Agricultural Energy Management Plan

To: ______________

GRAIN FARM

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SUMMARY

Overview
_____ conducted an agricultural energy use site assessment at _______ on September 20, 2011. This report has been developed with the use of _________, and provides a plan to increase the facility's energy efficiency. This Headquarters – Agricultural Energy Management Plan (AgEMP) covers the primary energy uses on this farm as identified by _____. These include stationary equipment and processes. Non stationary energy uses such as motor vehicles, tractors, trucks, and skid steers are outside the scope of a Headquarters AgEMP.

An average electricity cost of $0.18 per kWh, an average cost of $1.55 per gallon of propane, and an average cost of $2.77 per gallon of diesel fuel were used in this report; however, if actual costs are different from these documented values, the energy cost savings in this report would vary accordingly.

Total Project Economics
Installation of the recommended energy efficient equipment identified within this report will result in annual energy cost savings. The recommended equipment may be eligible for federal, state and/or local incentives as well as grants and/or loans such as through the USDA NRCS Environmental Quality Incentives Program (EQIP) Farmstead Energy Improvement Code 374, the USDA Rural Energy for America Program (REAP) Section 9007 of the Farm Bill, and utility incentives. Your first step after deciding to move forward with some or all of these recommendations should be to explore these funding opportunities. Helpful links to these resources are provided at the end of this report to get you started.

Farmer Preferences
The farmer expressed an interest in improving their energy efficiency, specifically in the area of grain drying. This measure was evaluated and the details can be found listed in the grain drying section of this report

Conservation Activity Plan
The recommended energy efficiency improvements should be implemented using NRCS Code 374, Farmstead Energy Improvement, beginning in fiscal year 2012.

Significant Findings
The facility at _______ is approximately 51 years old. This report focuses on the opportunities at _______ for the installation of energy efficient equipment and has identified the potential for approximately $16,514 in annual energy cost savings, if all of the recommended equipment is installed. This represents about 48% of the baseline energy costs of $34,429. The numbers and savings used here and throughout the report are based on the harvest information from 2009 when ________ dried 110,000 bushels of corn.

Bottom Line: Installation of all the recommended energy efficient equipment identified within this report will result in annual energy cost savings of approximately $16,514.

ENERGY EFFICIENT EQUIPMENT EVALUATION

Summary of Recommendations

__________operates a grain drying facility which in a typical yield can dry approximately 138,000 bushels of corn per year. This report presents cost effective recommendations for Rustin Farms to upgrade to more efficient lighting and grain drying.

During a recent twelve-month period, ________ used 14,185 kilowatt-hours (kWh) of electricity with a total cost of $2,558, for an average cost of $0.18 per kWh, as well as approximately 1,192 gallons of diesel with a total cost of $3,302, for an average cost per gallon of $2.77. The farm also produced an estimated 1,863 kWh of electricity through the use of a diesel generator, for a total farm usage of 16,048 kWh. In 2009, the farm used a total of 18,431 gallons of propane and paid approximately $28,569, for an average cost per gallon of $1.55. These average costs are used here and throughout this report.

Tables 1 and 2 summarize the benefits of the recommended energy saving equipment. Energy saving equipment lowers usage costs by performing the same or greater work with lower energy inputs. More detailed explanations of energy efficiency equipment are provided later in this report.

Table 1. Benefits of Recommended Energy Saving Equipment

Equipment	Estimated Annual Electricity Savings (kWh)	Estimated Annual Fuel Savings (gallons)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Lighting	2,456		$442	$1,006	2.3
Grain Drying		10,369	$16,072	$156,840*	9.8
Totals	**2,456**	**10,369**	**$16,514**	**$157,846**	**9.6**

*Quoted from TAM Systems, the equipment dealer for ________.

Table 2. Energy Savings of Recommendations

Fuel	Current Usage	MBtu Usage	Savings	MBtu Savings	% Savings
Electricity (kWh)	14,185	48	2,456	8	17.3%
Propane (gallons)	18,431	1,696	10,369	954	56.3%
Diesel (gallons)	1,192	166	0	0	0.0%
Totals		**1,910**		**962**	**50.4%**

Note: The generator consumed 492 gallons of diesel fuel in order to generate 1,863 kWh of electricity; included in the current fuel usage for diesel fuel. There are no energy saving recommendations in diesel fuel usage for the reduction in use of the generator.

Low Cost Energy Saving Tips

Some energy savings potential involves primarily management and requires either no or minimal investment other than minor planning or labor. Examples include combining trips and eliminating unnecessary energy expenditure by turning off lights and shutting down engines during periods of inactivity. In another example although replacing older fans with those of higher efficiency can be cost effective, periodic cleaning of fan blades in dusty environments (e.g., every 3 to 4 weeks) and maintaining belt tension may increase existing fan efficiency by 10% or more before replacement.

Current vs. Proposed Electric Use

Figure 1 and 2 reflect farm electricity usage from November 2010 through October 2011. Farms purchased approximately 14,185 kilowatt-hours (kWh) of electricity. The total cost of purchased electricity was $2,558. ________ also generated approximately 1,863 kWh, for a total farm usage of 16,048 kWh. The generated electricity was estimated from the difference in ______ calculated farm usage and the actual account usage. A stacked bar chart is used to show the average monthly generated kWh usage with respect to the actual account usage. The peak months typically coincide with the harvest season and are the result of increased loads on the grain drying fans motors. The monthly electricity usage is depicted in Figure 1.

