the farm has to weigh that decision with other investments on the farm (increasing herd size, hiring staff, etc.)
- Audits should be paid for by the beneficiaries. If the producer can realize energy savings benefits that are greater than the audit and implementation cost, then they should pay for the audit. If society benefits from the implementation of the energy audit (such as reductions in SO_x, NO_x, CO₂, and other greenhouse or other air quality gases/emissions), then society should bear part of the burden. Much greater thought and care should be given to these decisions and EnSave’s knowledge and experience can certainly help in this effort.

Do you have ideas for increasing participation in the Section 9006 (REAP) Program? To what extent is the lack of access to energy audits a barrier?

There is currently significantly more application demand for REAP program funding than there is funding. We currently conduct REAP audits and are capable of conducting many more, if asked. We do see more of a barrier in individuals able to complete the rest of the REAP application process, as that can be quite complex.

Do you have ideas for increasing the involvement of equipment dealers, utilities (including rural electric co-ops), Extension, Conservation Districts, or other agricultural organizations?

EnSave regularly fosters the involvement of all of the above ‘agricultural community’ leaders in any of our energy efficiency programs. Each state has an existing network of information sources that farmers turn to for information and advice. We always try to reach out to these allies to inform them of the program and let them know how our program, and/or energy audits, can benefit their constituencies. Equipment dealers have a built-in incentive to promote energy efficiency, because it helps spur sales of their energy efficient products.

It can be difficult to generalize the groups above because each category is made up of thousands of individuals. Some organizations are very interested in energy and are actively taking steps to address energy use. We welcome the cooperation of these entities to promote energy efficiency and the availability of energy audits, but we do not necessarily see them being involved in delivering energy audits.

Farm Energy Partners Network Energy Audit Program

1. Name of the program and contact information:

Farm Energy Partners Network Energy Audit Program
John Blais, Kennebec County Soil & Water Conservation District
(207) 622-7847 x3
<http://www.kcswcd.org/EnergyPage.htm>

2. How is the program funded? Can you provide an approximate annual funding amount?

We are partnering with Efficiency Maine, part of the PUC system.

3. What geographic area do you serve, and who is eligible to participate?

Kennebec County, Maine. We've been allowed to expand to a couple surrounding counties. Maine Rural Partners has funding to do audits and assist with purchases outside of these counties. We are involved in providing technical support to that project as well.

4. In what year did the program start? Does it have a known ending date?

2008; no known ending date

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

We've sponsored 21-22 audits, mostly dairies although we've done a couple non-dairy farms, including one beef and one goat operation. We are pretty happy with results so far. We are finding that a real important service is explaining incentive options for accurate comparison. Getting people to invest the money is the hard part. (Just 3-4 so far.)

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

We sponsored a training for 70+ people and started doing audits within a couple weeks after the workshop. The people who attended were a 50/50 split of energy auditors and others who needed to know more. Many auditors are private consultants; after the training they can now talk more intelligently about energy.

One auditor has become a specialist. Two have done most of the audits. Not Efficiency Maine employees, but consultants/freelancers.

7. *What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?*

All involved a physical visit to the farm.

8. *What are the most common energy saving measures included in your recommendations?*

Propane on-demand hot water heaters are popular. Compressors, fans. Lighting. Lots of dairies are 70-150 cows and have old equipment. Some still have electric hot water heaters. In Maine, most hot water comes from oil-fired furnaces (without holding tank) or electric.

9. *Can you provide statistics on how often your recommendations are implemented?*

10. *Can you provide energy and dollar savings estimates for recent years?*

11. *Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.*

Our grant has some very specific incentives for the dairy industry. Efficiency Maine has some funding of its own.

We weren't fully aware how much we would end up being "financial folks." Calculating incentives from multiple sources has become very confusing...the most difficult part to figure out.

12. *To what extent has demand for your audits been related to the USDA Rural Energy/ Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)? How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?*

Our grant was designed by a previous employee to dovetail with the Farm Bill program. Our audits would work for 9006.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

This is a good place for Soil & Water Districts to be: We are generalists and neutral. However, most of the expertise exists in vendors.

