Reaping the Rewards of Energy Efficiency: Money-Saving Measures for the Livestock Sector

May 1, 2012
Welcome!

Introduction and Objectives

Ernie Shea
25x’25 Project Coordinator
Webinar Objectives

1. Review the opportunities and savings potential of on-farm energy efficiency projects for animal agriculture operations
2. Highlight examples of steps producers have taken to reduce energy costs
3. Review programs and tools available to help livestock producers achieve their energy efficiency goals
Session Leaders

- **Ernie Shea**, 25x’25 Project Coordinator - moderator
- **Kate Farley**, Ag Energy Efficiency Research Assistant, ACEEE
- **Bennie Hutchins**, Energy Program Coordinator, Ag Energy Resources LLC
- **Tony Crooks**, Renewable Energy Specialist, USDA-Rural Development
- **David L. Faulkner**, Natural Resource Economist, USDA/NRCS
- **Amelia Gulkis**, Principle, EnSave, Inc.
Webinar Procedures:

- Lines will be muted during presentations to minimize background noise
- For presenters and Q&A, un-mute by pressing *6
- Will take questions at the end of the presentations
- To ask a question, either press *6 to un-mute or use the comment feature to submit a written question
Energy Efficiency in Livestock Production

Kate Farley
Research Assistant, Industrial and Agricultural Policy
About ACEEE

• Nonprofit 501(c)(3) dedicated to advancing energy efficiency through research and dissemination.
• 50 staff in DC, DE, MI, WA, & WI
• Focus on end-use efficiency in industry, buildings, utilities, & transportation
• Other programs in economic analysis, behavior, state & national policy
• Funding:
  ◦ Foundations (34%)
  ◦ Federal & State Grants (7%)
  ◦ Specific Contract work (21%)
  ◦ Conferences and Publications (34%)
  ◦ Contributions and Other (4%)
Live animal agriculture is very energy-intensive

- Agriculture is similarly energy-intensive to many kinds of manufacturing
- Livestock is one of the most energy-intensive kinds of agriculture
How is energy used on the farm?

- Other/Not Categorized: 62%
- Motors: 20%
- Machinery: 16%
- Lighting: 2%
Direct Energy Use

- Motors
- Lighting
- Gasoline
- Ventilation
- Refrigeration
Indirect Energy Use

Feed

Water
Looking at energy use holistically

- Spending money in the short run helps you save energy in the long run
- These decisions can be better for your animals, too
Example: A New Ventilation System
Upcoming ACEEE Agriculture Research

- Detailed look at energy intensity
- Agriculture and behavior in Alabama
- An updated look at on-farm energy use
Thank You

Contact:
Kate Farley
Research Assistant
kfarley@aceee.org
(202) 507-4031
Energy Efficiency Opportunities for Livestock Producers throughout the Southeast

Bennie Hutchins
Ag Energy Resources
P. O. Box 3670
Brookhaven, MS 39603
Phone 601-748-2622
Email: bhutchins@wildblue.net

May 1, 2012
Economic Impact of U.S. Animal Agriculture

1,818,843 Jobs; almost 113,000 more jobs that 10 years ago

$41 Billion Impact on Household Incomes

$6 Billion in Property Taxes Paid

$10 Billion in Income Taxes Paid

Animal Ag Contributed More Than 5% of the Gross State Product for 13 States (AL, AR, ID, IA, KS, MS, NE, NM, ND, OK, SD, WI and WY)


Confined Animal Ag Operations (poultry, pork, dairy, etc.) are huge energy users that can benefit greatly from REAP.
### Rural Energy for America Program Investments

<table>
<thead>
<tr>
<th>Technology</th>
<th>2009 – 2011 Investments $/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR</td>
<td>$0.405</td>
</tr>
<tr>
<td>HYBRID</td>
<td>$0.200</td>
</tr>
<tr>
<td>GEOTHERMAL</td>
<td>$0.092</td>
</tr>
<tr>
<td>HYDROPOWER</td>
<td>$0.083</td>
</tr>
<tr>
<td>BIOMASS</td>
<td>$0.080</td>
</tr>
<tr>
<td>WIND</td>
<td>$0.041</td>
</tr>
<tr>
<td>ENERGY EFFICIENCY</td>
<td>$0.029</td>
</tr>
</tbody>
</table>
Tara Adams, a single-mom, poultry producer, Haleyville, AL - Energy cost of $14.13 per 1000 pounds broilers was consuming 30 cents of every dollar she was getting for her birds.