Figure 1. Twelve Month Electricity Usage

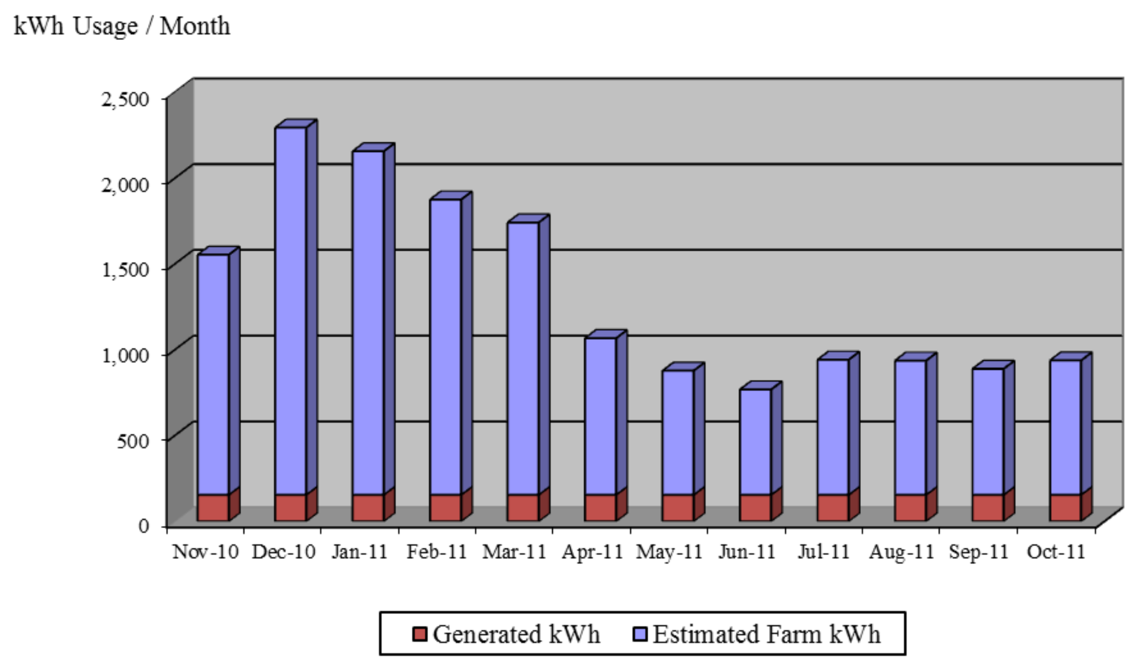
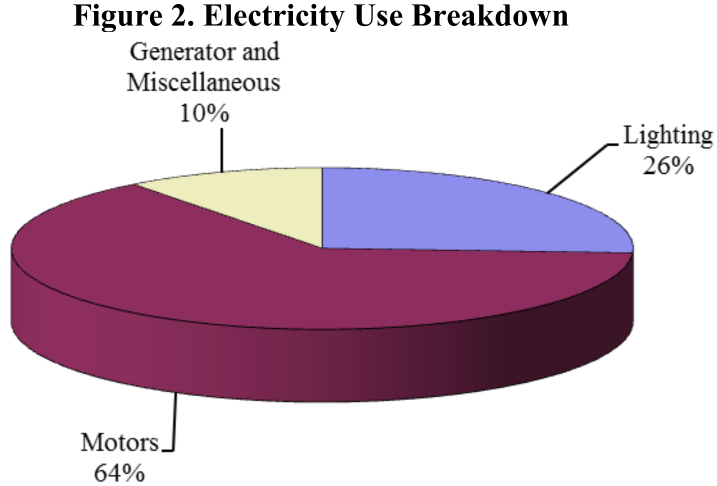


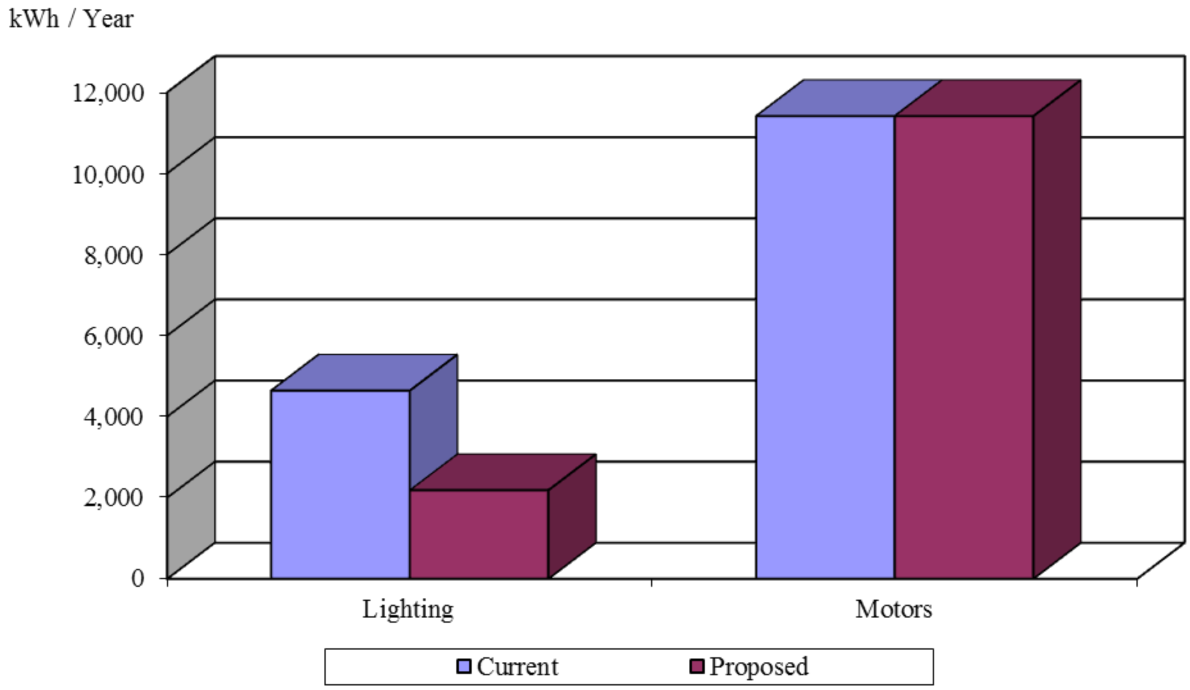
Figure 2 illustrates the end uses of the electricity used on the farm. Miscellaneous uses include small electrical end uses such as repair shop tools and small grain auger motors. The generated electricity is included in the miscellaneous section.

Figure 2. Electricity Use Breakdown



In Figure 3, calculated current electricity use is compared to calculated proposed usage after the installation of all recommended electric energy efficiency equipment.