Focus on Energy Agricultural and Rural Business Program

1. *Name of the program and contact information:*

Agriculture and Rural Business Program, Focus on Energy
800.762.7077
focusinfo@focusonenergy.com
<http://www.focusonenergy.com/Business/Agriculture/>

2. How is the program funded? Can you provide an approximate annual funding amount?

Public Benefits Charge collected from utility ratepayers

3. What geographic area do you serve, and who is eligible to participate?

The State of Wisconsin. A handful of co-ops do not participate.

4. In what year did the program start? Does it have a known ending date?

The program started in 2001; there is no known ending date.

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

1200-1500 projects per year, and a similar number of farm visits. These vary widely and do not always include a full site assessment. Some of these are only verbal, over the phone.

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

10-12 people are trained to do audits. "Focus-level audits" are geared towards rebates, and often count as "assessments" (for purposes of the 9006/REAP program). Two staff members are trained to do "comprehensive audits."

The cost gets more expensive as you look at more types of equipment, requiring more engineer time for creative & holistic thinking.

7. What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?

Some audits are purely verbal. Focus on Energy is restricted to electrical and natural gas/propane uses on farms. Program incentives are for those applications. Can look at heating oil for water heating. In the future, every site assessment will get a report.

8. What are the most common energy saving measures included in your recommendations?

Dairies: Plate coolers, VSD vacuum pumps, refig heat recovery, and commercial liquid propane and natural water heating systems.

Greenhouses: Greenhouses are a growing part of our work. We do at least 30 projects per year. There are lots of incentives for better films, including infrared-rated poly films for heat retention. Also power-vented unit heaters, greenhouse climate controls, and heat-retention curtains (custom incentive).

Grain drying systems: We deal with 40-50 customers per year. The greatest potential is for mixed-flow drying systems. Also implementation of in-bin cooling or "dryeration" grain-handling systems.

Irrigation: 30-40 or so customers per year. The most common measure is changing from high pressure to low-pressure. Increasingly, there are incentives for systems with one motor using multiple pivots with variable-speed drives.

9. Can you provide statistics on how often your recommendations are implemented?

Up until the last year or so, our completion rate was very high, around 90 percent, since we worked mainly with projects that were already in the planning stages. With the new year, we've been asked to become more proactive: getting out on the farm prior to planning or even interest on the part of the producer. We expect this to cause a dramatic decrease in our completion rate.

10. Can you provide energy and dollar savings estimates for recent years?

11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.

We offer both a prescriptive program and a custom program. In the prescriptive program, contact does not take place until after the customer sends in their paperwork—in other words, at point of purchase. GDS follows up with 50 percent of farms (by phone) that submit requests, and runs energy savings calculations. Custom projects all have a site assessment/energy audit.

12. To what extent has demand for your audits been related to the USDA Rural Energy/ Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)? How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

We have not tracked this but don't think it's that significant. It's much easier for producers to get Focus on Energy money than to pursue REAP funding.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

USDA grants are only \$25 million across the entire nation. There's not enough money in the program to see a big change.

Massachusetts Farm Energy Program

1. Name of the program and contact information:

Massachusetts Farm Energy Program
<http://www.berkshirepioneererrcd.org/contact.php>

2. How is the program funded? Can you provide an approximate annual funding amount?

Total funding: USDA-NRCS \$150,000 (Conservation Innovation Grant) + MA-Department of Agricultural Resources \$250,000

3. What geographic area do you serve, and who is eligible to participate?

Statewide program serving agricultural producers and forest products businesses

4. In what year did the program start? Does it have a known ending date?

2-year pilot project with start date October 2008, projected end date Dec. 2009

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

N/A as we are just recently began taking applications for energy audits

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

Experienced energy consultants have been retained on behalf of the MFEP. MFEP audits or consultations will typically be “targeted” to address specific measures or concerns identified in the application process, particularly those that are not addressed by a “public” utility energy efficiency program or Massachusetts Technology Collaborative’s (MTC’s) renewable energy programs. The audit/assessment report will contain recommendations and, if desired, content suitable for applying to other programs (such as MTC or USDA REAP). We anticipate most (targeted) audits to cost about \$1000 but could vary, especially for renewable energy assessments. <http://www.berkshirepioneerrcd.org/mfep/energy.php#energy>

7. What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?

No reports yet. The audit/assessment report will contain recommendations and, if desired, content suitable for applying to other programs (such as MTC or USDA REAP).

