



What to Expect for Farm Energy Audits

Charles Martin, P. E.
Energy Engineer



About Advanced Energy

Advanced Energy is a nonprofit energy consulting firm.

We work with electric utilities, government and a wide variety of private organizations in the residential, commercial and industrial, renewables, motors and drives, and electric transportation markets. Our customized services include research, testing, training, consulting and program design.

Agenda

- What is an energy audit?
- Preparation for the energy audit
- The on-site visit
- Building the energy baseline
- Determining the ECMs
- Qualifying the ECMs
- The energy audit report
- Next steps



What is an Energy Audit?

- An energy audit is the process of determining energy consumption of a facility
- The purpose of an agricultural energy audit is to quantify energy use in an operation and to prioritize opportunities for reducing energy use



Preparation for the Energy Audit

- Determine objectives
- Check with your electric utility
- Obtain an energy auditor
- Determine audit scope
- Schedule the site visit
- Get ready
 - Electricity & fuel bills
 - Make inventory of equipment
 - Note any problem areas



The On-site Visit

- Auditor needs to
 - See the operation
 - Review equipment and systems
 - Understand the farm operations
 - Obtain the goals for the farm
 - Gather required information
 - Consider problem resolution
- Obtain inventory
- Take electrical measurements



Building the Energy Baseline

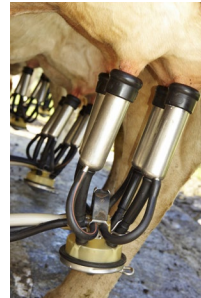
- Starts with electricity and fuel bills (12 months usage and cost)
- Build the energy model
- Calculate energy use for each system
- Validation: model = energy used
- Determine efficiency gaps

Dairy Systems

- Lighting
- Ventilation
- Refrigeration
- Milk harvesting
- Other motors and pumps
- Water heating
- Heating & cooling
- Waste handling

Determining the ECMs

- Energy Conservation Measures (ECMs) – Address energy gaps
- Milking operation
- Water delivery
- Water heating
- Milk storage
- Lighting
- Manure handling
- HVAC



Qualifying the ECMs

- Determining energy savings
 - Efficiency improvement
 - Time savings
 - Labor savings
 - Electricity cost reduction
- Determining implementation cost
- Determining ROI



The Energy Audit Report

- Executive summary
- Energy baseline
- ECM details
- Supporting calculations
- Additional supporting documents

REPORT
Good Milk Dairy Farm
Energy Assessment,
Crossroads, North Carolina

November 15, 2023
Authored By:
Charles Martin, P. E.

