Agricultural Energy Management Plan

To: ____________________

GREENHOUSE OPERATION

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SUMMARY

Overview
EnSave conducted an agricultural energy use site assessment at ___________________ on May 2, 2011. This report has been developed with the use of AutoAudit™, a product of EnSave, 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 EnSave. 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.

Average energy costs of $0.18 per kWh for electricity, $180 per cord for wood, and $1.645 per gallon for propane are 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 a general interest in energy efficiency, but no specific concerns were noted.

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

Tables 1 and 2 summarize the economics of the entire project if all of the energy saving measures recommended in this report were installed.

Table 1. Projected Annual Energy Savings for this Energy Efficiency Project

Fuel	Current Usage	MBtu Usage	Savings	MBtu Savings	% Savings
Electricity (kWh)	40,062	137	3,814	13	9.5%
Propane (gallons)	7,329	674	3,124	287	42.6%
Wood (cords)	180	3,600	10.4	208	5.8%
Totals		**4,411**		**508**	**11.5%**

Table 2. Simple Payback Calculation

Total Project Cost		Projected Total Cost Savings		Simple Payback Years
$42,840	÷	$7,703	=	5.6

Significant Findings
By taking action on the energy efficiency recommendations detailed in this report, you can save approximately $5,139 per year in propane costs (3,124 gallons), $1,872 in wood costs (10.4 cords), and $687 in electricity (3,814 kWh). With electricity, wood, and propane combined, EnSave estimates that your net energy cost savings will amount to $7,703 per year. This represents about 14.9% of the farm's baseline energy costs of $51,680.

Bottom Line: Taking no action would be expensive. EnSave recommends acting on these recommendations to avoid having to pay years of energy costs that are higher than necessary.

ENERGY EFFICIENCY EVALUATION

Summary of Recommendations
Table 3 summarizes the projected annual cost savings of the recommended energy saving measures. Energy saving measures lower energy costs by performing the same or more work with less energy. _____________ should be commended for the current energy efficiency of their operation. This report focuses on the remaining opportunities for energy efficiency on the farm.

Table 3. Summary of Energy Efficiency Recommendations

Equipment	Estimated Annual Electricity Savings (kWh)	Estimated Annual Fuel Savings (gallons)	Estimated Annual Wood Savings (Cords)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Lighting	3,814			$687	$1,840	2.7
Greenhouse Measures		3,124	10.4	$7,016	$41,000	5.8
Totals	**3,814**	**3,124**		**$7,703**	**$42,840**	**5.6**

* The greenhouse energy efficiency measures can be seen in detail in Table 4.

Table 4 provides details of the cost effective energy efficiency measures for the greenhouse.

Table 4. Summary of Greenhouse Efficiency Measures

Efficiency Measure	Estimated Annual Fuel Savings (gallons)	Estimated Annual Wood Savings (Cords)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Repair Curtain	706	10.4	$3,038	$10,000	3.3
Condensing Boiler	484	0.0	$796	$11,000	13.8
Condensing Boiler and Repair Curtain	1,446	10.4	$4,255	$21,000	4.9
Condensing Boiler, Repair Curtain, and Underbench Heating	3,124	10.4	$7,016	$41,000	5.8

Individual vs. Interactive Savings

There are several options for saving energy on the farm. Each energy savings measure is discussed in detail later in the report. Each measure is shown with an estimate of savings individually and interactively with other measures. The savings for individual measures assumes that only that measure would be implemented. Interactive savings assumes that all the measures listed in that option are implemented. In other words, adding up savings from individual measures will not equal interactive savings values. Multiple measure savings are interactive.

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 expenditures by turning off lights and shutting down engines during periods of inactivity. In another example, although replacing older ventilation 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 status

Current Farm Operation

________________ is a greenhouse operation selling wholesale flowers and plants to garden centers. The farm currently consists of one large greenhouse. The big greenhouse is the only greenhouse that was working during the 12 month period. Main energy uses for the farm are heating, ventilation, motors, and lighting. The farm uses electricity, as well as wood and propane for heating.

Table 5 shows a description of the greenhouse.

Table 5. Greenhouse Inventory Table

House Name	House Type	Dimensions	End Walls	Side Walls	Ceiling	Operating Time
Big House	Arch	192' x 200'	Double Polycarb	Double Layer Poly	Double Layer Poly	Nov-Jul

Current Electricity Use
From January 2010 through December 2010, ____________________ used 40,062 kilowatt-hours (kWh) of electricity. The total cost of electricity was $7,226. The actual monthly electricity usage for the greenhouses is depicted in Figure 2. The peak electricity months in winter are due to the increased run times on the heat exchanger motors and all motors related to the heating system.