8. What are the most common energy saving measures included in your recommendations?

Although MFEP will consider for eligibility any genuine energy saving technology, the following conventional energy saving technologies (listed by agricultural sector) will be considered of high priority: <http://www.berkshirepioneerrcd.org/mfep/energy.php#energy>

9. Can you provide statistics on how often your recommendations are implemented?

No data to report yet but target is 50 percent implementation.

10. Can you provide energy and dollar savings estimates for recent years?

Not yet

11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.

Yes – we offer technical assistance, grant writing support for USDA REAP, and incentives for implementation. Currently conducting REAP information sessions and grant writing assistance workshops. Now accepting applications for MFEP Audits & Incentives:

<http://www.berkshirepioneererrcd.org/mfep/services.php>

12. To what extent has demand for your audits been related to the USDA Rural Energy/ Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)? How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

We provided technical support and grant writing assistance to seven farmers in 2008. All seven were funded. Two of these were for energy efficiency projects. Although we did not provide the audits, we did refer one of the two to an auditor and we worked very closely with the both auditors to insure the reports met the grant requirements. As we could not find enough experienced farm auditors for referrals in 2008, our MFEP Audits & Incentives program is designed to alleviate that problem for 2009 applicants, provided REAP applicants apply early for assistance from the MFEP.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

Currently, the Farm Bill language is unclear whether or not a non-profit can apply for funding for audits. Berkshire-Pioneer RC&D Area, Inc. has now established a statewide audit program for agricultural producers with startup support from USDA-NRCS and MA-Department of Agricultural Resources (MDAR). The MFEP has retained experienced farm energy auditors and negotiated the audit costs. Thus, the MFEP can now connect an auditor with a farmer thus eliminating the need for a farmer to find and verify credentials of energy auditors and has made it more affordable. Even if MDAR continues to support this program, matching funds will be necessary and the 9007 program is probably the only program that could provide that match. At the end of 2009, the program will likely end if an additional funding source cannot be located, and the most likely funding source is 9007.

Pacific Gas & Electric Company

1. Name of the program and contact information:

Do-It-Yourself Online Audit

The SmartEnergyAnalyzer™ is a self audit tool designed specifically for business customers that is quick, easy, and free. Customer spends less than 5 minutes describing their facility and receives a list of customized cost-saving recommendations on how to:

- Reduce their energy bill.
- Improve the productivity & comfort of customers and employees.
- Obtain information about incentive programs.
- Improve their bottom line

Click on the link to get started

<http://www.pge.com/mybusiness/energysavingsrebates/analyzer/onlineaudit/>

On-Site Energy Audit

This service is best for medium and large-sized businesses. A PG&E account representative conducts an on-site audit to help the customer identify potential steps they can take to save energy and money at their business. They will receive a customized report tailored to their business that describes energy-saving tips and identifies rebates and incentives from PG&E that they may want to consider.

To schedule an on-site audit, contact the Business Customer Service Center at 1-800-468-4743.

Integrated Energy Audit

The integrated audit takes a comprehensive view of all of the customer's energy management options:

- Energy efficiency opportunities
- Time of use management
- Demand response opportunities
- Self-generation and renewable energy information

Integrated audits are best for commercial, industrial, and agricultural customers whose electric demand exceeds 200kW. Agriculture related audits during the last few years have been conducted at dairies, wineries, food processors, packing houses, millers and canners.

To request an integrated audit, contact the Business Customer Service Center at 1-800-468-4743.

Targeted Energy Audit

The Targeted Energy Audit is best for medium and large-sized customers and identifies specific strategies and technologies that can deliver immediate energy savings for the customer's facility. A PG&E technical consultant will work with the customer to identify projects that have the potential to save lots of energy. The consultant will also recommend sound investments in energy-efficient equipment and provide information on rebate and incentive programs to help offset the initial costs.

Targeted energy audits focus on specific end uses of energy, like process heating and cooling, and refrigeration system improvements.

To schedule a targeted energy audit, contact the Business Customer Service Center at 1-800-468-4743.