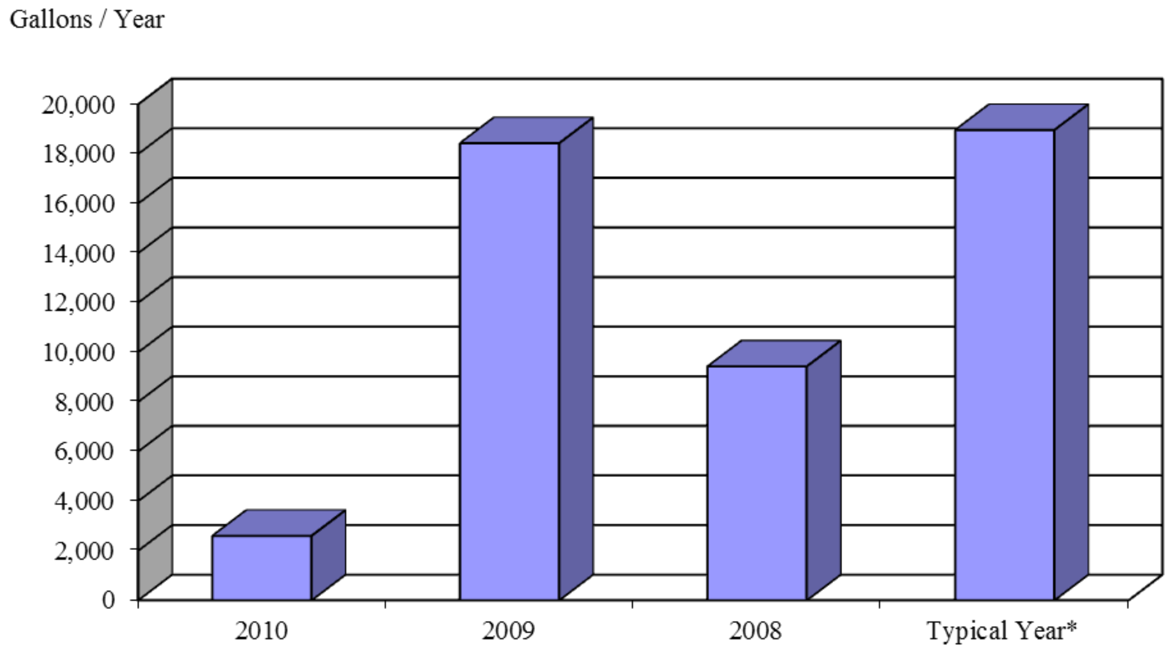
Figure 3. Comparison of Current and Proposed Electricity Use



Current vs. Proposed Propane Use

Figure 4 reflects the variations in farm propane usage over the last three years. The differences in propane use from year to year are a result of the harvest yield and the drying conditions of the weather and of the crops. The typical year is included to represent a maximum harvest yield at average drying conditions. The typical year propane use is calculated from the performance of the existing grain dryer based on the harvests of 2009 and 2008. The 2010 harvest was omitted due to the reduced load on the grain dryer and it being considered a poor representation of a typical year. In the 2009 harvest season, _________ used approximately 18,431 gallons of propane. The total cost of propane was $28,569. The grain dryer is the sole consumer of propane on the farm.

Figure 4. Comparison of Annual Propane Use



*A typical year is a complete harvest yield of 138,000 bushels of corn being dried on a wet basis from a moisture content of 20% to a moisture content of 14%.

Grain Drying

_________ currently operates a Farm Fan 1000H, which was installed in 2002 and manufactured in 1980. As per conversation with the farmer, ______ evaluated replacing the existing grain dryer with the more energy efficient Brock SQ 40A.

It is extremely important that the recommended maintenance and operation instructions from the manufacturer of the grain dryer are followed. Maximum recommended temperatures should not be exceeded and the system should be maintained properly to ensure it operates at maximum efficiency. At the same time, a lower or higher temperature than the recommended temperature may compromise the performance of the system and increase the operating costs. Electronic moisture / temperature controls also improve the performance of the system by avoiding over-heating and shutting off fans when not needed. Finally valves on all propane storage tanks should be checked periodically for leaks.

Consistent and routine maintenance is essential to the productivity of grain dryers. Proper calibration of temperature controls and grain moisture sensors can improve energy efficiency by 18% annually, reducing over-drying, and improving grain quality, according to a study performed by the International Energy Administration (IEA). Maintaining airflow by keeping floors and screens clean can aid in the efficiency of a grain dryer, as well as rinsing and cleaning the grain to remove fines, reducing its accumulation and improving air flow.

We analyzed and compared the existing dryer with the proposed dryer in two different scenarios. The first scenario is the annual production from 2009 of 110,000 bushels of corn dried on a wet basis from 21% to 14%. The second scenario is for a typical annual production of 138,000 bushels of corn being dried on a wet basis from 20% to 14.5%.

Grain Drying 2009 Annual Production
Tables 3 and 4 provide economic details for the proposed new equipment for the 2009 annual production of 110,000 bushels of corn being dried on a wet basis from 21% to 14%. Figure 5 shows the 2009 propane use and the proposed propane use if the new equipment is installed at the 2009 production level.

Table 3. Grain Drying: Benefits of Proposed Energy Saving Equipment at 2009 Annual Production

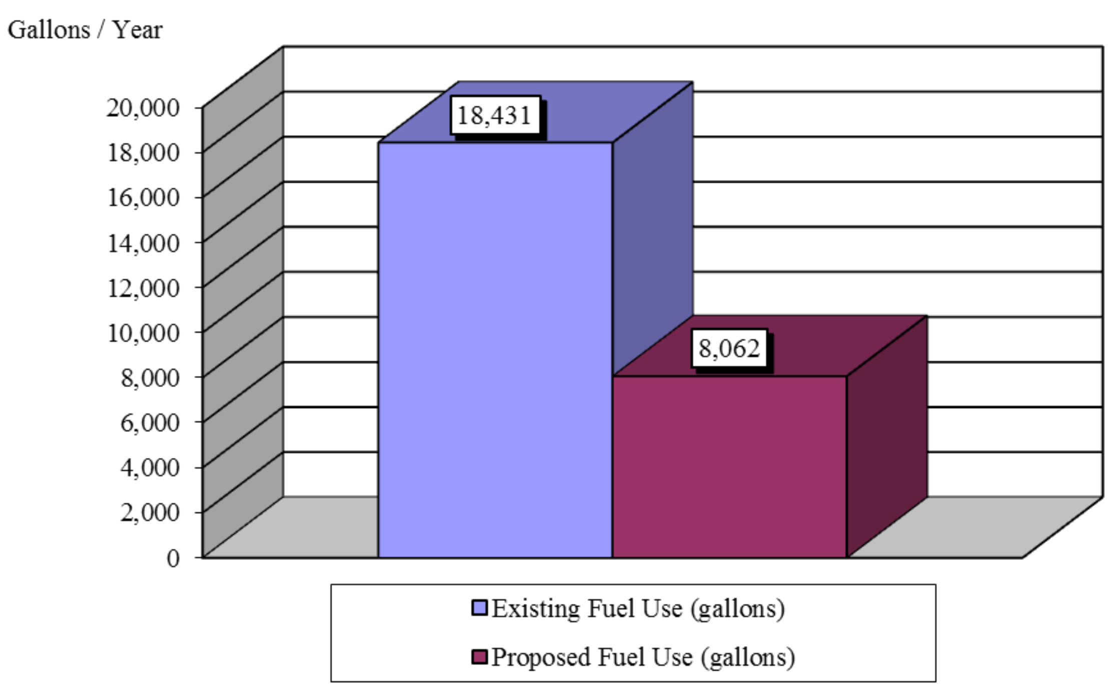
Existing Fuel Use (gallons)	Proposed Fuel Use (gallons)	Estimated Annual Fuel Savings (gallons)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
18,431	8,062	10,369	$16,072	$156,840*	9.8

*Quoted from TAM Systems, the equipment dealer for ________.