Results of $20,000 REAP Grant:
Annual Energy Use Reduction – 31%
Payback Period – 3 years
Survey of 40 Mississippi REAP Grant Recipients (poultry)

• Annually Saving 6% on Electricity and 41% on Propane

• Annual Value of $12,000 per Producer

• Combined Annual Savings of 28.7 Billion BTUs, equal to 314,000 gallons of propane
Great American Shrimp, Port St. Joe, FL:

300 freshwater acres producing 200 tons of Pacific White Shrimp annually

**REAP Project ($9,700 grant):**
Solar oxygen monitoring system with Computer Controller for Pond Aerators

Annual Energy Reduction: 36%

Payback Period: 5.6 years
Energy Use by 21 Catfish Producers Participating in REAP 2011-2012

(average per farm)

<table>
<thead>
<tr>
<th>Energy cost per 1000 pounds live catfish BEFORE</th>
<th>Energy cost per 1000 pounds live catfish AFTER</th>
<th>Baseline annual energy cost</th>
<th>Annual KWH savings</th>
<th>Projected % Annual Energy Savings</th>
<th>Projected Payback Period</th>
<th>Pounds fish produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>$58.26</td>
<td>$37.16</td>
<td>$61,443</td>
<td>145,800</td>
<td>36.2</td>
<td>3.8 years</td>
<td>1,074,025</td>
</tr>
</tbody>
</table>
White Rock Fish Farm
Craven County, NC

$6,700 REAP grant for solar powered oxygen monitoring units with computer controller for pond aerators

21% annual energy savings
6 year payback period
Jubilee Farms, catfish producer, Sunflower County, MS: Installed 1600-ft. deep well to extract 82º water for fish hatchery. Eliminates the need to heat 60 million gallons per year.

“The system is performing above projections, both in temperature of water we’re getting up and the volume. It’s saving me $30,000 a year in energy costs.” - Leigh Holland, Jubilee Farms, July 2011
Spring Hill Farm, Pork Producer, Halifax County, VA: $3,300 REAP grant for more efficient fans and water heaters in farrowing houses.

Annual Energy Savings: 9%
Payback Period: 2.7 years
POTENTIAL ENERGY CONSERVATION MEASURES for Dairy Producers

- Lighting
- Ventilation
- Refrigeration
- Heat Reclaim Equipment
- Variable Frequency Drives for Pumps and Motors
- Hot Water
Rural Energy for America Program
Energy Efficiency Opportunities for Livestock Farmers and Ranchers

Reaping the Rewards of Energy Efficiency:
Money-Saving Measures for the Livestock Sector

Tony Crooks
USDA Rural Development
• Increasing economic opportunity in rural America
• Improving the quality of life of all rural Americans
$1.1 billion to leverage renewable energy industry investments in new technologies and feedstocks

- **Rural Energy for America Program (REAP)** -- $255 M
- **Biorefinery Assistance** -- $75 M ('09), $245 M ('10)
- **Biomass Crop Assistance Program (BCAP)** -- ($70) M
- **Repowering Assistance** -- $35 M
- **Bioenergy Program for Advanced Biofuels** -- $300 M
- **Biomass Research and Development** -- $118 M
- **Biobased Markets Program** -- $9 M
- **Biodiesel Fuel Education Program** -- $5 M
- **Biofuels Infrastructure Study** -- $1 M
2008 Farm Bill – Title IX
Renewable energy programs administered by USDA Rural Development

- Biorefinery Assistance Program
- Repowering Assistance Program
- Advanced Biofuels Payment Program
- Rural Energy for America Program (REAP)
Section 9007 -- Rural Energy for America Program (REAP)


- Establishes a grant and loan guarantee program to assist agriculture producers and rural small businesses in purchasing renewable energy systems and making energy efficiency improvements.