Agricultural Pumping Efficiency Program (APEP)

Administered by CSU Fresno's Center for Irrigation Technology, the APEP program provides subsidized pump tests for owners or users of a non-residential, PG&E electric or natural gas account that is primarily used for pumping water (25 h.p. or above) for production agriculture, landscape or turf irrigation, and municipal purposes, including potable and tertiary-treated (reclaimed) water. Excluded are pumps used for industrial processes, raw sewage, or secondary-treated sewage. Additionally, the program provides technical assistance and incentives for retrofit and repair of inefficient pumps.

The twin goals of APEP are:

- Get highly efficient hardware in the field, including pumping plants, irrigation systems, and water distribution systems.
- Ensure that this hardware is managed correctly.

More information on APEP can be found at <http://www.pumpefficiency.org/>

PG&E's Retrocommissioning (RCx) Program

Retrocommissioning (RCx) is a systematic process for identifying less-than-optimal performance in an existing customer's facility which include existing equipment, lighting, and control systems and then making the necessary adjustments.

Two audits are performed: an initial Scoping Audit and a comprehensive Investigative Audit. Whereas retrofitting involves replacing outdated equipment, RCx focuses on improving the efficiency of what is already in place, and will pay for repair, maintenance or optimization of existing systems.

The RCx Program is a calculated rebate program where the business owner earns incentives based on actual annual energy savings.

To learn more about Retrocommissioning (RCx), contact the Business Customer Service Center at 1-800-468-4743.

Third Party Program: The Wine Industry Efficiency Solutions Program (WIES)

Managed and administered by Resource Solutions Group, Inc. (RSG), WIES provides comprehensive audits at small and mid-sized wineries that identify opportunities for energy savings. Underwritten by PG&E through the Public Purpose Programs Fund under the auspices of the CPUC, the audits are conducted to identify the most cost-effective efficiency upgrades to implement. A comprehensive energy management plan is developed for each participant that describes energy efficiency measures to implement, promoting those measures with the highest Internal Rate of Return and energy savings that will meet the winery's specific operational needs. Additionally, the program offers unbiased technical service, education and support through a tailored energy management approach to facility staff to identify, evaluate and promote the installation of energy efficiency measures to reduce the operating expenses and improve the efficiency of facility operations.

2. How is the program funded? Can you provide an approximate annual funding amount?

The programs are funded by California customers through a small "public purpose charge" on the customer's bill and administered by PG&E under the auspices of the California Public Utilities Commission.

- Integrated Audits and Targeted audits: For the years 2009-2011, approximately \$27,000,000 to underwrite audits across all business segments.
- Ag Pump Efficiency Program (APEP) audits: For the years 2009-2011, approximately \$440,000 per year to subsidize pump tests for qualifying pump customers.

3. What geographic area do you serve?

The PG&E service territory, which extends from Bakersfield and the northern half of Santa Barbara County in the south, to Humboldt and Shasta counties in the north.

Who is eligible to participate?

All PG&E agricultural customers (including post-harvest) who take delivery of electricity and/or natural gas from PG&E.

4. In what year did the program start?

We began with agricultural pump testing in 1922. We have been providing energy audits to agricultural, industrial and commercial customers continuously since the mid 1970s.

Does it have a known ending date?

No.

5. How many audits have been performed annually during each of the past six years (2003-2008)?

- APEP: From 2002 through 2008, a total of 12,900 subsidized pump efficiency tests (audits) were performed; an average of 1,840 per year.
- Integrated Energy Audits: In addition to audits performed at packing houses, cold storage facilities, millers and other facilities engaged in post-harvest activities, from 2002 to 2008 more than 20 audits were performed at dairies, and 25 at wineries.
- RSG Wine Industry Efficiency Solutions program: 101 audits performed at wineries from 8/2006 to 12/2008

How many have been performed in total, over the life of the program?

Not available.

6. Who conducts audits, and how are your auditors trained?

Audits are conducted by PG&E employees, consultants and/or 3rd party providers.

APEP: Participating pump test companies receive training annually on pump testing best practices, safety and new technology and techniques.

PG&E employees are generally trained internally at one of our training facilities: The San Ramon Learning Center, the Pacific Energy Center in San Francisco, and the Energy Training Center in Stockton.

