



Results from on Farm Energy Audits

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Table 5: Annual Electricity Cost Estimates For Ontario Agriculture

Organization	Annual kWh	Annual \$ @ \$0.12/kWh	Annual \$ Savings @ 15%
Ag Energy Cooperative	1,650,000,000	\$198,000,000	\$29,700,000
OMAFRA	1,833,333,333	\$220,000,000	\$33,000,000

Table 7 Average Annual Electricity Cost by Sector (From 2006 Audits)

Production Type	Average Annual Electricity Cost (\$/yr)
Dairy	\$13,141
Finish	\$10,770
Farrow to Finish	\$17,222
Farrow	\$19,706
Farrow - Nursery	\$28,640
Nursery	\$11,145
Nursery Finish	\$14,616
Poultry	\$13,163
Average	\$14,878

Larger farms audited had electrical annual costs of \$24,000 to \$46,000/yr; smaller farms were \$3300-\$5700/yr.

Presentation Overview

1. Audit Software
2. Reports
3. On-Farm Audits
4. Surveys:
 - Audited farms, pre and post audit
 - Auditors
5. Case Studies
6. Incentives
7. Lessons Learned/Opportunities
8. Next Steps/Recommendations

1. Audit Software

- Software – Identifies and Predicts Common Energy Technologies and Savings:
 - Lighting (all types of facilities)
 - Ventilation (facilities using ventilation fans)
 - Heating (facilities able to convert forced air box heaters to infrared tube heating)
 - Creep Heating (swine farrow facilities)

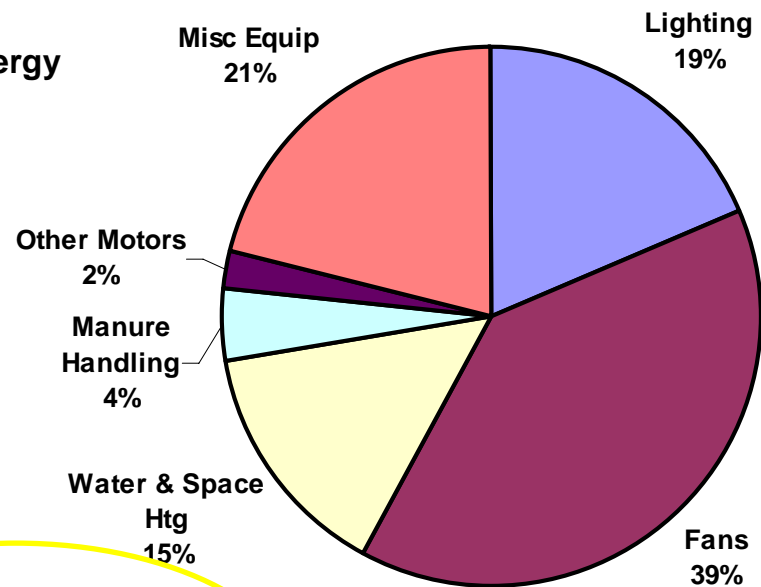
3. On Farm Audit

- 65 completed- 35 in 2005= 100
- East & West Ontario
- Dairy: Tie & Free Stall
- Swine: Farrow, Finish, Farrow-Finish, Nursery, Farrow-Nursery, Nursery-Finish
- Poultry: Layer, Broiler Chicken, Turkey
- Other: Cash crop, Mink, Tobacco

3. On Farm Audits

- Report preparation made easy
- Actual vs.. predicted energy

**Electrical
Annual Energy
Use Profile**



[Bill Total = 145,757 kWh/yr]
[Calculated Total = 150,887 kWh/yr]

Figure 2: Tie Stall Dairy Annual Electrical Energy Use Profile

Electrical Annual Energy Use Profile

[Bill Total = 124,092 kWh/yr]

[Calculated Total = 119,841 kWh/yr]