Figure 2. Twelve Month Electricity Usage

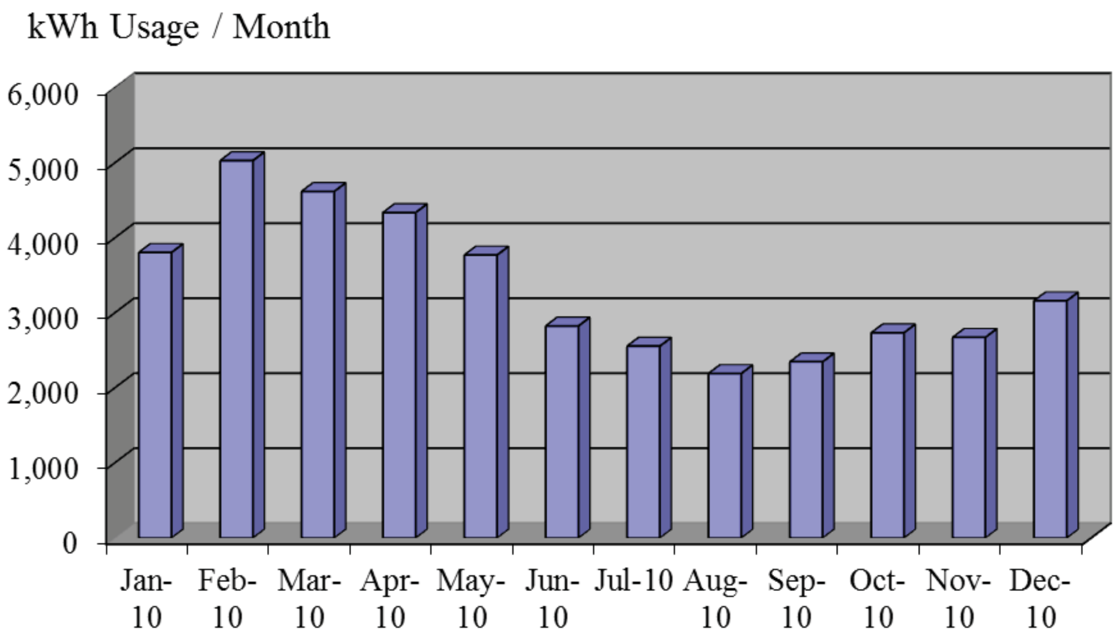
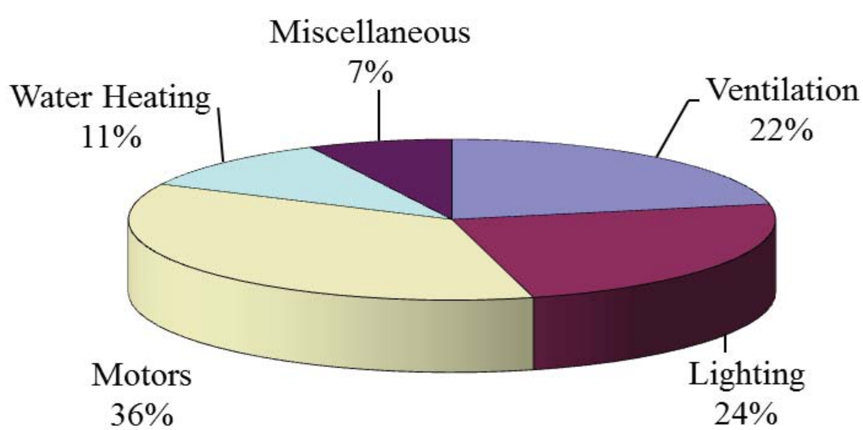


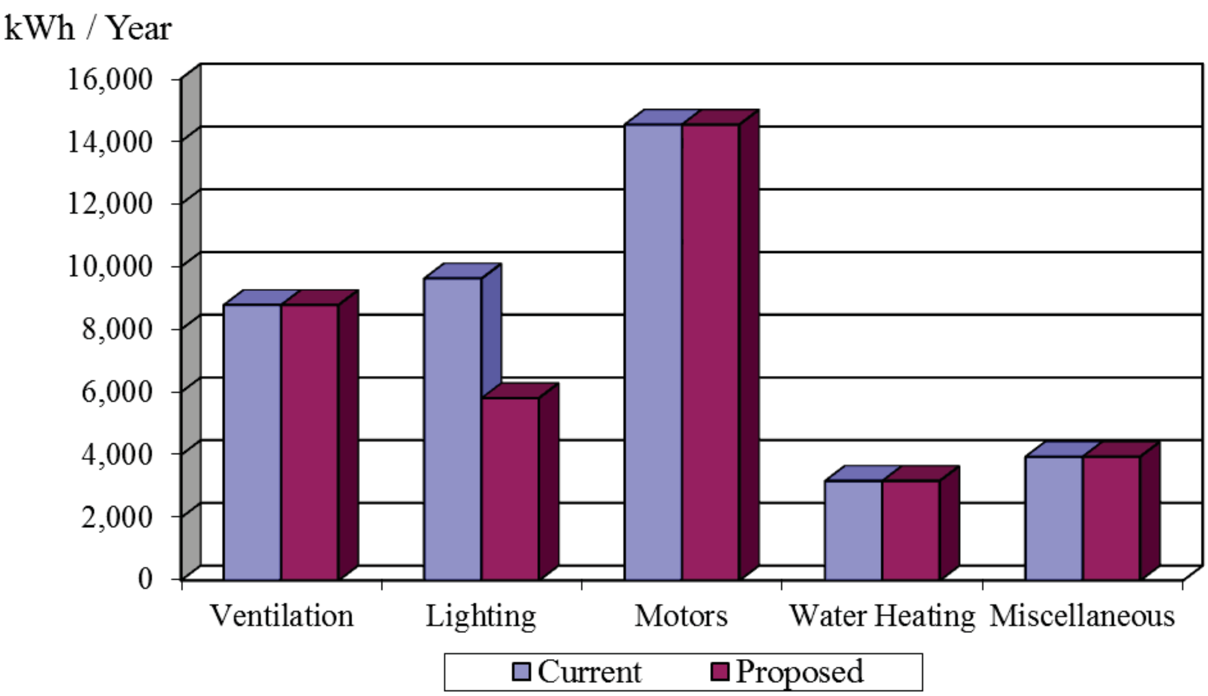
Figure 3 illustrates the end uses of the electricity used on the farm. The motors include all of the heat exchanger motors and circulation pump motors for the boilers. Miscellaneous uses include inflator motors, the air conditioner, shop tools, and the refrigerator in the barn. Typical miscellaneous usage is approximately 5%. The increased miscellaneous usage could be from variations in the run times provided for the equipment.