Can you provide an average cost per audit?

APEP subsidized pump tests: \$150 to \$170 per audit

Integrated Audits: \$15,000 - \$20,000 per audit

7. What happens during an audit, and what sort of report does the customer/client receive?

See #1 above.

Are there restrictions on the operations or equipment that can be included?

Generally any equipment or operational strategy that saves energy can be included, including water-saving strategies (due to the energy embedded in water pumping, transport, heating and cooling).

Is a sample report available?

APEP: Yes, in section VII (pages 4—5) of the APEP Policies and Procedures manual:

<http://www.pumpefficiency.org/About/literature/APEPIIIProgSumry.pdf>

8. What are the most common energy saving measures included in your recommendations?

In Ag and Food Processing, the three most common recommendations are lighting, motors and refrigeration.

9. Can you provide statistics on how often your recommendations are implemented?

APEP: During the period 2006-2008, approximately 16 percent of subsidized pump tests led to pump retrofits.

10. Can you provide energy and dollar savings estimates for recent years?

APEP for 2006 - 2008: Pump retrofits that resulted from pump tests, including both completed and currently committed projects, are providing 22.5M kWh of energy savings

11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance?

All of the above.

Please briefly describe these.

Demand Response Programs

PG&E's demand response programs offer incentives for business owners who curtail their facility's energy use during times of peak demand.

<http://www.pge.com/mybusiness/energysavingsrebates/demandresponse/>

Self-Generation Incentive Program

The Self-Generation Incentive Program (SGIP) to offers financial incentives to customers who install certain types of distributed generation facilities to meet all or a portion of their energy needs.

<http://www.pge.com/mybusiness/energysavingsrebates/selfgeneration/>

California Solar Initiative (CSI)

With over 25,000 PV systems installed, PG&E has connected more solar customers to the electric grid than any other utility company in the country—in fact this represents almost 50 percent of the installs throughout the entire U.S.

<http://www.pge.com/mybusiness/energysavingsrebates/solar/csi/index.shtml>

ClimateSmart Program

When a customer joins the ClimateSmart program, their monthly energy bill shows the cost of reducing or absorbing the greenhouse gas emissions associated with their facilities' actual ener-

gy use. The ClimateSmart program, a first-of-its-kind, helps you to balance out your business's greenhouse gas (GHG) emissions through environmental conservation, restoration and protection projects. By adding a voluntary, tax-deductible donation to your monthly PG&E bill—customers can join the fight against climate change and reduce their carbon footprint.

Rebate and Incentive Programs

- Agricultural Products Catalog
http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/agriculture_catalog.pdf
- New Targeted Customer Catalog
<http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/rebatesincentives/08agfoodprocessingweb.pdf>
- Non Residential Retrofit (NRR)
<http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ief/index.shtml>
- Non Residential New Construction (NRNC)
<http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/inc/>
- APEP <http://www.pumpefficiency.org/>

12. To what extent has demand for your audits been related to the USDA Rural Energy/Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)?

None to date.

We have established a working group with USDA, CEC, CPUC, the CA Farm Bureau and other industry groups to find ways to streamline the REAP Program for California Ag customers. One goal of our effort is to allow California's existing utilities' agricultural energy audit programs/technical assistance to comply with the Technical Assistance Section 9007 of the 2008 Farm Bill. PG&E provided public comment to USDA in December 2008 stating that:

“The Department (USDA), should consider supplementing the relatively modest funding of the Technical Assistance Section 9007 of the 2008 Farm Bill by utilizing existing California Utilities' audit and technical assistance services...The availability in California of industry accepted, high-quality audits/technical assistance will further leverage USDA funds to those many states where energy audits are not available.”

How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

None that we know of.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

Southern California Edison Agricultural Energy Efficiency Program Ag Efficiency Plus Pump Test Program

1. Name of the program and contact information:

Agricultural Energy Efficiency Program
Ag Efficiency Plus Pump Test Program
<http://www.sce.com/b-rs/agriculture/>
Gary Suzuki, Agricultural Energy Efficiency Program Manager
(626) 633-3130

2. How is the program funded? Can you provide an approximate annual funding amount?

From the California Public Utilities Commission and rate payers. A line item charge on all utility bills.