Table 4. Grain Drying: Energy Savings of Proposed Dryer at 2009 Annual Production

Fuel	Current Fuel Usage	MBtu Usage	Fuel Savings	MBtu Savings	% Savings
Propane (gallons)	18,431	1,688	10,369	950	56.3%

Figure 5. Grain Drying Propane Usage at 2009 Annual Production



Grain Drying Typical Annual Production
Tables 5 and 6 provide economic details for the proposed new equipment with a typical annual production of 138,000 bushels of corn being dried from on a wet basis from 20% to 14.5%. Figure 6 shows the estimated typical propane use and the proposed propane use if the new equipment is installed for the typical annual production of 138,000 bushels of corn.

Table 5. Grain Drying: Benefits of Proposed Energy Saving Equipment at the Typical Annual Production

Estimated Existing Fuel Use (gallons)	Estimated Proposed Fuel Use (gallons)	Estimated Annual Fuel Savings (gallons)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
18,965	8,561	10,404	$16,127	$156,840*	9.7

*Quoted from TAM Systems, the equipment dealer for _________.

Table 6. Grain Drying: Energy Savings of Proposed Dryer at the Typical Annual Production

Fuel	Estimated Current Fuel Usage	Estimated MBtu Usage	Estimated Fuel Savings	Estimated MBtu Savings	Estimated % Savings
Propane (gallons)	18,965	1,737	10,404	953	54.9%

Figure 6. Grain Drying Propane Usage at Increased Production

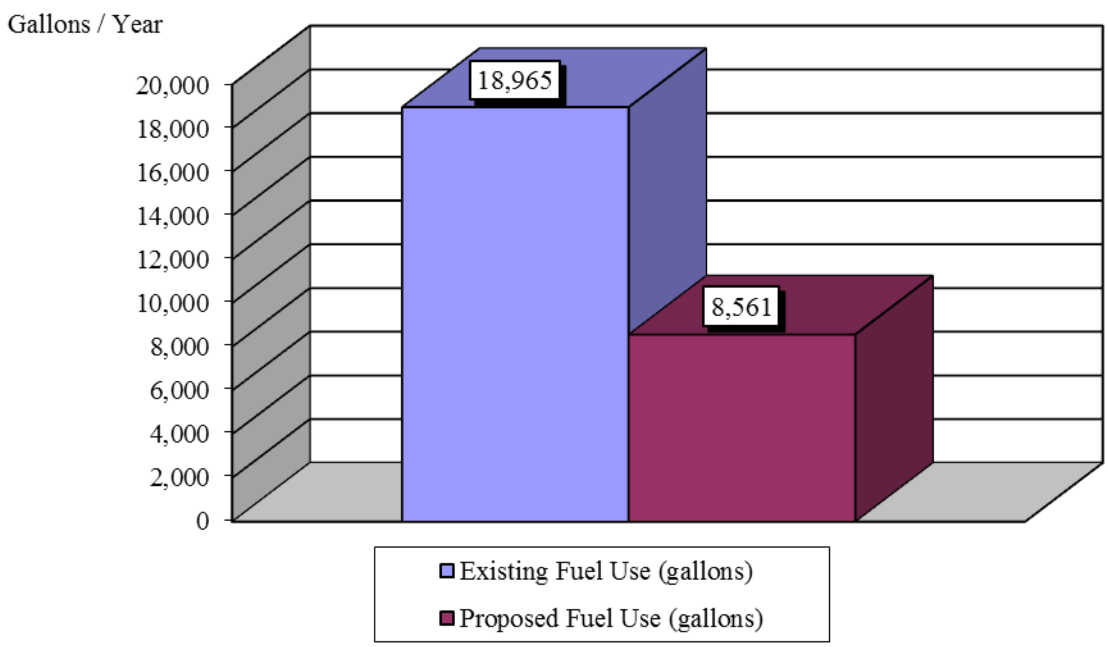


Table 7 provides a summary of the operating performances of the existing dryer and the proposed dryer.

Table 7. Grain Drying: Summary of Performances

Equipment	Btu / Lb of Water Removed
Calculated Performance of Existing Dryer Farm Fan 1000H	3,051
Manufacturing Specifications for Existing Dryer Farm Fan 1000H	N/A
Manufacturing Specifications for Proposed Dryer Brock SQ 40A	1,377*

*Performance results of a grain drying simulation conducted by the manufacturer drying shelled corn from 21% moisture content to 14%. See grain dryer simulation section for manufacturer's simulation.

_______ recommends replacing the existing dryer with the more energy efficient proposed dryer. The proposed dryer is approximately 54.9% more efficient than the current performance of the existing dryer. While the energy savings affect results in a payback period of 9.7 years for a typical annual production, there may also be other aspects to be considered such as operational performance, through-put, maintenance costs, etc. when making the decision about replacement of the existing dryer.

Lighting
___________ has an opportunity to improve the energy efficiency of its lighting system. We recommend replacing the 200 watt metal halide fixtures in the shop with 4-bulb, 4-foot, T5 High-Output (HO) fixtures. T5HO fixtures, specifically designed for demanding agricultural applications, are readily available on the market. Desirable features include a gasketed enclosure to keep out moisture, dust and insects and to facilitate hosedown, premium efficiency ballasts and optically efficient reflectors. The higher efficiency and longer service life will lead to energy savings. T5HO bulbs maintain around 95% of their initial light output over their lifetime, whereas metal halides lose up to 50% as they age. ______ recommends installing T5 lamps with a high correlated color temperature (CCT), greater than 4,000 Kelvin (K) if possible, and a high color rendering index (CRI), greater than 82% if possible. These attributes will result in a higher quality of light and increased apparent brightness. We also recommend the installation of occupancy and daylight harvesting sensors where appropriate in the facility, which will further reduce electrical usage in those areas by reducing the runtimes of the lighting fixtures. For more information on metal halide vs. fluorescent lighting applications, see http://www.aboutlightingcontrols.org/education/papers/high-low-bay.shtml.

