


Farm Energy IQ


Farm Energy Audits

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Energy Audit


- An energy audit is the process of determining energy consumption of a building or facility (Source: U.S. DOE – EERE)
- The purpose of an energy audit is to quantify energy use in a facility or operation and to prioritize opportunities for reducing energy use



Agricultural Energy Audit - Definition


- “...to determine and document current energy usage, and to provide an estimation of energy savings from alternatives in the cultivation, protection, harvesting, processing and storage of agricultural commodities and in the feeding, housing and processing of farm animals and animal products.”

Source: American Society of Agricultural and Biological Engineers Standard S612




Questions an Energy Audit Should Answer

- How much energy does the operation use?
- What are the major uses of energy?
- Why?
- What steps will reduce energy consumption?




Conducting Energy Audits

- NRCS certifies Technical Service Providers (TSPs) to conduct agricultural audits.
- NRCS provides funding for agricultural audits based on a fee structure related to size and type of operation
- ASABE S612 discusses qualifications for audit professionals
- Not only is agriculture different from commercial and industrial operations, but different sectors within agriculture use energy in very different ways



Components of an Audit

- Compilation of utility bills
- Visual inspection
- Characterization of equipment and systems
- Interviews
- On-site measurement and testing
 - Blower door
 - Power measurement
 - IR imaging
 - Hours of operation - lights and motors
- Simulation modeling



Slide 1

JS2 None of the other presentations have authorship. We should discuss whether or not we'll have a contact slide for ASPs.

Jeannie Sikora, 1/5/2015

Slide 6

JS1 How often would this be used in agricultural audit? Might be off topic.


Jeannie Sikora, 1/5/2015

T1 Because of the very wide diversity of agricultural operations there are certainly occasions when a blower door would help identify significant energy losses. It wouldn't be frequent, but probably worth mentioning.

Tom, 1/14/2015


What to Expect from an Audit

- Facility summary and status
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Facility Summary and Status

- Overview of the operation
- Building summary
 - Area
 - Use
 - Construction details
- Infrastructure summary
 - Electric supply
 - Fuels
 - Major systems





Building A:
Use: Product sales, storage, food preparation.
Area: 600 square feet
Heating: Natural gas hot air furnace
 Coleman G8T13020UHD11A furnace, 130,000 Btu/hr input,
 104,000 Btu/hr output, 80% efficient
Ventilation: Range hood
Cooling: Coil in furnace ductwork
 Zone 1: Trane RAUC C20 20 ton air conditioner with Trane
 air handler (total of 4 hp)
Controls: 7 day thermostat
Hot water (Natural Gas):
 Bradford White MI50036FBN 50 gallon 40,000 Btu/hr, 78%
 efficient



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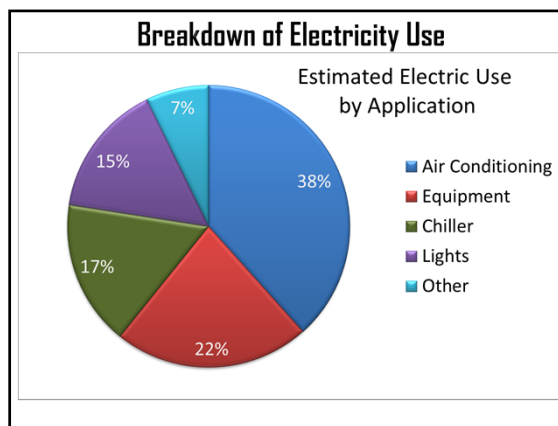
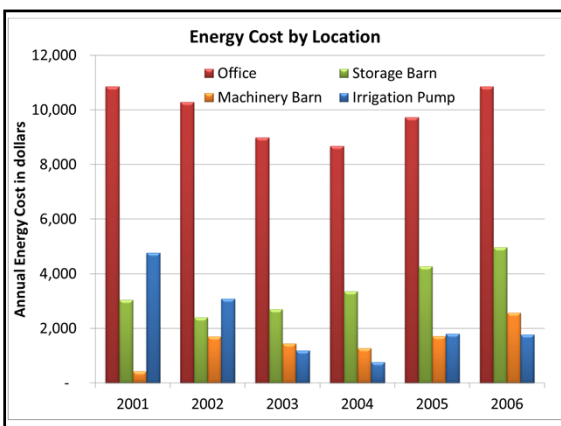


Summary of Use by Application or Location

- Lighting
- Ventilation
- Refrigeration
- Milk harvesting
- Controllers
- Other motors and pumps
- Water heating
- Air heating/building environment
- Drying
- Waste handling
- Air cooling
- Cultural practices
- Storage