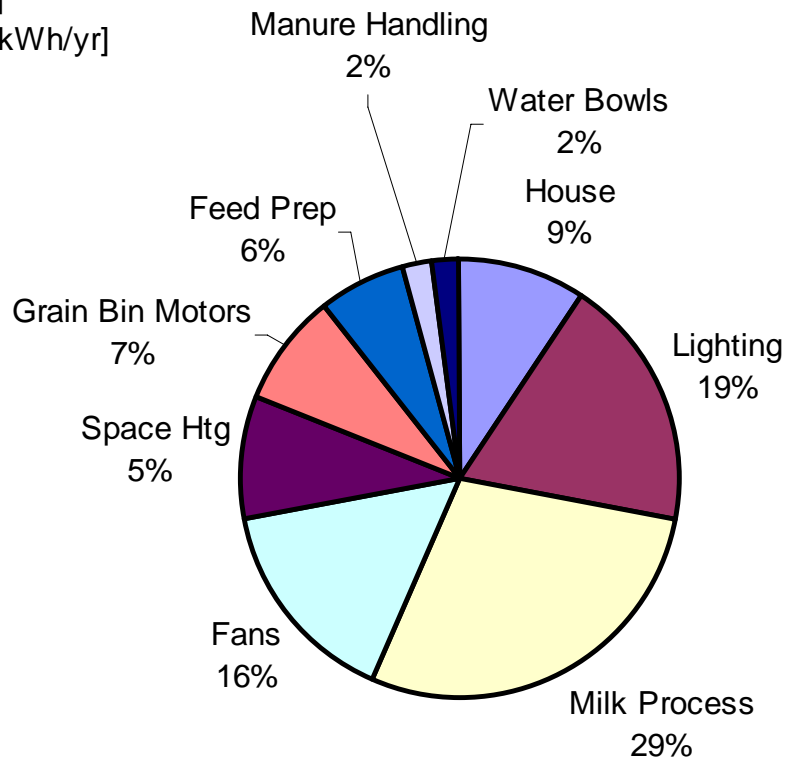


Figure 4: Free Stall Dairy Annual Electrical Energy Use Profile

Electrical Annual Energy Use Profile

[Bill Total = 142,201 kWh/yr]

[Calculated Total = 141,946 kWh/yr]

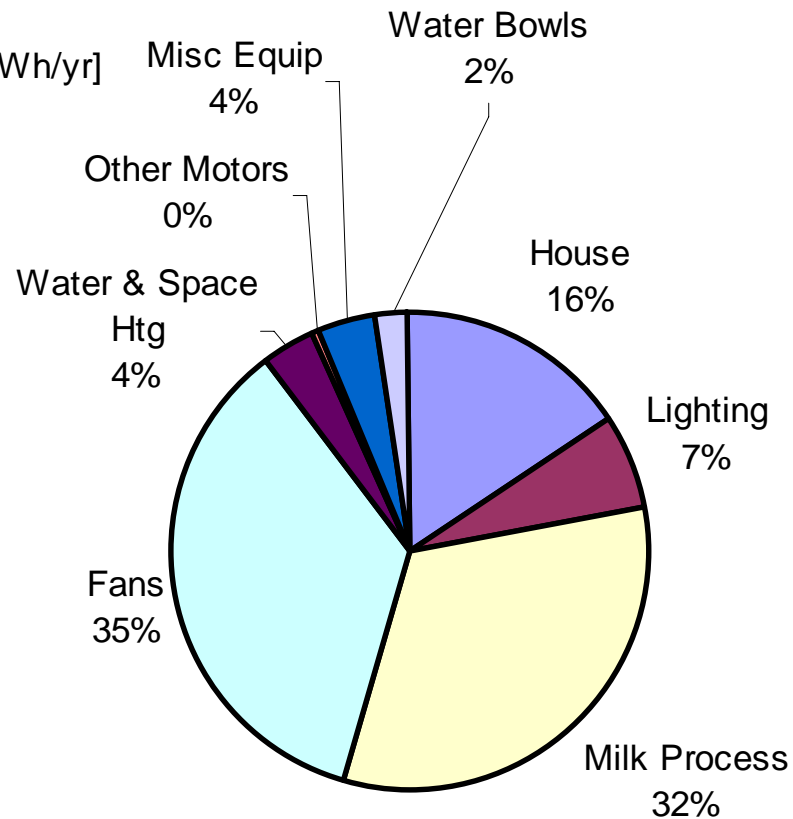
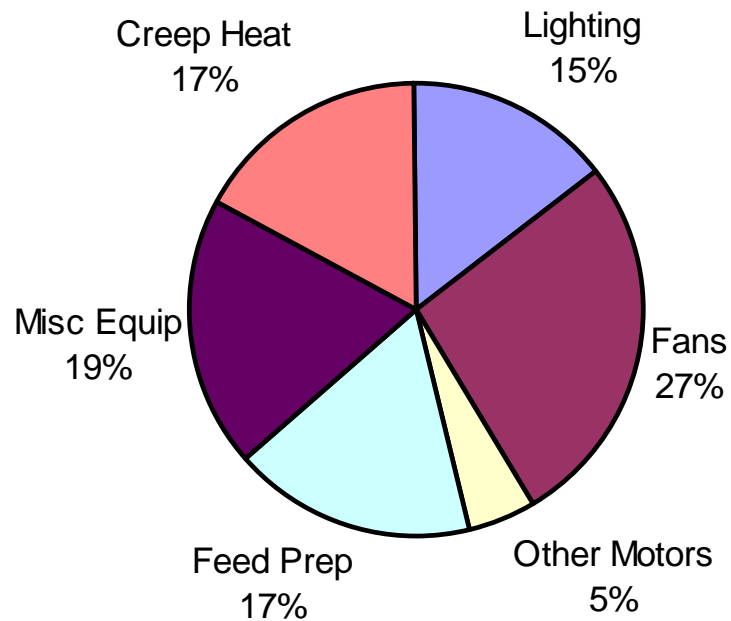