For information on high-performance fluorescent lamps and ballasts, see the Resources section of this report, including: *T-8 and T-5 Efficient Fluorescent Lighting,* published by EnSave; *High-Performance T8 Lamp Specification*, published by the Consortium for Energy Efficiency (CEE); and *High-Performance 4' T8 Lamp and Ballast Qualifying List*, also published by CEE.

We recommend replacing the mercury vapor fixture on the grain drying bin with a more efficient pulse start metal halide fixture. Pulse start metal halide fixtures will provide equal light output using less energy than traditional mercury vapor and standard metal halide fixtures. We would normally recommend replacing mercury vapor or standard metal halides with linear fluorescent T8 or T5 fixtures but due to the location and or mounting style of the light, pulse start metal halide is the best option. We also recommend replacing the shop halogen light with an energy efficient equivalent pulse start metal halide light.

We generally recommend installing vapor-proof fixtures, where appropriate, to keep strip fluorescent fixtures clean, dry, and protected. We also recommend installing vapor-proof lamp guards that can be used on standard incandescent bulb sockets when replacing them with compact fluorescent lamps to also keep them clean, dry, and protected, where appropriate. For safety reasons, it is advised to never fully enclose compact fluorescent lamps greater than 23-Watts in order to prevent heat from building up inside the fixture, which can lead to a potential fire hazard. We also recommend the installation of photocell, occupancy and daylight harvesting sensors where appropriate in the facility, which will further reduce electrical usage in those areas by reducing the runtimes of the lighting fixtures. An example would be to install occupancy sensors in bathrooms and hallways where there is infrequent use.

Although we are not recommending the replacement of the farms' probe start metal halide fixtures in the barn/storage area, and the halogen fixtures on the grain drying bins at this time due to the long payback period, when they lights burn out we advise replacing these lights with energy efficient equivalent pulse start metal halide lights. Pulse start fixtures provide more lumens per watt than traditional probe start fixtures and maintain more lumens over the life of the lamp. This means a 200 watt probe start fixture can be replaced with a 150 watt pulse start fixture, still have greater light output and reduce electrical costs by 20%. Pulse start fixtures also warm up faster, have less color variation, and can last up to 50% longer than traditional probe start fixtures. For more information on probe start vs. pulse start metal halide fixtures, see http://www.geappliances.com/email/lighting/specifier/2008_07/downloads/MetalHalide_Probevspulse.pdf.

Figure 7 shows a comparison of the estimated current and proposed lighting electricity usage. Table 8 provides economic details for each lighting upgrade recommendation.

Figure 7. Lighting Electricity Usage

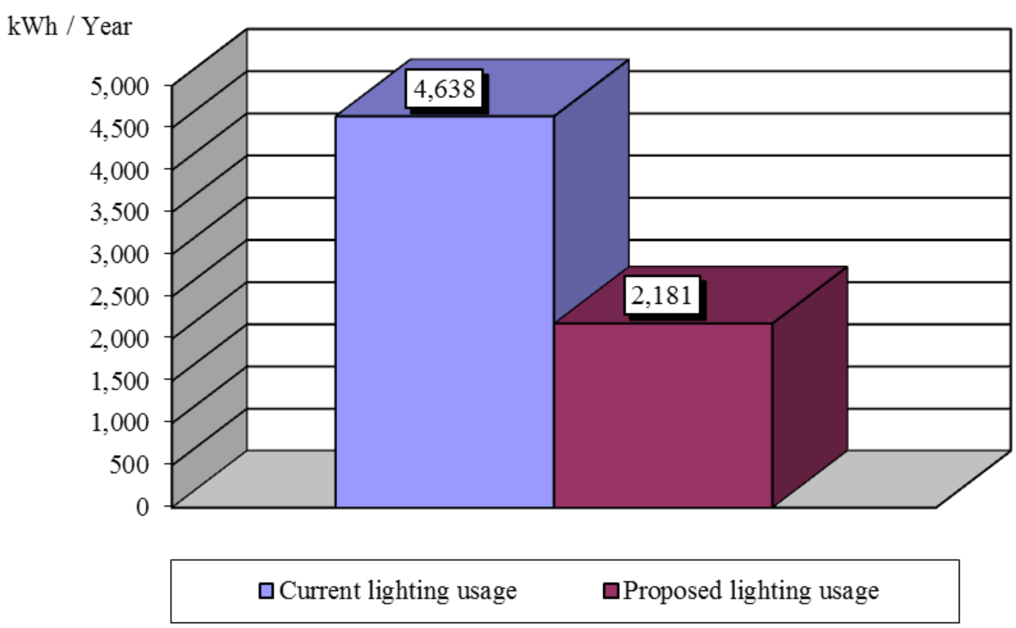


Table 8. Lighting: Recommended Energy Saving Equipment

Area	Existing Lighting Fixture to be Replaced	Recommended Lighting Fixture	Number of Fixtures to Install	Estimated Annual Electricity Savings (kWh)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Shop Light	500W Halogen (500W Total Input Watts), running 4,380 hours annually	175W PSMH (191W Total Input Watts)	1	1,353	$244	$190	0.8
Grain Dryer	175W Mercury Vapor (205W Total Input Watts) , running 4,380 hours annually	100W PSMH (110W Total Input Watts)	1	416	$75	$175	2.3
Shop Light	300W Halogen (300W Total Input Watts), running 2,920 hours annually	150W PSMH (163W Total Input Watts)	1	400	$72	$185	2.6
Shop Lights	200W Standard Metal Halide (232W Total Input Watts), running 640 hours annually	4-Lamp, 4ft.T5 (28W Bulbs, 120W Total Fixture Wattage)	4	287	$52	$456	8.8
			Totals	**2,456**	**$442**	**$1,006**	**2.3**

Note:

- Work with your electrician to determine whether the T5HO, HPT8, T5, and T8 fixture is optimal for your specific operation. Considerations when choosing between the different types of fixtures include, cost, availability from suppliers, geographic location of your farm, and operating conditions. It is also important to consider the temperature range that the ballast will be performing in as some ballasts are optimum for cold starting but may be too warm for enclosed or vapor-sealed fixtures, a High Output ballast may not be recommended if the ambient temperature will not go below 50 degrees Fahrenheit.