- Establishes a grant program for energy audits/renewable energy development assistance, and feasibility studies.
Section 9007 -- Rural Energy for America Program (REAP) Continued

• Grant Limits:
  o $500,000 for Renewable Energy Systems (or 25% of TPC)
  o $250,000 for Energy Efficiency Improvements (or 25% of TPC)

• Loan Guarantee Limits:
  o $25 Million Cap
  o Cap Federal share at 75% of project costs

• Mandatory Funding:
  o FY 09 - $55 Million + $5 million discretionary
  o FY 10 - $60 Million + $39 million discretionary
  o FY 11 - $70 Million + 5 million discretionary
  o FY 12 - $70 Million (rescinded to $24.5 million)
## REAP Eligible Technologies

<table>
<thead>
<tr>
<th>Renewable Energy Systems:</th>
<th>Energy Efficiency Improvements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Bioenergy</td>
<td>▪ Industrial</td>
</tr>
<tr>
<td>▪ Anaerobic Digester</td>
<td>▪ Buildings</td>
</tr>
<tr>
<td>▪ Geothermal</td>
<td>▪ Other</td>
</tr>
<tr>
<td>▪ Hydrogen</td>
<td></td>
</tr>
<tr>
<td>▪ Solar</td>
<td></td>
</tr>
<tr>
<td>▪ Wind</td>
<td></td>
</tr>
<tr>
<td>▪ Hydroelectric/Ocean (tidal, wave, current,</td>
<td></td>
</tr>
<tr>
<td>and thermal)</td>
<td></td>
</tr>
</tbody>
</table>
Energy Efficiency Improvements Defined

Energy efficiency improvements. Improvements to a facility, building, or process that reduce energy consumption, or reduce energy consumed per square foot.
Why Energy Efficiency?

- Applicable to many operations
- Energy savings = $$$ savings
- Often short payback
- Other non-energy benefits
  - Improved yield
  - Water savings
  - Reduced O & M Costs
  - Reduced CO₂ footprint
    - Lowest hanging GHG “fruit”
Start with an Energy Assessment or Audit

- Baseline for comparison
- Objective evaluation of all options
- Whole system design
  - Account for interaction between systems, especially in buildings
Energy Efficiency projects

- **Industrial**
  - Irrigation Projects
  - Grain Dryers
  - Reverse Osmosis systems
  - Other

- **Buildings**
  - Poultry Houses
  - Building Envelope
  - Tobacco Barns
  - Other
### Section 9007 Investments

<table>
<thead>
<tr>
<th>Technology</th>
<th>Number</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
<th>Total Project Cost</th>
<th>MWH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>4,070</td>
<td>$ 97,393,055</td>
<td>$ 41,850,622</td>
<td>$ 410,444,118</td>
<td>3,287,298</td>
</tr>
<tr>
<td>Solar</td>
<td>937</td>
<td>$ 33,709,107</td>
<td>$ 17,832,930</td>
<td>$ 171,376,648</td>
<td>162,976</td>
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<tr>
<td>Biomass</td>
<td>158</td>
<td>$ 29,115,735</td>
<td>$ 56,226,851</td>
<td>$ 320,231,633</td>
<td>2,502,675</td>
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<tr>
<td>Wind</td>
<td>318</td>
<td>$ 21,252,628</td>
<td>$ 39,668,057</td>
<td>$ 194,810,127</td>
<td>132,726</td>
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<tr>
<td>Flexible Fuel Pump</td>
<td>66</td>
<td>$ 4,284,342</td>
<td>$</td>
<td>$ 26,477,711</td>
<td>353,292</td>
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<tr>
<td>Geothermal</td>
<td>146</td>
<td>$ 3,264,002</td>
<td>$ 645,987</td>
<td>$ 21,412,238</td>
<td>41,789</td>
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<tr>
<td>Hydroelectric/Hydropower</td>
<td>17</td>
<td>$ 2,185,799</td>
<td>$ 8,092,000</td>
<td>$ 36,541,431</td>
<td>26,222</td>
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<tr>
<td>Hybrid</td>
<td>21</td>
<td>$ 730,916</td>
<td>$ 213,902</td>
<td>$ 3,188,548</td>
<td>781</td>
</tr>
<tr>
<td>Total</td>
<td>5,733</td>
<td>$ 191,935,584</td>
<td>$ 164,530,349</td>
<td>$ 1,184,482,455</td>
<td>6,507,759</td>
</tr>
</tbody>
</table>