Figure 3. Electricity Use Breakdown



In Figure 4, calculated current electricity use is compared to calculated proposed usage after the installation of all recommended electric energy efficiency equipment.

Figure 4. Comparison of Current and Proposed Electricity Use



Current Heating Fuel Use

From January 2010 through December 2010, ___________ used 7,329 gallons of propane and 180 cords of wood. The total cost for the propane was $12,054, and the total cost for the wood was $32,400. The greenhouse is heated using a wood boiler as the main heat source and a propane boiler for supplemental heating. Half of the big greenhouse has a radiant concrete slab, and there are several heat exchangers throughout the big greenhouse. The big greenhouse is heated from January 1 to April 1. The small house was heated with propane unit heaters when the house was functioning. Table 6 provides a list of the heating equipment on the farm.

Table 6. Heating Inventory Table

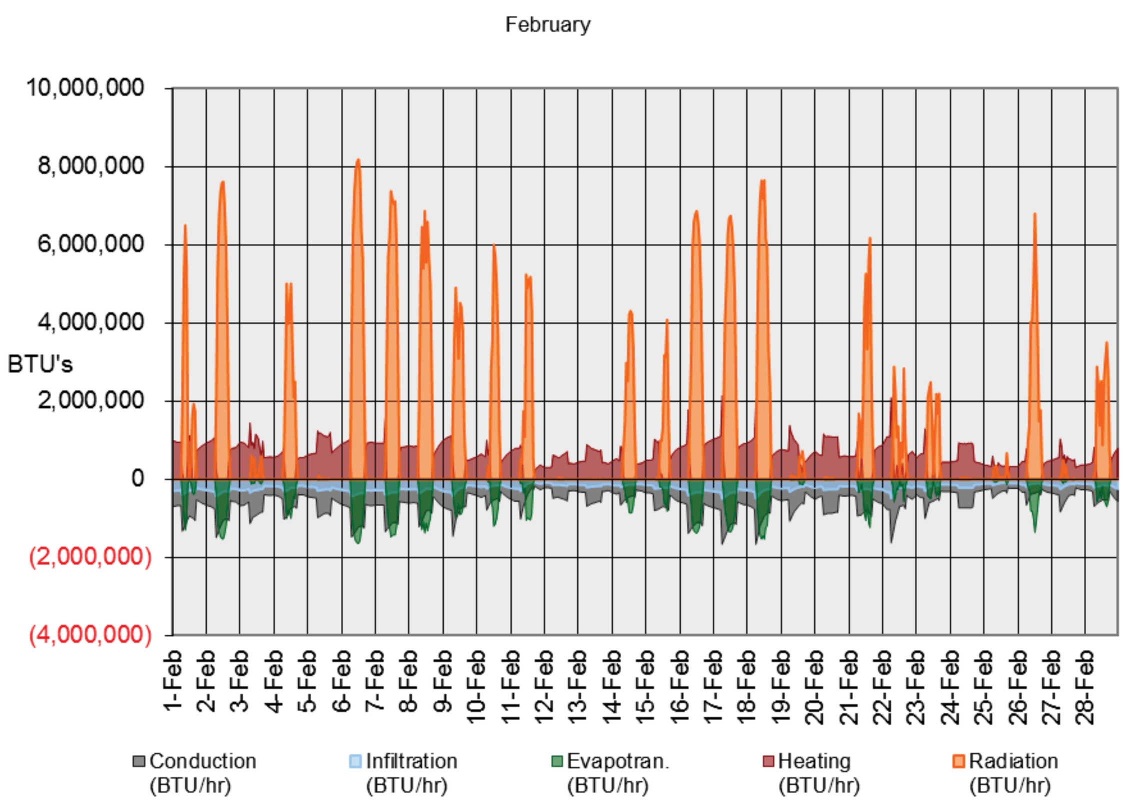
Location / Area Description	# of Heaters	Type of Heater	Btu/hr Output	Make / Model	Fuel Type
Slant Fin Propane Boiler	1	Gas-Fired Boiler	300,000	Slant Fin GG-375	Propane
Freedom Outdoor Furnace	1	Wood-Fired Boiler		Big Eliminator 60	Wood
Big House*1	12	Forced Hot Air	180,000	Modine	Propane
Big House*1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

*1 These heaters are heat exchangers. The heat exchangers with a propane fuel type run off of the propane boiler, and the heat exchangers with a wood fuel type run off of the wood boiler.
*2 The small house was not in operation during the 12 month period evaluated, therefore no fuel was used by these heaters during that time.

Greenhouse simulation software was used to quantify the heat transfer through the greenhouse due to conduction, infiltration, evapotranspiration, heating, and radiation. Conduction is the heat transfer through a material due to a temperature gradient. A temperature gradient is formed when outside ambient temperature is different from that of the inside temperature of a greenhouse. Infiltration is heat transfer due to unintentional introduction of outside air into a building. An example of infiltration is having a broken pane of glass in a greenhouse and cold air entering through the hole. Evapotranspiration is heat transfer due to evaporation and transpiration of plants in the greenhouse. Water evaporating from the leaves of plants removes heat and acts as a cooling mechanism. The heating referred to in the simulation is supplemental heating. Radiation is heat transfer due to the emission of electromagnetic waves from an object. An example of radiant heat is the heat of the sun. As seen in figure 5, radiation is the major natural form of heating.