Ventilation

_________ currently has no ventilation fans on the farm. The grain drying fans were analyzed in the motors section of this report. If the farm is ever interested in installing fans, ______ recommends working with a ventilation specialist and choosing the most energy efficient fans. For more information on energy efficient ventilation, look at "Agricultural Ventilation Fans: Selection and Maintenance", published by the Rural Electricity Resource Council (RERC) in the resources section of the report.

The fans we generally recommend represent the midpoint between the minimum efficiency threshold and the highest efficiency fan as grouped and tested by Bioenvironmental and Structural Systems (BESS) Laboratory. Circulation fans are typically rated based on the pounds of force per kW of power rating (lb_f/kW) at 0.00" water gauge static pressure; the higher the (lb_f/kW) the higher the efficiency. Exhaust fans are typically rated based on the cubic feet of air moved per minute per Watt of power rating (cfm/Watt) and airflow ratio, which gives an indication of a fan's ability to push air when there is contrary pressure acting against the fan from either wind or higher static pressure inside a building. Exhaust fans are commonly rated at a static exhaust pressure of 0.10" water gauge.

We also recommend that any fans being installed be models previously tested by BESS Lab http://www.bess.uiuc.edu/ or the Air Movement and Control Association (AMCA) http://www.amca.org/. For more specific information on circulation fan selection and maintenance please refer to the Resources section of this report.

Water Heating
___________ operates an oil-fired boiler specifically for space heating needs. The oil-fired boiler was analyzed in the space heating section of this report.

Stock Watering
___________ does not currently have any livestock and do not operate any stock waterers.

Space Heating
___________ currently operates an oil-fired forced hot air heater and an oil-fired boiler in the shop. The oil-fired boiler provides radiant baseboard space heating for the insulated shop building. These two space heaters in the shop were estimated to consume 700 gallons of oil.

It is quite costly to heat the air in a room using a forced hot air furnace. Rather than heating the air, radiant heaters use radiant energy to efficiently heat the objects in a room. Like sitting in a room with a wood stove, greater comfort can be achieved at lower air temperatures and lower energy costs. The forced hot air furnace transfers 40% of their energy as radiant heat to the floor and 60% to the air as convection heat. Because of their design, radiant heaters are able to transfer 90% of their heat to the floor. As a result radiant heaters consume 15-30% less fuel than the forced hot air heaters. Although we are not recommending replacement of the forced hot air space heater in the shop due to a long payback, when the unit fails we recommend replacement with a more energy efficient radiant heater. At this time there are no energy saving opportunities to improve the space heating in the shop.

Table 9 provides a list of the space heaters analyzed in this report.

Table 9. Space Heating: Existing Equipment

Location / Area Description	# of Heaters	Type of Heater	Annual Run Hours	Btu/hr Output	Make / Model	Year Installed
Shop Heater	1	FHA	720	100,000	R.W. Beckett AFG DU201	1993
Oil-Fired Shop Boiler	1	Radiant	3,024	N/A	N/A	1993

Motors
It has been determined that ___________ has very little energy saving opportunities from improving the efficiency of their motors by upgrading to motors that meet the NEMA Premium® standards. Therefore, at this time there are no cost effective recommendations to upgrade any of the existing motors on the farm. It is also important to understand that improving the efficiency of a pump or a compressor motor will likely increase the life of the equipment and reduce operating costs. Proper maintenance and monitoring techniques will help to detect problems early on and determine solutions for creating a more efficient system.

If it was not possible to read motor nameplate information, a Totally Enclosed Fan Cooled (TEFC) motor type and/or 1,800 revolutions per minute (RPM) were assumed. When actual motor efficiencies were not available, the estimated energy and related cost savings assume a baseline using the Energy Policy Act of 1992 minimum requirements, which all motors manufactured after 1997 meet. Replacing a motor that is less efficient than the assumed baseline would result in greater energy and cost savings.

Table 10 provides a list of the motors analyzed in this report.

Table 10. Motors: Existing Equipment

Location / Area Description	# of Motors	Motor HP	Annual Run Hours	RPM rating	NEMA Efficiency Rating	Make / Model
25000 Bushel Bin	1	1	50	1740	N/A	N/A
30000 Bushel Bin #1	1	5	60	1745	86.5%	Magnetek Century
50000 Bushel Bin #1	1	7.5	80	1760	89.5%	Leeson N213T17FB45B
Belt Conveyor	1	7.5	200	1740	N/A	U.S. Electrical
Belt Conveyor	1	15	200	1725	N/A	Baldor
Dryer Legs	2	5	200	1750	N/A	Lifeline CSP
Dryer Legs	1	20	200	1760	N/A	Hermans L2A- M233L1
Air Compressor	1	5	728	0	N/A	N/A
4000 Bushel Bin	1	1	6	1725	N/A	Century
4000 Bushel Bin	1	1.5	6	1725	79.0%	Leland - Faraday
4000 Bushel Bin	1	5	6	1740	82.5%	Dayton
30000 Bushel Bin #2	1	5	60	1740	84.0%	A.C. Motor
50000 Bushel Bin #2	1	7.5	80	1725	86.0%	Baldor

Tables 11 and 12 provide economic details for each motor upgrade considered.

Table 11. Motors: Energy Saving Equipment Considered

Area	Existing Motor Description	Proposed Motor Description	Number of Motors to Install	Estimated Annual Electricity Savings (kWh)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Air Compressor	5 hp, tefc, 1800 RPM, 87.5% efficiency, running 728 hours annually	5 hp, tefc, 1800 RPM, NEMA Premium®, 89.5% minimum nominal efficiency	1	59	$10.61	$700	66
Dryer Legs	20 hp, tefc, 1800 RPM, 91% efficiency, running 200 hours annually	20 hp, tefc, 1800 RPM, NEMA Premium®, 93% minimum nominal efficiency	1	60	$10.79	$2,000	185
50,000 Bushel Bin #2	7.5 hp, tefc, 1800 RPM, 86% efficiency, running 80 hours annually	7.5 hp, tefc, 1800 RPM, NEMA Premium®, 91.7% minimum nominal efficiency	1	27	$4.95	$1,000	202

Table 12. Motors: Energy Saving Equipment Considered (continued)