USDA Rural Development
Committed to the future of rural communities.
## FY 2011 Rural Energy for America Program

Renewable Energy/Energy Efficiency investments by technology

<table>
<thead>
<tr>
<th>Technology</th>
<th>Number of Projects</th>
<th>Grant and Loan Guarantee Investments</th>
<th>Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>1,142</td>
<td>$23,188,213</td>
<td>$ 73,649,041</td>
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<tr>
<td>Anaerobic Digesters</td>
<td>19</td>
<td>$20,901,079</td>
<td>$ 89,972,097</td>
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<tr>
<td>Solar</td>
<td>478</td>
<td>$20,385,450</td>
<td>$ 57,861,071</td>
</tr>
<tr>
<td>Hydropower/Hydroelectric</td>
<td>9</td>
<td>$ 8,523,518</td>
<td>$ 13,386,461</td>
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<tr>
<td>Biomass</td>
<td>29</td>
<td>$ 6,986,914</td>
<td>$ 23,784,615</td>
</tr>
<tr>
<td>Flex Fuel Pump</td>
<td>66</td>
<td>$ 4,256,346</td>
<td>$ 22,109,380</td>
</tr>
<tr>
<td>Wind</td>
<td>55</td>
<td>$ 3,872,127</td>
<td>$ 75,388,274</td>
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<tr>
<td>Geothermal</td>
<td>59</td>
<td>$ 1,412,560</td>
<td>$ 4,251,333</td>
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<tr>
<td>Biofuels</td>
<td>4</td>
<td>$ 872,633</td>
<td>$ 12,013,838</td>
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<tr>
<td>Hybrid</td>
<td>13</td>
<td>$ 700,604</td>
<td>$ 1,595,703</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>1,873</strong></td>
<td><strong>$ 91,011,834</strong></td>
<td><strong>$ 374,011,813</strong></td>
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</tbody>
</table>

USDA Rural Development
Committed to the future of rural communities.
## REAP RES-EEI Awards
Agricultural producers and rural small businesses, 2009-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
<th>Number</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
<th>Number</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Agricultural Producers</td>
<td>Rural Small Businesses</td>
<td>All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2009</td>
<td>1,121</td>
<td>$32,034,517</td>
<td>$29,674,237</td>
<td>364</td>
<td>$18,947,463</td>
<td>$27,784,792</td>
<td>1,485</td>
<td>$50,981,980</td>
<td>$57,459,029</td>
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<tr>
<td>2010</td>
<td>1,857</td>
<td>$49,788,847</td>
<td>$26,334,345</td>
<td>519</td>
<td>$34,138,129</td>
<td>$46,664,159</td>
<td>2,376</td>
<td>$83,926,976</td>
<td>$72,998,504</td>
</tr>
<tr>
<td>2011</td>
<td>1,286</td>
<td>$28,653,678</td>
<td>$3,060,150</td>
<td>587</td>
<td>$28,372,950</td>
<td>$31,012,666</td>
<td>1,873</td>
<td>$57,026,628</td>
<td>$34,072,816</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,264</td>
<td>$110,477,042</td>
<td>$59,068,732</td>
<td>1,470</td>
<td>$81,458,542</td>
<td>$105,461,617</td>
<td>5,734</td>
<td>$191,935,584</td>
<td>$164,530,349</td>
</tr>
<tr>
<td>% of All</td>
<td>74%</td>
<td>57%</td>
<td>36%</td>
<td>26%</td>
<td>43%</td>
<td>64%</td>
<td></td>
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</tr>
</tbody>
</table>
REAP Energy Efficiency Investments, 2003-2011
Grants and loan guarantees

<table>
<thead>
<tr>
<th>Year</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>2004</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>2005</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>2006</td>
<td>$5</td>
<td>$1</td>
</tr>
<tr>
<td>2007</td>
<td>$7</td>
<td>$4</td>
</tr>
<tr>
<td>2008</td>
<td>$13</td>
<td>$5</td>
</tr>
<tr>
<td>2009</td>
<td>$18</td>
<td>$28</td>
</tr>
<tr>
<td>2010</td>
<td>$22</td>
<td>$48</td>
</tr>
<tr>
<td>2011</td>
<td>$1</td>
<td>$22</td>
</tr>
</tbody>
</table>