Figure 5 shows the heat transfer through the big greenhouse for the month of February. The other months are similar, so only one month was shown.

Figure 5. Big Greenhouse Heat Transfer Simulation (February)



RECOMMENDATIONS

Thermal Energy Curtains

________________ has the opportunity to increase the energy efficiency of their heating system by replacing the existing energy curtain material with new material. The existing energy curtain has greatly deteriorated from its original condition.

A thermal energy curtain saves energy by retaining heat within the greenhouse at night or on cloudy cold days. The amount of heat that is retained depends on the type of material, but commonly results in savings of 30%-60% over an uncovered house. The thermal curtain conserves heat in the greenhouse in three ways:

- It creates an attic space in the house; an insulation layer of air between the curtain and the roof.
- It reduces the volume of air that needs to be heated.
- It reflects the radiated heat back into the greenhouse instead of out to the black, cold, night sky.

There are a couple variations of curtain systems available:

- Gutter-to-gutter systems pull across the width of the greenhouse at the height of the gutter. This system uses a single panel of fabric in each house and eliminates the costs of sealing between trusses and the leakage. There may be a need to move irrigation lines, heating ducts, wiring, and lighting systems to accommodate this system.
- Truss-to-truss systems move between the trusses and above the bottom of the truss. These systems can more easily accommodate irrigation lines, heating ducts, wiring, and lighting systems, but is more complicated than the gutter-to-gutter system.

Figure 6: Truss-to-Truss Energy Curtain

Costs for energy curtain systems will vary based on material, configuration, controls, installation, and size. For the most part, costs vary from $1.35 to $4.12[1] per square foot of greenhouse.

[1] Sanford, Scott. "Reducing Natural Gas/Propane Use for Greenhouse Space Heating." *Greenhouse Energy Conservation*. Wisconsin Focus on Energy, 2001. Web. Values adjusted for inflation from 2010 dollars using *Inflation Calculator*. Web. 14 May 2010. <http://www.usinflationcalculator.com/>.

Figure 7 compares the current propane usage to the proposed propane usage for the farm if the energy curtain was repaired on the big greenhouse. Figure 8 compares the current and proposed wood usage for the farm if the energy curtain on the big greenhouse was repaired. Table 7 provides economic details for the recommendation.