Figure 7: Swine Farrow to Finish Electrical Demand Profile

Electrical Demand Profile (Barn Only)

[Bill Maximum = 0 kW]

[Calculated Maximum = 143 kW]



Results from Ontario Pilot farm energy audit

- Lighting: - \$1,520/yr.
- Fans: *Improvements in fan motor and exhaust hood efficiency,* -
- \$1,000/yr.
- Variable Frequency Drive Vacuum Pump:
- \$800/yr per.
- **Average per audited farm savings was
\$2,100/yr or \$21,000 over ten years**

3. On Farm Audits

- However, a recent swine 600 sow f-f farm audit had \$28,000/yr savings
- Payback of < 0.5 years
 - Management: heat lamps and pads
 - Lower cost capital; resistors
 - Preheat hallways
 - Lighting

4. Surveys: Pre-Audit

- 61% electricity cost important (Rank 7 or 8/10); 98% concerned
- 97% believe energy \$ will rise
- 69% installed EE equipment 2 yrs ago
 - Value >\$5,000 (36%)
 - 66% Lights, 36% Ventilation, 22% Milk Equipment
 - 61% Compact fluorescents most common

4. Surveys: Auditors

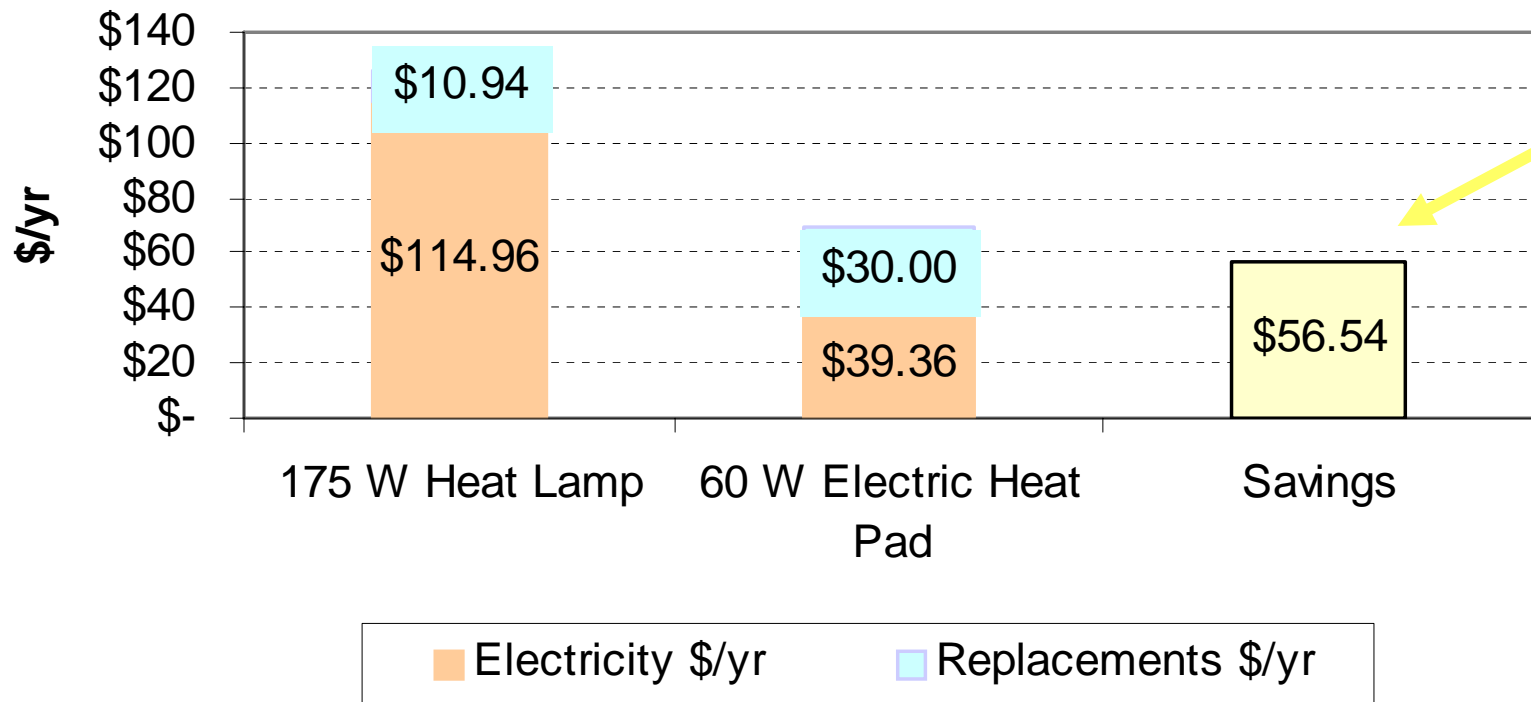
- Software easy to use
- 2 sites/day difficult
- Need trained auditor experienced in ag
- Best audit timing: winter