Millions

- $1 to $5
- $10 to $18
- $20 to $48
- $50 to $70

USDA
Rural Development
Committed to the future of rural communities.
### REAP Energy Efficiency Improvements

Selected Agricultural Producer Recipients, 2009-11

<table>
<thead>
<tr>
<th>Type of Producer</th>
<th>Number of Projects</th>
<th>Grant Amount</th>
<th>Loan Amount</th>
<th>Leverage Amount</th>
<th>Total Project Cost</th>
<th>Number of Jobs Saved</th>
<th>Energy Saved kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy &amp; Cattle</td>
<td>109</td>
<td>$2,127,401</td>
<td>$992,590</td>
<td>$9,877,862</td>
<td>$12,997,853</td>
<td>133</td>
<td>922,130</td>
</tr>
<tr>
<td>Hogs &amp; Pigs</td>
<td>48</td>
<td>$868,048</td>
<td>$291,791</td>
<td>$3,690,801</td>
<td>$4,423,086</td>
<td>38</td>
<td>16,517</td>
</tr>
<tr>
<td>Poultry</td>
<td>13</td>
<td>$302,772</td>
<td>-</td>
<td>$1,057,547</td>
<td>$1,360,319</td>
<td>11</td>
<td>137,106</td>
</tr>
<tr>
<td>Sheep &amp; Goats</td>
<td>10</td>
<td>$223,714</td>
<td>-</td>
<td>$684,061</td>
<td>$231,587</td>
<td>14</td>
<td>125,593</td>
</tr>
<tr>
<td>Fish &amp; Aquatic</td>
<td>21</td>
<td>$320,357</td>
<td>-</td>
<td>$957,487</td>
<td>$1,277,844</td>
<td>19</td>
<td>38,338</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>201</strong></td>
<td><strong>$3,842,292</strong></td>
<td><strong>$1,284,381</strong></td>
<td><strong>$16,267,758</strong></td>
<td><strong>$20,290,689</strong></td>
<td><strong>215</strong></td>
<td><strong>1,239,684</strong></td>
</tr>
</tbody>
</table>
Dairy and cattle

- Vacuum Pumps
- Milk Cooling/Pumping
- Water Heating
- Ventilation
- Lighting
- Long Day lighting
- Outdoor animal watering fountains
Building Envelope improvements

- Improving insulation
- Changing windows or doors
- Adding caulking
- Adding new roof
Hogs and pigs

HVAC!!
Efficiency improvements -- grain dryers
Grain dryer improvements

• Almost all grain dryer applications include a project to replace an older, inefficient grain dryer with a new grain dryer.

• Usually, individual components of these systems are not replaced.
Irrigation efficiency improvements
Irrigation efficiency improvements

- Gates to Pivots
- Pumps
- Nozzles
Irrigation components

- Different types of systems: gated, pivot
- Pumps
- Motors
- Nozzles
Poultry house components

- Lights
- Heaters
- Mechanical Equipment
- Windows
- Insulation
- Curtains
Poultry house efficiency improvements

- Brooders
- Curtains
- Fans
- Insulation
Poultry house heating systems
Sheep and goats

10 Solar projects
$223,714 grant amount
123,4923 kWh
Fish, aquaculture, and gators!

- Water well pump replacements
- Irrigation systems
- Aeration units
- Thermal exchange units
- Lighting
Other Industrial Energy Efficiency Improvement Examples

- Reverse Osmosis Maple Syrup Systems
- Refrigeration units
- Boiler/kiln replacement
by Recipient, Number, and Amount Awarded

<table>
<thead>
<tr>
<th>Recipient</th>
<th>2009-2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Amount Awarded</td>
</tr>
<tr>
<td></td>
<td>of Awards</td>
<td></td>
</tr>
<tr>
<td>State, tribal, or local governments</td>
<td>15</td>
<td>$1,421,805</td>
</tr>
<tr>
<td>Land Grant colleges, universities, and other institutions of higher education</td>
<td>34</td>
<td>$3,195,664</td>
</tr>
<tr>
<td>Rural electric cooperatives or public power entities</td>
<td>18</td>
<td>$1,751,090</td>
</tr>
<tr>
<td>Instrumentalities (State, tribal, or local governments)</td>
<td>8</td>
<td>$750,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>$7,118,559</strong></td>
</tr>
</tbody>
</table>
Wealth creation

Multiplier effect --
USDA leveraged investments create a multitude of secondary and tertiary employment opportunities and business startups in rural areas and serve as an incubator to new green technologies.
Thank you!