Figure 7: Energy Curtain: Current vs. Proposed Propane Use

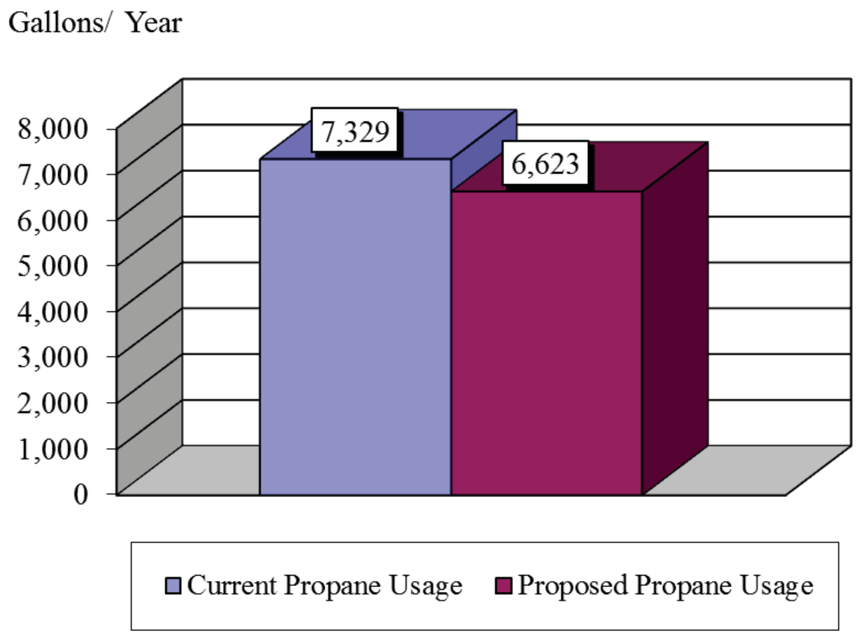


Figure 8: Energy Curtain: Current vs. Proposed Wood Use

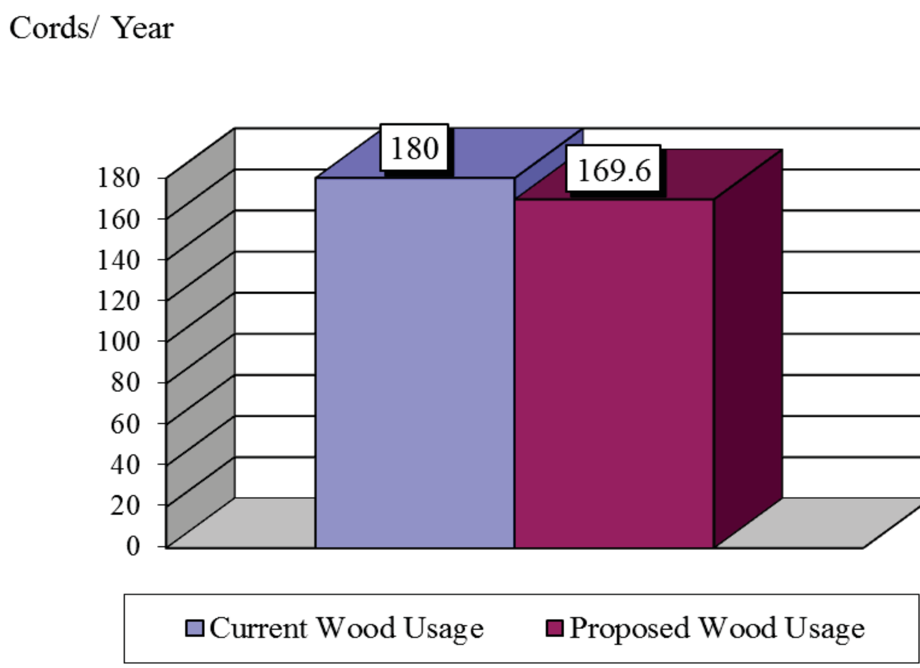


Table 7. Energy Savings from Energy Curtain

Efficiency Measure	Estimated Annual Fuel Savings (gallons)	Estimated Annual Wood Savings (Cords)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Repair Curtain	706	10.4	$3,038	$10,000	3.3

High Efficiency Condensing Boiler

Condensing boilers are more efficient than other boilers. They burn at higher temperatures and have a secondary heat exchanger that captures heat from the water vapor in the exhaust stream from the latent heat. These units are usually made of higher quality materials to resist corrosion since they need to handle the condensate. As such, they work well for greenhouses. These boilers are available for natural gas or propane heating.

EnSave recommends replacing the existing propane boiler with a condensing gas boiler. The existing propane boiler was assumed to have a combustion efficiency of 80%. The proposed condensing gas boiler will have a combustion efficiency of 92%. Figure 9 compares the current propane usage to the proposed propane usage for the farm if a condensing gas boiler was installed on the farm. Table 8 provides economic details for the recommendation.

Figure 9: Condensing Boiler: Current vs. Proposed Propane Use

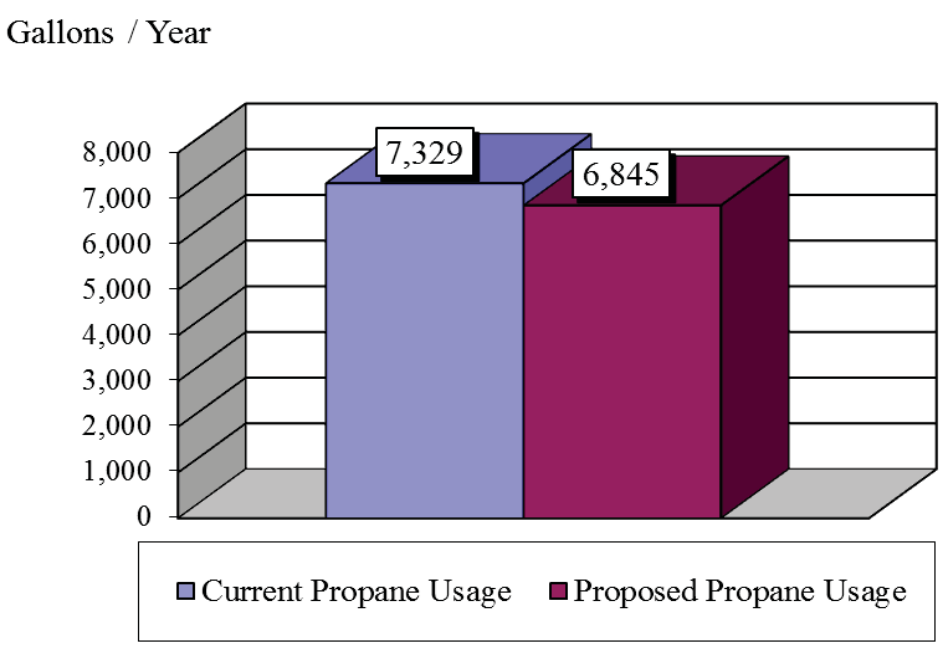


Table 8. Energy Savings from Condensing Boiler

Efficiency Measure	Estimated Annual Fuel Savings (gallons)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Condensing Boiler	484	$796	$11,000	13.8

Reduce Air Leaks

All greenhouses suffer from air leaks. The simple act of locating and repairing them can drastically reduce heat loss and improve energy bills. Over time, leaks increase as gaps in door seals and louvers increase, glazing materials deteriorates, and tears or cracks occur. Wind, internal pressure from blowers, and greater differences between the outside and inside temperature cause this exchange of air that needs to be heated. Tight greenhouses should have about one half of an air change per hour, where very leaky greenhouses can be as high as four air changes an hour.

_______________________ keeps their greenhouses in very good shape, with an existing air exchange ratio of 0.75 air changes per hour. Repairing the energy curtain will further reduce the air exchange ratio to an estimated 0.5 air changes per hour. There are no specific recommendations to seal air leaks in the greenhouse, but repairing the energy curtain will have a positive effect on air sealing.

Under-Bench Heating

Under-bench heating, also referred to as root zone heating, has been proven to reduce energy use during the greenhouse heating system. Under-bench heating is a series of pipes or tubing that run under the benches in a greenhouse, distributing hot water through the pipes. The pipes then radiate heat from the hot water to the roots of the plants. This allows the plants to be sufficiently heated while reducing greenhouse air temperature by about 5 °F. The radiant concrete slab in half of the big greenhouse is a good example of under-bench heating. EnSave recommends installing under-bench heating in the non-radiant slab portion of the greenhouse. Work with a greenhouse heating specialist to properly design a system for the greenhouse.