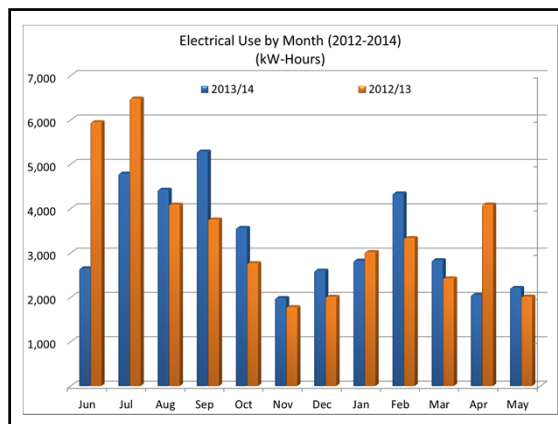
Summary of Use by Application (ASABE SG12)

- Waste handling
- Air cooling
- Cultural practices
- Storage
- Water management
- Material handling
- Irrigation




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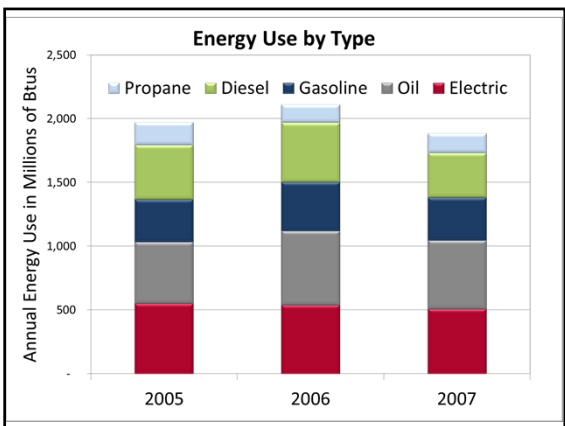
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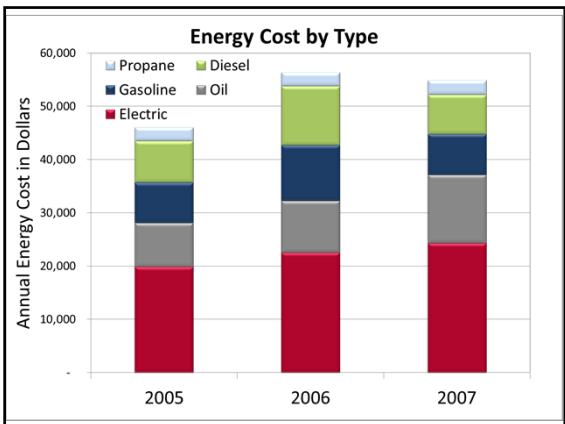
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Electric Bills - Storage Barn Area: 4,800 Square feet
 Meter # G123456789 (acct 0000000)

Billing Period	Amount Billed	kW-hr	KVA	e/kW-hr	kW-hr per sq. foot
Dec 15 to Jan 16	\$170.92	1,010	5.1	16.9	0.21
Jan 17 to Feb 15	\$176.80	1,059	4.9	16.7	0.22
Feb 16 to Mar 19	\$133.65	776	4.7	17.2	0.16
Mar 20 to Apr 18	\$127.23	763	4.5	16.7	0.16
Apr 19 to May 17	\$57.21	332	2.6	17.2	0.07
May 18 to Jun 18	\$218.14	1,105	5.1	19.7	0.23
Jun 19 to Jul 18	\$169.86	782	7.9	21.7	0.16
July 19 to Aug 16	\$510.64	2,966	6.9	17.2	0.62
Aug 17 to Sep 13	\$457.65	2,639	7.8	17.3	0.55
Sept 14 to Oct 12	\$445.43	3,167	8.0	14.1	0.66
Oct 13 to Nov 13	\$189.80	1,086	7.8	17.5	0.23
Total:	\$2,657.33	15,685			3.27
Maximum:	\$510.64	3,167	8.0	21.7	0.66
Minimum:	\$57.21	332	2.6	14.1	0.07
Average:	\$241.58	1,426	5.9	16.9	0.30

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Equipment Summary

- Equipment summary by location
- Motors, refrigeration equipment, fans, boilers and furnaces, fans, pumps, other
- Equipment capacity, efficiency, and runtime
- Lighting summary by location
- Type
- Quantities
- Hours of use