Tony Crooks
USDA, Rural Development
202-205-9322
Anthony.Crooks@wdc.usda.gov
On-Farm Agricultural Energy Management Plans (Energy Audits)

Presented by David Faulkner, Natural Resource Economist with the USDA/NRCS/Richmond, Virginia

May 1, 2012
EQIP-funded Energy Audits

• EQIP provides funds to help pay for 2 kinds of energy audits:

  – Both fall under a category of technical assistance called Conservation Activity Plans or CAPs:

    • CAP122s (headquarters audits); and

    • CAP124s (field operations or landscape audits);
CAPs (continued)

- What are CAPs?
  - Conservation activity plans are a category of specialized plans authorized by the 2008 Farm Bill;
  - They are designed to address specific problems and opportunities associated with a narrowly defined resource concern such as energy, forest mgt., etc.;
  - And are prepared by Technical Service Providers (private consultants certified for the services);
CAP rules

• Applications for CAPs don’t have to be ranked against other applications (this is a distinct advantage for the applicant);

• Funds are reserved on a 1st come, 1st served basis until the funding pool is exhausted;

• CAPs trigger development of a single practice, single year, stand alone program contract;
EQIP Process

• Client applies for financial assistance for either a CAP 122 (Energy Audit of HQ), a CAP 124 (field operations audit) or potentially both;

• NRCS contacts client if/when your application gets approved and your contract is ready to be signed;
EQIP process continued

• After signing an EQIP contract the client gets a list of TSPs certified for CAPs in their state; the client then identifies and contacts the TSP of their choice and negotiates a contract for TSP services;

• TSP will send you a packet of information and start on-farm audit data collection;
EQIP process continued

- The TSP will need copies of your bills for propane, electricity, and any other energy you used over the last 12 months at a minimum;

- The TSP will also conduct a telephone interview with you (about 45 minutes to an hour and a half long) and schedule to send someone out to your farm to collect additional data;
EQIP process continued

• Data on existing equipment, buildings and any other machinery that uses energy will be utilized by the TSP to prepare a draft audit report;

• The draft report is prepared and reviewed;

• Once approved, the TSP will transmit copies of the audit to you and NRCS;
EQIP process continued

• The local NRCS planner will certify the completed agricultural energy management plan and process your payment;

• Your payment will be deposited into your bank account;

• When applicable, we also discuss other opportunities for further participation in our programs;
## FY12 Payment Rates for Livestock Operations

<table>
<thead>
<tr>
<th>Energy Audit – CAP122s</th>
<th>Regular EQIP Clients</th>
<th>Historically Underserved EQIP Clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters, &lt; 70 animal units (AUs)</td>
<td>$1,145</td>
<td>$1,375</td>
</tr>
<tr>
<td>Headquarters, &gt;70 AUs and &lt; 300AUs</td>
<td>$1,510</td>
<td>$1,810</td>
</tr>
<tr>
<td>Headquarters, &gt; 300AUs and &lt; 2,500AUs</td>
<td>$1,865</td>
<td>$2,240</td>
</tr>
<tr>
<td>Headquarters, &gt; 2,500AUs</td>
<td>$2,400</td>
<td>$2,880</td>
</tr>
</tbody>
</table>
Energy Audit Report Results

- I took a look at 12 on-farm energy audits to glean key findings; 8 dealt with livestock operations:
  - 7 poultry farm audits and
  - 1 dairy farm audit

- These audits were either prepared through EQIP or for Rural Development’s “REAP” program;
Current & Projected Energy Use/Year and Annual Savings Potential on Poultry Farms

1/ Assumed average costs used for current and future conditions: electricity: $0.105/kilowatt hour ("kWhrs" = kilowatt hours of electricity); propane: $1.64/gallon;
Current & Projected Energy Use/Year and Annual Savings Potential on the 1 Dairy examined