Figure 10 compares the current propane usage to the proposed propane usage for the farm if all greenhouse measures were installed on the big greenhouse. Under-bench heating will not be as effective in reducing energy use if the energy curtain and condensing boiler measures are not installed, therefore the savings for under-bench heating are shown interactively with the other measures. Figure 11 compares the current and proposed wood usage if all the greenhouse measures are installed. Table 9 provides economic details for the recommendation.

Figure 10: All Greenhouse Measures: Current vs. Proposed Propane Use

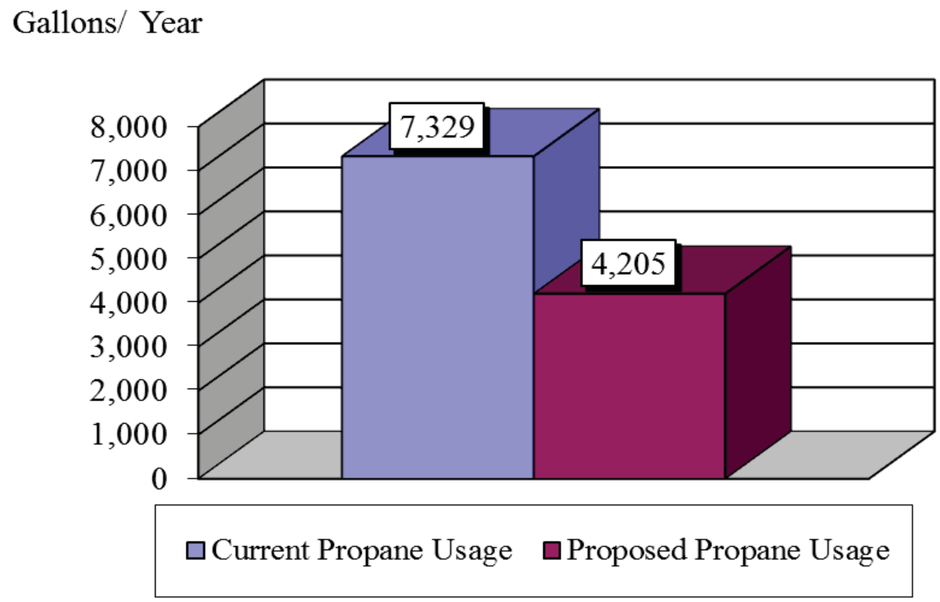


Figure 11: All Greenhouse Measures: Current vs. Proposed Wood Use

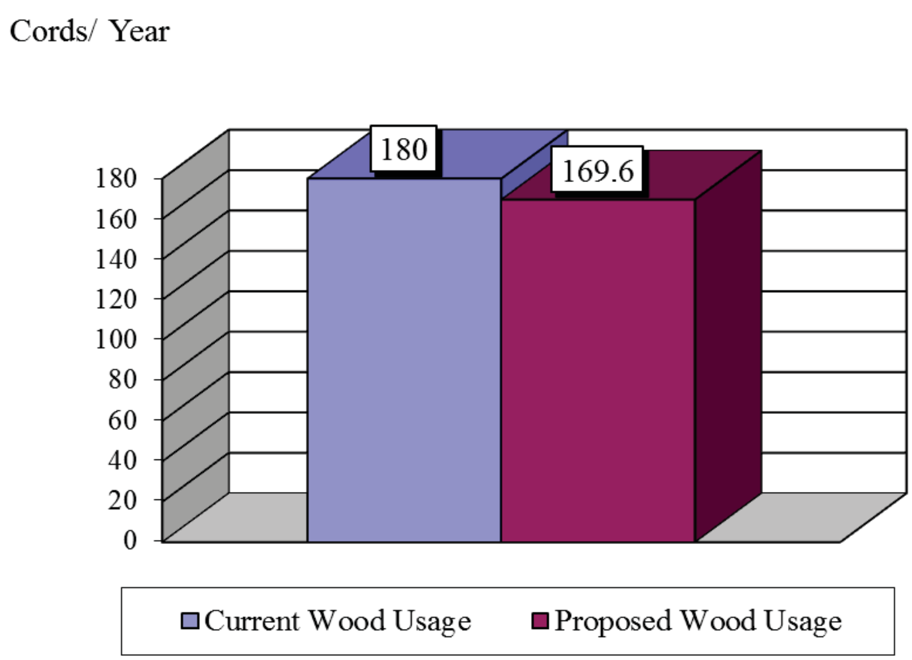


Table 9. Energy Savings from All Greenhouse Measures

Efficiency Measure	Estimated Annual Fuel Savings (gallons)	Estimated Annual Wood Savings (Cords)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Condensing Boiler, Repair Curtain, and Underbench Heating	3,124	10.4	$7,016	$41,000	5.8

Lighting
_____________ has an opportunity to improve the energy efficiency of its lighting system. We recommend replacing the 400 Watt Metal Halide fixtures in the barn with 6-bulb, 4-foot, High Performance T8 (HPT8) fixtures. HPT8 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. HPT8 bulbs maintain around 95% of their initial light output over their lifetime, whereas metal halides lose up to 50% as they age. EnSave recommends installing HPT8 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.

We recommend replacing standard incandescent lights in the big greenhouse with energy efficient compact fluorescent lights (CFL). CFLs deliver the same lighting levels as incandescent lights, but are approximately four times more energy efficient. The technology is less expensive to install than electronically ballasted strip fluorescent T-8 and T-5 fixtures. However, in some cases we would recommend replacing incandescent lighting fixtures with T-8 or T-5 fixtures because they deliver less noise, more light per watt, better color rendering, no flickering, cooler operation, and more energy savings to the user.