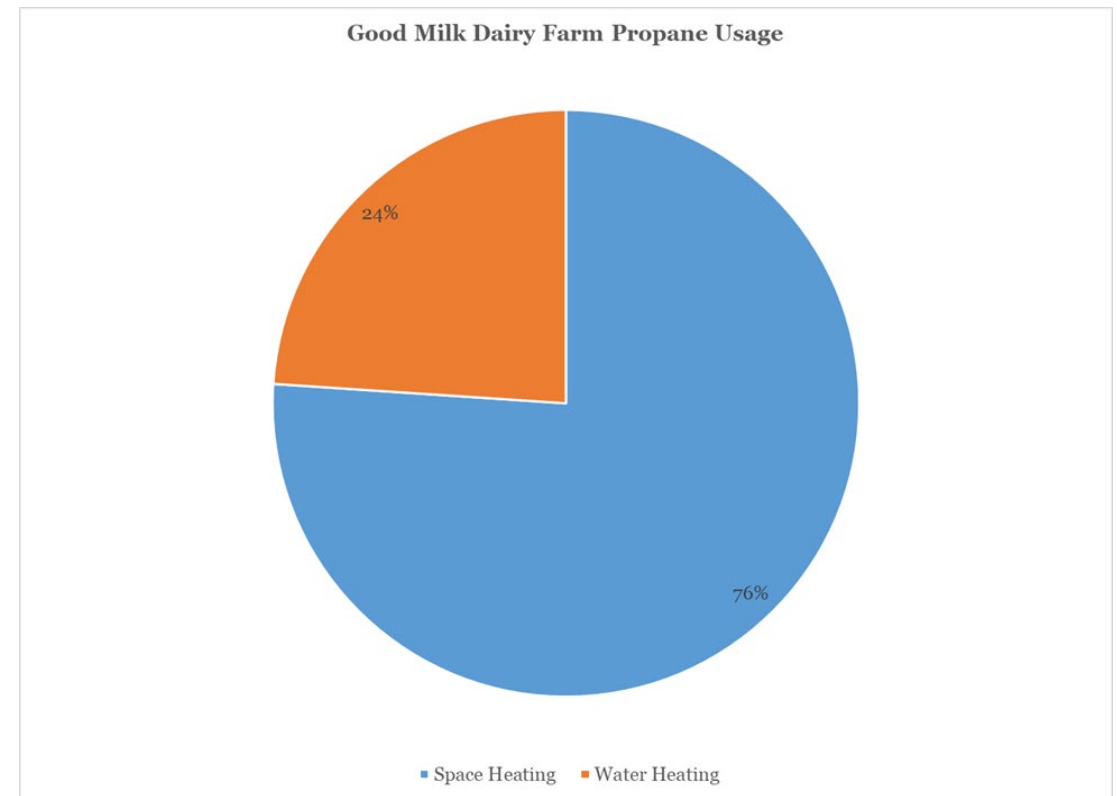
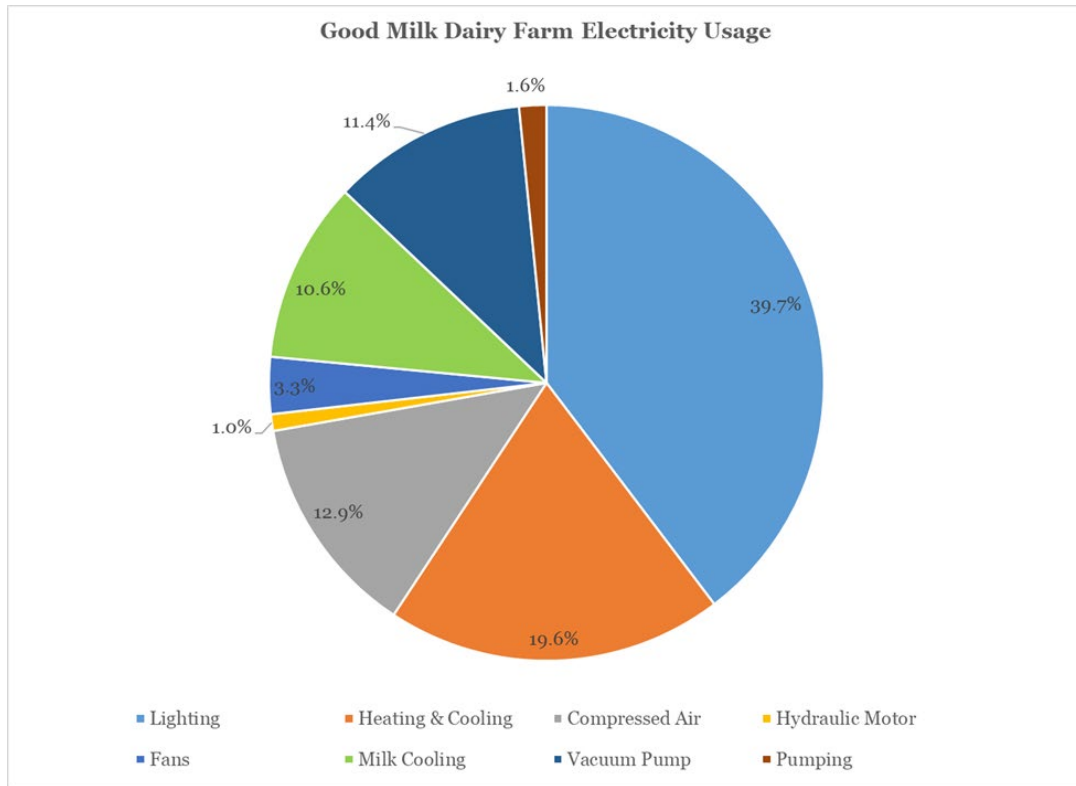


Executive Summary

- ECM name
- Annual energy savings
- Annual cost savings
- Install cost
- Return on investment
- Air emissions reduction

Energy Conservation Measure	Estimated Annual Energy Savings	Estimated Annual Cost Savings	Estimated Net Install Cost	Simple Payback (Years)	Estimated Annual CO ₂ e Reduction (Metric Tons)
LED Lighting Upgrade	24,500 kWh	\$2,270	\$5,600	2.5	4.1
Install Occupancy Sensors	8,800 kWh	\$860	\$3,100	3.6	1.5
Fix Compressed Air Leaks	2,800 kWh	\$320	\$150	0.5	0.5
Reduce Compressed Air Pressure	1,500 kWh	\$180	\$0	Immediate	0.3
Install VFD on Milking Vacuum Pump Motor	6,200 kWh	\$605	\$2,300	3.8	1.0
Install VFDs on the Milk Pumping Motors	600 kWh	\$70	\$500	7.8	1.0
Install Well Water Pre-Cooler Before the Milk Refrigeration System	2,600 kWh	\$180	\$1,050	4.4	0.4
Recover Heat from the Milk Cooler Compressor	250 gallons	\$640	\$6,000	9.4	1.4
Install High Efficiency HVAC Units at Failure or at Replacement	7,500 kWh	\$910	\$900	1.0	1.3
Totals	60,100 kWh 250 Gallons	\$6,620	\$21,400	3.2	11.6

Energy Baseline



LED Lighting Upgrade

- Retrofit 48 T8 fluorescent fixtures with LED 15-watt hybrid tubes
- Replace metal halide area light with 100-watt LED flood light
- 24,500 kWh annual savings
- \$2,270 annual savings
- \$5,600 install cost
- Simple payback - 2.5 years
- 4.1 metric tons carbon reduction



Install VFD on Milking Vacuum Pump

- 10-HP vacuum pump
- Install VFD & pressure sensor to control motor Speed
- 6,200 kWh annual savings
- \$610 annual savings
- \$2,300 install cost
- Simple payback - 3.8 years
- 1.0 metric tons carbon reduction



Next Steps

- Obtain quotes from contractors or equipment suppliers
- Contact electric utility regarding energy efficiency rebates
- Consider REAP grants
- Obtain assistance



Questions ?



Thank You

www.advancedenergy.org

919-857-9000

Charlie Martin

919-857-9021

cmartin@advancedenergy.org