Area	Existing Motor Description	Proposed Motor Description	Number of Motors to Install	Estimated Annual Electricity Savings (kWh)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Belt Conveyor	7.5 hp, tefc, 1800 RPM, 89.5% efficiency, running 200 hours annually	7.5 hp, tefc, 1800 RPM, NEMA Premium®, 91.7% minimum nominal efficiency	1	25	$4.59	$1,000	218
Dryer Legs	5 hp, tefc, 1800 RPM, 87.5% efficiency, running 200 hours annually	5 hp, tefc, 1800 RPM, NEMA Premium®, 89.5% minimum nominal efficiency	2	32	$5.83	$1,400	240
Belt Conveyor	15 hp, tefc, 1800 RPM, 91% efficiency, running 200 hours annually	15 hp, tefc, 1800 RPM, NEMA Premium®, 92.4% minimum nominal efficiency	1	32	$5.70	$1,500	263
30,000 Bushel Bin #2	5 hp, tefc, 1800 RPM, 84% efficiency, running 60 hours annually	5 hp, tefc, 1800 RPM, NEMA Premium®, 89.5% minimum nominal efficiency	1	14	$2.50	$700	280
30,000 Bushel Bin #1	5 hp, tefc, 1800 RPM, 86.5% efficiency, running 60 hours annually	5 hp, tefc, 1800 RPM, NEMA Premium®, 89.5% minimum nominal efficiency	1	7	$1.33	$700	528
50000 Bushel Bin #1	7.5 hp, tefc, 1800 RPM, 89.5% efficiency, running 80 hours annually	7.5 hp, tefc, 1800 RPM, NEMA Premium®, 91.7% minimum nominal efficiency	1	10	$1.83	$1,000	545
25,000 Bushel Bin	1 hp, tefc, 1800 RPM, 82.5% efficiency, running 50 hours annually	1 hp, tefc, 1800 RPM, NEMA Premium®, 85.5% minimum nominal efficiency	1	1	$0.24	$500	2,061
4,000 Bushel Bin	5 hp, tefc, 1800 RPM, 82.5% efficiency, running 6 hours annually	5 hp, tefc, 1800 RPM, NEMA Premium®, 89.5% minimum nominal efficiency	1	2	$0.32	$700	2,157
4,000 Bushel Bin	1.5 hp, tefc, 1800 RPM, 79% efficiency, running 6 hours annually	1.5 hp, tefc, 1800 RPM, NEMA Premium®, 86.5% minimum nominal efficiency	1	1	$0.11	$520	4,614
4,000 Bushel Bin	1 hp, tefc, 1800 RPM, 82.5% efficiency, running 6 hours annually	1 hp, tefc, 1800 RPM, NEMA Premium®, 85.5% minimum nominal efficiency	1	0.2	$0.03	$500	17,174

Note: To consistently have the lowest possible energy consumption from motors, when a 1 hp or greater burns out always replace them with the most energy efficient motor available. _______ recommends replacing motors with units that meet the NEMA Premium® standard. For information on NEMA Premium®, see http://www.nema.org/gov/energy/efficiency/premium/

Generator
__________ currently operates one diesel generator. The generator was estimated to consume 492 gallons of diesel fuel. Table 13 contains details on the existing generator.

Table 13. Generator: Existing Equipment

Location / Area Description	Size (kW)	Fuel Type	Annual Run Hours	Estimated kWh Generated	Make / Model
Farm Generator	125	Diesel	82	1,863	Katolight D125FJJ4

Manure Management and Transfer
__________ does not currently have any livestock and does not manage or transfer any manure.

Feed Handling and Storage
__________ does not currently have any livestock and does not handle or store any feed.

Miscellaneous Electrical Use
On a grain drying facility there are minor electrical uses that are not accounted for in the previous sections. These uses include small grain auger motors and shop tools. These motors may operate every day, yet there are three reasons why it is not justifiable to replace these motors based on energy savings:

- **First**, they do not operate for a sufficient number of hours, annually, to justify replacement. Typically, to justify replacing a motor, based upon energy savings alone, it needs to run a minimum of 2,000 hours annually. A motor would have to run about five hours a day to justify replacement.

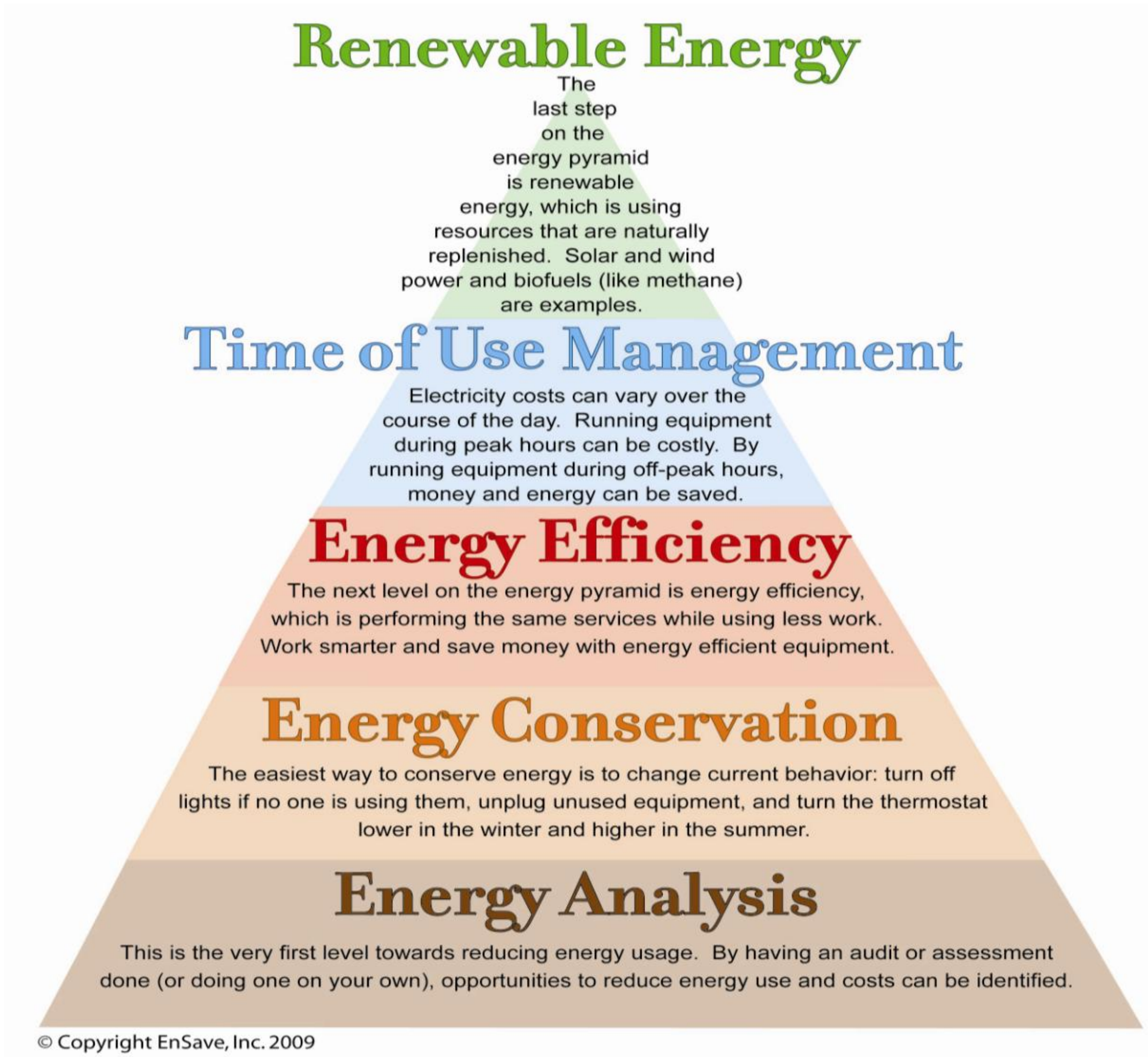
- **Second**, most of these motors are small, 3/4 hp or 1 hp, and motors of that size do not consume enough energy to justify replacing them.