Although we are not recommending the replacement of your T12 fluorescent fixtures at this time due to the long payback period, when the lights burn out we advise replacing these lights with either T8 or T5 vapor-proof fixtures. This will result in energy cost savings and protect the lights.

Figure 12 shows a comparison of the estimated current and proposed lighting electricity usage. Table 10 provides economic details for each lighting upgrade recommendation.

Figure 12. Lighting Electricity Usage

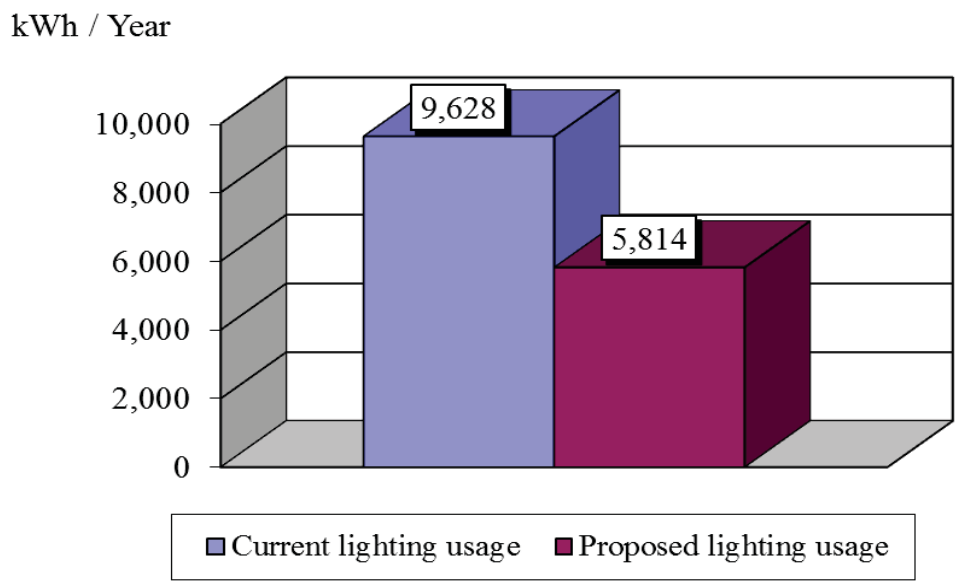


Table 10. Lighting: Recommended Energy Saving Equipment

Area	Existing Lighting Fixture to be Replaced	Recommended Lighting Fixture	Number of Fixtures to Install	Annual Run Hours	Estimated Annual Electricity Savings (kWh)	Estimated Annual Energy Cost Savings	Estimated Cost to the Farm	Estimated Payback in Years
Big House	100W Incandescent (100W Total Input Watts)	23W CFL (23W Total Input Watts)	10	1,728	1,331	$240	$90	0.4
Barn	400W Standard Metal Halide (456W Total Input Watts)	6-Lamp, 4ft.T8 (32W Bulbs, 220.8W Total Fixture Wattage)	4	1,920	1,806	$325	$1,000	3.1
Barn	400W Standard Metal Halide (456W Total Input Watts)	6-Lamp, 4ft.T8 (32W Bulbs, 220.8W Total Fixture Wattage)	3	960	677	$122	$750	6.2
Totals			**17**		**3,814**	**$687**	**$1,840**	**2.7**

Ventilation

It has been determined that ___________________________ has a limited amount of energy saving opportunities from improving the efficiency of their fans by upgrading to more energy efficient fans. In general, it is not cost effective to install any equipment with a payback that will exceed the expected life of the equipment. Therefore, at this time there are no recommendations to upgrade any of the existing circulation fans on the farm. It is good practice to develop proper maintenance and monitoring techniques that will help to detect problems early on and help determine solutions for creating more efficient ventilation systems.

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.

Table 11 provides a list of the existing fans on the farm.

Table 11. Fan Inventory Table

Location / Area Description	# of Fans	Fan Diameter (Inches)	Annual Run Hours	Fan Motor HP	Make / Model	Fan Type
Big House	2	24	6,048	0.33	GE	Circulation
Big House	1	36	6,048	0.5	Fasco 7190	Circulation

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 motor will likely increase the life of the equipment it runs 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 existing efficiency would result in reduced energy and cost savings.

Table 12 provides a list of the motors analyzed in this report.

Table 12. Motors: Existing Equipment

Location / Area Description	# of Motors	Motor HP	Annual Run Hours	RPM rating	NEMA Efficiency Rating	Make / Model
Ply Inflation Fan Motors	12	0.01	6048	3200		Schaefer B60 and A.O. Smith 9470
Javo Pot Filler	1	20	224	1740	86.5%	Siemens OSU
Davis Planter	1	0.5	252			
Side Vents and Ceiling Shade Motors	4	1	140	1725	82.5%	Lock (German)
Circulation Pump Wood Boiler	6	0.04	2016	3250		Taco 007-F5
Wood Boiler Fan	1	0.5	2016	1075		Dayton 4C668C
Circulation Pump Propane	1	0.75	1008	1725		ITT Bell Goset M74792
Wood Heat Exchangers	2	0.5	2016			
Propane Heat Exchangers	12	0.33	672			
Wood Heat Exchangers	6	0.1	2016			

Note: To consistently have the lowest possible energy consumption from motors, when a motor, 1 hp or greater burns out always replace them with the most energy efficient motor available. EnSave 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/

Water Heating

_______________ heats approximately 40 gallons of water a day from 55 °F to 150 °F for tempering the water going to the plants. The water is heated using an electric water heater. The water heater is fairly new and was assumed to have an efficiency of 80%. There are no cost effective opportunities to increase the energy efficiency of the water heating system.