See report.

3. What geographic area do you serve, and who is eligible to participate?

Southern California Edison service territory in California.

4. In what year did the program start? Does it have a known ending date?

2006 was first year Edison had a general program for ag customers. Pump tests have been offered since 1911.

5. How many audits have been performed annually during each of the past six years (2003-2008)? How many have been performed in total, over the life of the program?

From late 2006 until mid 2007, we did 20-28 farm audits.

Initially we had a strategy to target dairies. They are geographically difficult to reach, but the potential for energy savings comes into play, and there are a few key processes. Even larger dairies weren't taking advantage of it or the savings were lower than expected. We later found that dairies were more challenging than we anticipated. Our focus shifted from dairies to more supportive services such as cold storage warehouses.

Audits always will be open to any agricultural customer, although 90 percent of our farm activity is pump evaluations. These are free and we do them on demand. 6500 were completed last year, although not all were farm systems.

6. Who conducts audits, and how are your auditors trained? Can you provide an average cost per audit?

We have 15-16 pump testers plus 3-5 third party contractors.

PEs are involved in all of our programs; always at least one PE with considerable expertise in the technology they are reviewing. Senior engineers were involved in the dairies. A separate engineer with cold storage expertise handled those cases.

Sometimes the engineer went to the farm. Other times they used data gatherers who took photos, provided info to engineers. For complex systems, we send out the engineer to the farm.

For pump tests: Our methodology has been developed and reviewed over a long time. Testers go through a minimum of one year of journeyman training, where they learn theory and gain hands-on experience.

Our third party pump testers average \$320 per pump test. Cost per audit numbers for whole-farm audits are not known.

7. What happens during an audit, and what sort of report does the customer/client receive? Are there restrictions on the operations or equipment that can be included? Is a sample report available?

8. What are the most common energy saving measures included in your recommendations?

The number one measure was pump renovations. Southern Cal Edison received over 800 applications for incentives and 80 percent of these were for pumping system improvements. Irrigation districts and water agencies are very attuned to keeping costs low for downstream customers.

9. Can you provide statistics on how often your recommendations are implemented?

Not available.

10. Can you provide energy and dollar savings estimates for recent years?

See report.

11. Besides the audits themselves, does your program offer related cash incentives, rebates, educational programs, workshops, or technical assistance? Please briefly describe these.

We advise customers of the potential for incentives. We conduct walk-through audits (including a full report). Pump tests include incentive information in the reports.

12. To what extent has demand for your audits been related to the USDA Rural Energy/ Energy Efficiency Program, Section 9006 (recently renamed the Rural Energy for America Program)? How many of your audits have resulted in proposals to this program, and how many of these proposals have been successful?

Historically, Southern Cal Edison has not been very attuned to this program. We are working to try to get to the point of coordinating with REAP and also AB32 (related to greenhouse gas emissions).

We met with USDA's California office about REAP. The number one problem identified was the fact that application deadlines are "a moving target." If USDA could schedule twice per year, with RFP solicitations, many more California applications would come in.

Please add any other comments or suggestions you have for improving the availability or usefulness of farm energy audits nationally:

Comprehensive audits are a long-term goal you should have. These should be coupled with education about using the information and developing internal requirements so you can phase in projects over time. You will need a lot of follow-up. Every customer group has challenges that prevent them from being able to implement energy efficiency. For our agricultural customers, energy efficiency is not a big deal to them. They are more likely to see it as a tool to help them meet air water and water quality targets. Energy conservation is “absolutely not a priority.”

Audits can be a very useful tool. The state is finally recognizing that energy efficiency plays a big role in meeting the state’s energy requirements. We try to impress on our customers that this is a tool to help you set up a plan to do improvements to the farm operation over a period of time...unless they have the capital to do it all at once.

You definitely want to know what your base case is. In California, there’s a general requirement that energy efficiency is considered first, before any renewable energy goes in. You are expected to get your base usage down to the lowest level possible.

If your goal is to do anything, you need to have the audit to establish a baseline. It will be costly. Farms use a sizable amount of energy but “don’t have a slew of options available to them.”