5. Four Info-Bits

1. Swine Farm Creep Heat
2. Dairy Farm VFD vacuum pump and HVLV circulating fans
3. EE Dairy Farm
4. EE Poultry Farm

5. Swine Highlights

Cost Comparison: Heat Lamps vs. Heat Pads in Farrowing Crates



5. Dairy VFD & Fans Highlights

- VFD HVLV: 100% more cfm, about \$400/yr or 50% energy savings
- VFD Vacuum Pump: Operates at 30% of full load 90% of the time, smoother pressure at udder, as well as energy and life cycle improvements

5. EE Dairy Highlights

- 59 - 100 W inc to CF roughly \$1,484/yr
- Each 250 W low energy bowl saves roughly 4,000 kWh/yr or about \$480/yr (calves)
- Each energy free water bowl saves about 4,800 kWh/yr or \$576/yr over a 1,500 W heated water bowl (cows)
- Natural ventilation conversion saved about 6,800 kWh/yr or about \$816/yr
 - Better light
 - No fan noise

5. Poultry Highlights

- T8 fluorescents on photocells vs. T8 on standard timer : 3,400 kWh, **\$340/barn**, 55% electrical savings
- T-8 fluorescent vs. incandescent on standard timers: 7,060 kWh/yr, 53% electrical savings. Combined kWh & kW savings approx. **\$1,500/barn**, < 4 yr payback
- Dual vent + T8s vs. mechanical vent + inc lights: 38,400 kWh/yr/barn, about **\$3,800/yr/barn** or 66% electrical savings

6. Incentives-Top Five

1. Creep heat pads
2. Creep heat controls
3. VFD on large motors with variable loads
4. Photocell control for barns with natural light
5. Stand-by generator block heater thermostat

6. Incentives – Next Five

1. Dual Ventilation
2. Energy Efficient Exhaust and Recirculation Fans (NRCAn)
3. Electrical Systems Energy Monitoring
4. Demand Management Controls
5. Conversion/Supplemental and Alternative Fuels and systems for hot water heating

Cooling



EE fans and staging



Dual and natural ventilation



Heat Pads and Lamps



7. Lessons Learned- Software

- Software is a functional tool for data gathering
- Data from these audits is being used to develop the Ag Energy Benchmarking tool

7. Lessons Learned- Savings

- Although farms are energy aware and generally efficient, there is still plenty of opportunities for savings on almost all farms
- A 15% savings would generate a minimum **\$23,400,000** annual savings and 35 MW of demand

8. Recommendations

- In general, develop specialized agricultural incentive and audit programs.
- All programs, especially prescriptive, should be for both new and retrofit.

8. Recommendations

- Professional Audit Advantages:
 - Improve energy savings impact through:
 - Time to analyze energy and management systems
 - Review opportunities with farmer
 - Provide a detailed report
 - Potential to provide follow-up design

8. Recommendations Next Steps

- Proposed Lessons Learned Demonstrations:
 - LED lighting in layer barns; possibly other sites as well
 - Hard conversion to EE lighting technologies
 - Induction lighting
 - T5 and T8
 - Photocell control
 - Evaluation of fluorescent vs. HID

8. Recommendations Next Steps

- Proposed Lessons Learned Demonstrations:
 - High Volume Low Velocity recirculation fans and VFD on vacuum pump and milk pump, other large loads (HVLV)
 - Demand management
 - Dual Ventilation in
 - Swine: gestation;
 - Poultry: broiler, turkey grower and layer;
 - Dairy: tie stall

Conclusions – Project Experience

- On-Site Audit requires time and skill
- Savings opportunities
- Incentive program opportunities
- Demonstrations/ Lessons Learned opportunities

Conclusions – Trends

- Audits resulted in:
 - Culture of conservation-Educating participants
 - EE technologies being considered or installed
 - Established preliminary energy benchmarks for dairy, swine & poultry
 - Useful analysis software



Thank You