- Average Annual Total Cost of Energy (Current conditions: $64,555)
- Average Annual Total Cost of Energy (Projected future conditions: $46,080)
- Average Annual Cost Savings ($/Yr.): $18,475
<table>
<thead>
<tr>
<th>Farm Type</th>
<th>Typical Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>Seal air leaks</td>
</tr>
<tr>
<td>Dairy</td>
<td>Install variable speed drive vacuum pumps for milk collection</td>
</tr>
</tbody>
</table>
Key Findings for Poultry Farms

• Range of projected costs for individual improvements on poultry farms: $90 to $52,000;

• Range of projected payback periods for individual improvements on poultry farms: 5 months to 44 years (5-15 years most typical);

• Estimated average payback period in years for improvements for the poultry operations: 10.4 years (excluding NRCS financial assistance);
Key Findings for the 1 Dairy Farm

• Range of projected costs for individual improvements on the dairy farm: $1,500 to $28,760;

• Range of projected payback periods for individual improvements on the dairy farm: 1.9 years to 6.0 years;

• Estimated average payback period in years for improvements for the dairy operation: 4.4 years (excluding NRCS financial assistance);
Take-away-points

• Farms with older equipment, machinery and buildings are the best candidates for realizing energy savings with short payback periods from implementing audit recommendations;

• Savings projections and payback periods are a function of the age and condition of existing equipment, machinery and buildings and assumed energy costs;
Take-away-points

• Savings projections and payback periods should be evaluated on an individual improvement by individual improvement basis for each farm’s situation;

• You can’t just look at the overall cost of all evaluated improvements as this may well be cost prohibitive even if all are recommended;
Take-away-points

• Improved operation and maintenance usually is cost-effective, i.e., pays for itself each year during the life of equipment, machinery and buildings;

• Improvements with payback periods longer than 10 years are not generally recommended;
Take-away-points

• NRCS also helps pay to implement audit recommendations through a new practice (374 - Farmstead Energy Improvements);

• Payments via 374 can significantly reduce investment payback periods;
Take-away-points

• The real value of an energy audit is derived from the specific deficiencies that are evaluated and the estimated costs and payback periods for each improvement. This information allows the farmer to evaluate and decide which specific investments are worth making and which ones aren’t.
Take-away-points

• The bottom-line is that an on-farm energy audit can be a great tool for making your farm operation more efficient and profitable.

• For additional information: contact your local USDA Service Center; or in Virginia call David Faulkner, NRCS/Virginia’s State Energy Contact (804) 287-1664
Farm Energy Audits: A Roadmap to Energy Savings

25 x 25
Reaping the Rewards of Energy Efficiency:
Money-Saving Measures for the Livestock Sector

Presented by:
Amelia Gulkis, COO
EnSave, Inc.
May 1, 2012
EnSave is the leading agricultural energy efficiency consulting firm in the United States

Our passion is helping American agriculture become more sustainable and profitable through energy efficiency and resource conservation
About EnSave

Provided of thousands of farm energy audits since 1991

Registered as a USDA Technical Service Provider throughout the United States

Design and implement agricultural energy efficiency programs for utilities, state energy offices, rural electric cooperatives, and agricultural organizations
Goals of an energy audit

- Clearly identify types and cost of energy use
- Understand how energy is being used
- Identify and analyze more cost-effective ways of using energy
- Identify improved operational techniques
- Recommend new equipment, processes or technology
- Perform an economic analysis on those alternatives and determine which are cost-effective
Five Step Farm Energy Audit Process

1. Initial Interview
2. Farm Visit
3. Energy Analysis and Calculations
4. Plan Writing and Delivery
5. Follow-up with Farmer
Initial Interview

Establish understanding of process and expectations

Collect actual usage and cost history for all energy types
  • Consider all energy accounts on site pertaining to agricultural operations
  • Identify trends, peaks, valleys, and confirm fit to operational information

Consider how the energy is currently used on site
  • Equipment ratings and schedules (i.e. rated HP and run hours)
  • Where is energy used (i.e. milk cooling, water heating, etc.)

Other operations, equipment or processes?
  • Confirm with producer - Have we covered everything?