- **Third**, motors such as grain auger motors run at very low speeds. A slower moving motor uses less electricity than a higher speed motor. These motors do not consume enough energy to justify replacement

ENERGY PYRAMID

_____ uses an energy pyramid as a model to outline the steps necessary for reducing energy usage. Figure 8 shows the energy pyramid.

Figure 8. Energy Pyramid



The energy pyramid has been proven to be very effective, and it serves as a road map to reducing energy consumption. _____________is at the top end of the pyramid. The audit process has identified that ___________ is running as efficiently as possible with the exception of the grain dryer and lighting opportunities detailed in this report. The next step for them would be to move toward the use of renewable energy.

ENVIRONMENTAL ASPECTS

Measure	Soil	Water	Animal*	Plant	Air
Grain Drying	N/A	N/A	N/A	N/A	See Summary of All Measures Below
Lighting	See Note 1	See Note 1	N/A	N/A	

*This resource refers to endangered species.

Note 1: This report recommends using compact fluorescent lights. Fluorescent lights are regulated under the Resource Conservation and Recovery Act. These lights cannot be disposed with trash, it is against the law. Please contact your local waste district for information on how to properly dispose of fluorescent lamps. Additional information is provided in the resource section of this report.

Summary of All Measures: If implemented, the energy saving recommendations made in this report will reduce emissions by the following estimated amounts:

Contaminant	Amount
Sulfur Dioxide, SO_2 (tons)	0.002
Nitrogen Oxides, NOx (tons)	0.07
Carbon Dioxide, CO_2 (tons)	65.69
Nitrous Oxides, N_2O (pounds)	0.96

SOx and NOx are ambient air contaminants; CO_2 is a green house gas.

GRAIN DRYER SIMULATION

Figure 9 is a simulation performed by the manufacturer for the proposed grain dryer, Brock SQ 40A.

Figure 9. Proposed Grain Dryer Simulation

SUPERB ENERGY MISER™ MEYER ENERGY MISER™ GRAIN DRYERS

Operating Data for the

SQ40A

Computed for

Ensave

by

Brock Grain Conditioning

Conditions:	***Pressure Heat Suction Cool***
Grain to be dried:	*Corn*
Ambient Temperature:	*50 °F*
Plenum Temperature:	*220 °F*
Initial Moisture of the grain:	*21.0 %*
Target Moisture:	*14.0 % (from dryer) 13.9 % (est. final in bin)*
Fuel to be used:	*Propane*
Fuel Price:	*$ 1.17 / gal*
Electricity Price:	*$ 0.110 / kwh*
Louver Opening:	*20 %*
Results:	
Dryer Capacity:	*800 bu / hr*
Exit Grain Temperature:	*57 °F*
Power Required:	*60.6 kw*
Electricity Cost / hr:	*$ 6.67 / hr*
Heat Energy Required:	*5.0 Mbtu / hr*
Fuel Usage:	*54.8 gal / hr*
Fuel Cost / hr:	*$ 64.11 / hr*
Fuel Efficiency:	*1377 btu / lb H2O*
Operating Cost:	*$ 70.77 / hr*
Total Cost per Bushel:	*$ 0.088*

Capacities and efficiencies will vary depending on humidity, crop variety, foreign material, test weight, etc.

RESOURCES

The following resources provide additional information on ways to save energy at your facility.

1. *Farm Safely With Electricity*, published by the Rural Electricity Resource Council (formerly NFEC)

2. *Agricultural Ventilation Fans: Selection and Maintenance*, published by the RERC

3. *Compact Fluorescent Lighting*, published by EnSave, Inc.

4. *T-8 and T-5 Efficient Fluorescent Lighting,* published by EnSave, Inc.

5. *High Performance 4' T8 Lamp and Ballast Qualifying List*, published by CEE

6. *Outdoor Lighting for Safety and Productivity: A Guide for Rural Homes, Farms, and Related Businesses*, published by RERC

7. *NEMA Premium® Motors,* published by EnSave, Inc.

8. *Managing Mercury on the Farm*, published by EnSave, Inc.

INTERNET RESOURCES

The following resources provide additional information on ways to save energy at your facility.

1. *NJ NRCS Environmental Quality Incentives Program*
   http://www.nj.nrcs.usda.gov/programs/eqip/index.html

2. *USDA Farm Service Agency*
   http://www.fsa.usda.gov

3. *Bioenvironmental and Structural Systems Laboratory (BESS Labs)*
   http://www.bess.uiuc.edu/

4. *Database of State Incentives for Renewables & Efficiency (DSIRE)*
   http://www.dsireusa.org

5. *USDA Section 9007 Information*
   http://www.rurdev.usda.gov/rbs/farmbill/

6. *National Renewable Energy Laboratory*
   http://www.nrel.gov/

7. *Jersey Central Power & Light*
   https://firstenergycorp.com/content/customer/jersey_central_power_light.html

8. *Consortium for Energy Efficiency (CEE) High Performance T8 Specifications*
   http://www.cee1.org/com/com-lt/com-lt-specs.pdf

9. *North Dakota State University Corn Storage, Handling*
   http://www.ag.ndsu.nodak.edu/abeng/postharvest.htm

10. *Corn Drying Tips*
    http://cornandsoybeandigest.com/corn/1023-corn-drying-tips/