Tabulation of Large Equipment

Location	Equipment	Manufacturer	Model	Motor											
				Manufacturer	Model	HP	kW	RPM	V	A	Ph	Hz	Eff.	P.F.	
C Winery	Pump	Iverani			IP-MINOR	2	1.5	775	220		2.4				
C Winery	SPD Pump								1.2	0.8		220		4.38	
C Winery	Pump	Iverani		Carpantelli	M1124A	5.5	4.4	1740	220		15.2			6.0	77%
C Winery	Chiller Pump					2	1.5								
C Winery	Compressor	Ingersoll Rand	2475N			7.5	5.5		230/460						
C Winery	Cooler	WPAK 80		Baldor	EM3615T	5	3.7	1760	208/230		13.9/13.4			1.0	90% 78%
C Winery	Press	Bella Torfale		Italmac Motori	IT100	3.0	2.4	1700	220		10			3	60
C Winery	Beam Generator	Electro-Steam	LG-20	Rossi Motoriduttori	HFV903	1.5	1.1	1420	230		5			3	50 75%

Heating Equipment Summary

Location / Area Description	# of Heaters	Type of Heater	Btu/hr Output	Make / Model	Fuel Type
Propane Boiler	1	Gas-Fired Boiler	300,000	Slant Fin GG-375	Propane
Outdoor Furnace	1	Wood-Fired Boiler		Big Eliminator 60	Wood
Greenhouse #1	12	Forced Hot Air	180,000	Modine	Propane
Greenhouse #1	2	Forced Hot Air	300,000	Reznor UPAP300	Wood
Greenhouse #1	6	Forced Hot Air	89,000	Reznor WS96/120	Wood
Greenhouse #2	3	Forced Hot Air	180,000	Modine	Propane

Lighting Summary

LOCATION	Hrs.	CFL/LED			Incand.			Other			Linear Fluorescent				
		Watts	Qty.	kWh Total	Watts	Qty.	kWh Total	Watts	Qty.	Total	Watts	# Bulbs	Type	kWh Total	
Pasting Room				580			1,672			190					
Microzone	7	17	13	565	56	2	286	15	1	131			Exit		
Bus	7	10	10	256	60	17	2,608	15	2	263			Exit		
	7				60	6	1,381	120	1	88	120	Rope			
Booths	1	13	3	14				25	1	9	25	Fan			
Close	0	100	1												
Office	2	30	4	88											
Lab/Office														820	
Lab	9										100	2	T12	1,381	
Office	9										54	4	T8	1,315	
Greenhouse #1	10							15	2	263			Exit	100	
Greenhouse #1	12				154	3	164	450	1	164	450	HID		3,835	
Greenhouse #1	12													1,050	
TOTALS				923	580		4,439	2,122		919	595			6,531	1,870

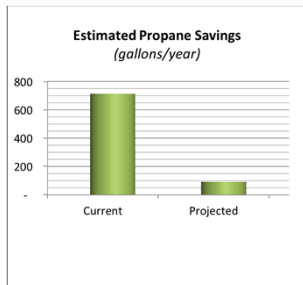
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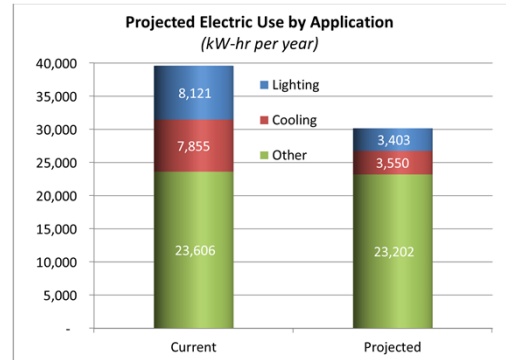
Energy Conservation Opportunities

Location	Recommended Measure	Electric Savings (kWh)	Propane Savings (Gal)	Installed Cost	Energy Cost Savings	Payback (years)
Tasting Room	Replace incandescent bulbs with LEDs	3,403		\$650	\$851	0.8
Lab	Replace T-12 fluorescent fixtures with T-8 fixtures	197		\$200	\$70	2.9
Winery	Insulate Walls	2,069	828	\$13,600	\$3,748	3.6
Winery	Replace T-12 fluorescent fixtures with T-8 fixtures	548		\$500	\$137	3.7
Small Office	Replace refrigerator	404		\$800	\$101	7.9
Winery	Replace chiller	8,176		\$20,000	\$2,044	9.8
Lab	Replace hot water heater with 90% efficient heater		52	\$2,500	\$204	12.3

Current vs. Proposed Propane Use



Current vs. Proposed Electricity Use



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Questions?