Producer concerns, interests, plans?
Farm Visit

- On-site review and confirmation of structures, processes and equipment documented during initial interview
- Capture name plate information
- Photographs
- Did we capture everything?
- Face to face interaction with producer

*Trained Professional Data Collectors are a key component*
Energy Analysis and Calculations

• Energy use and savings calculations should be based on site specific equipment, operational information and work being done
• Analyze current energy use by process/equipment using the farmer’s operational schedules and existing equipment specifics
• Compare calculated current energy usage against actual usage history
Energy Analysis and Calculations

Figure 1. Twelve Month Electricity Usage

Figure 2. Electricity Use Breakdown

- Motors: 29%
- Lighting: 20%
- Milk Harvest: 8%
- Milk Cooling: 6%
- Miscellaneous: 1%
- Ventilation: 36%
How Were Energy Usage and Savings Calculated?

- Published energy use indices are fine for comparison of subject site with others in a broad group but are only an indication of relative energy consumption.
- Indices represent a ratio of total annual energy usage per unit i.e. kWh per cow or BTU per square foot.
- Does not account for fuel/energy mix.
- Is an overall “average”

Bottom line: Energy use indices are not a substitute for site specific calculations based on actual conditions.
To Drive the Point Home

Think about balancing your checkbook each month - Does the value in your register match the bank statement? Would an average dollar amount be good enough?
Plan Writing and Delivery

- Must meet applicable criteria such as NRCS 122, including those within S-612 as applicable
- Clear summary of current energy use
- Summary of recommendations, energy and cost savings, payback period, and environmental benefits
- Clear direction on measures recommended for implementation
Table 1. Summary of Estimated Annual Energy Efficiency Improvements

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>43,833</td>
<td>150</td>
<td>$2,929</td>
<td>$4,602</td>
<td>0.6</td>
<td>33,019</td>
<td>0.372</td>
<td>1.172</td>
<td>90.550</td>
<td>34.185</td>
<td></td>
</tr>
<tr>
<td>Water Heating</td>
<td>1,308</td>
<td>133</td>
<td>$4,800</td>
<td>1,293</td>
<td>3.7</td>
<td>15,747</td>
<td>0.000</td>
<td>0.001</td>
<td>0.079</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Milk Cooling</td>
<td>10,279</td>
<td>35</td>
<td>$9,274</td>
<td>$1,079</td>
<td>8.6</td>
<td>7743</td>
<td>0.087</td>
<td>0.275</td>
<td>21.234</td>
<td>8.017</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>54,111</td>
<td>1,308</td>
<td>$17,003</td>
<td>$6,974</td>
<td>2.4</td>
<td>56,509</td>
<td>0.459</td>
<td>1.448</td>
<td>111.863</td>
<td>42.232</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Energy Savings of Recommendations

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Current Usage</th>
<th>MBTU Usage</th>
<th>Savings</th>
<th>MBtu Savings</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity (kWh)</td>
<td>179,920</td>
<td>614</td>
<td>54,111</td>
<td>185</td>
<td>30.1%</td>
</tr>
<tr>
<td>Natural Gas (ccf)</td>
<td>2,856</td>
<td>291</td>
<td>1,308</td>
<td>133</td>
<td>45.8%</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>905</td>
<td>318</td>
<td></td>
<td>35.1%</td>
</tr>
</tbody>
</table>

Table 1 Notes:
1) SO\(_2\) and NO\(_x\) are ambient air contaminants; CO\(_2\) is a greenhouse gas.
Energy Savings as a percent of total energy use must also be presented for each energy type in Table 2 format (as shown below).
Follow-up with Farmer

- Confirm receipt and understanding of plan
- Discuss any concerns, address any questions
- Ask for feedback on service provided
- Does the plan meet expectations?
- Reinforce the installation of the right equipment, and importance of quality over price
- Guide farmer to sources of funding

Following up is critical to help the farmer move forward
Farm Energy Audit Tool (FEAT)

Software product that enables users to complete farm energy audits using EnSave’s calculations and report templates

Allows local personnel to meet the demand for farm energy audits

Geared to professionals with an energy background

**Bottom line:** A tool you can use
For more information, contact:

Amelia Gulkis
EnSave, Inc.
Toll Free: 800-732-1399
Direct: 802-434-1826
E-mail: ameliag@ensave.com

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Questions and Discussion
Thank you!

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