Miscellaneous Electrical Equipment & Efficiency Recommendations

In a greenhouse there are minor electrical uses that are not accounted for in the previous sections. These uses include the refrigerator, air conditioner, inflator motors, and shop tools. This equipment may be used every day, but there are several reasons why the equipment is not cost effective to replace. There is often not more efficient equipment to replace the existing equipment with. Also, the equipment may run every day but not for a significant amount of time. Longer run times on equipment typically make the equipment more cost effective to replace.

ENVIRONMENTAL ASPECTS

Measure	Soil	Water	Animal*	Plant	Air
Greenhouse Measures	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: The farm is currently using 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)	0.004
Nitrogen Oxides, NOx (tons)	0.02
Carbon Dioxide, CO_2 (tons)	41.38
Nitrous Oxides, N_2O (pounds)	0.32

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

FUNDING OPPORTUNITIES

Become Informed about Sources of Funding in NJ

Most programs require an energy audit. Some provide higher ranking for installation of energy efficiency measures. Renewable energy projects also require an assessment that includes life cycle analysis, not simple payback.

In the list of resources you will find the database of state incentives for Renewables and Efficiency. The following are several resources that can help with the energy management on your farm.

Net Metering

Net metering for wind, solar, and agricultural energy installations allows owners of these systems to earn credit on their electric bills if they generate more power than they need. Under the Green Communities Act, non-municipal, investor-owned ("public") utility companies must compensate their customers for this excess electricity at the retail rate rather than the lower wholesale rate for systems up to 2 megawatts. Owners of renewable energy systems may allocate their credits to other customers, who will save on their electric bill by generating some portion of the electricity they use. Farms are allowed to earn credit for other technologies such as anaerobic digesters. Municipal utility companies do not offer net metering and therefore, municipal customers should determine the compensation for excess electricity before a renewable energy system is designed.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program, administered by the USDA Natural Resources Conservation Service, provides technical and financial assistance to farmers and forest land owners to help implement a variety of practices aimed at improving environmental quality. In 2009 the EQIP program added renewable energy practices (including wind, solar and methane digesters) and energy efficiency practices (including greenhouse thermal blankets and horizontal air flow fans) to the list of practices for which they can provide funding. NRCS may include additional energy practices in future years. Payments are limited to $300,000 per participant over a 6 year period. Payment rates for practices are set annually and are available at www.ma.nrcs.usda.gov/programs/eqip/documents.html. Eligible beginning, socially disadvantaged and limited-resource farmers (as defined at www.nrcs.usda.gov/PROGRAMS/SLB_Farmer) can receive higher payment rates. EQIP will fund projects that replace or save farm energy. Any residential use shared on the farm meters will need to be documented so the project can be prorated. **An energy audit is required for both energy efficiency and renewable energy projects**. Applications are accepted all year through the local NRCS office, but are reviewed in a competitive ranking process when funding becomes available - usually once each year. Applicants cannot accept EQIP funds in conjunction with other USDA funding, such as REAP grants.

Rural Energy for America Program (REAP)

This program, administered by the USDA-Rural Development, provides financial assistance to agricultural businesses to purchase renewable energy systems or make energy efficiency improvements. Awards are made in the form of grants only, guaranteed loans only, or combinations of grants and guaranteed loans. Total awards can fund up to 75% of eligible project costs, with grants funding up to 25% of eligible project costs. Energy generated or saved through the program cannot be for residential use, so if a farm and residence are on the same meter, a separate meter must be installed after the award notification.

Grants can range from $2,500 to $500,000 for renewable energy systems and $1,500 to $250,000 for energy efficiency improvements. Guaranteed loans can range from $5,000 to $25 million. For 2010, it is anticipated that first priority is given to applications requesting grants under $20,000 (projects $80,000 or less, or willing to accept $20,000 for larger projects), second priority to loans only, and third priority to applications requesting a combination of grants and loans. Applications requesting grants only, greater than $20,000, are given lowest priority for funding.

An energy audit or assessment is required for energy efficiency projects. Eligible project costs include post-application purchase and installation of new equipment and materials (except vehicles and tillage equipment), energy audits, permit fees, professional service fees, feasibility studies and technical reports, installing a separate farm meter, and business plans. Projects under $200,000 qualify for a simplified application process. Applicants cannot accept REAP funds in conjunction with other federal funds like EQIP or the 2010 Commonwealth Solar Stimulus (ARRA funds) program. Federal tax credits should not be used as matching funding for the grant application but can be utilized after the project is completed.

Federal Tax Credit and Rebate Programs
Businesses that install solar, wind and other renewable energy systems may either take advantage of federal tax credits, or they may apply to receive a cash payment from the U.S. Department of Treasury in lieu of tax credits.

Federal Tax Credit Option: The Energy Investment Tax Credit (ITC) allows businesses to take a tax credit for 30 percent of the basis of qualified solar or wind property. If a taxpayer chooses to take the energy investment credit, the taxpayer must reduce the basis of the property by one-half of the credit, but the credit does not add to the taxpayer's taxable income. Credits are available for small solar and wind systems placed in service on or before December 31, 2016.

Federal Cash Payment Option: Taxpayers without the tax base to fully take advantage of a credit may elect to apply for and receive from the U.S. Department of Treasury a cash payment of 30 percent of the taxpayer's basis for qualified solar or wind property. As with Federal Tax Credits, these payments are available for small solar and wind systems placed in service on or before December 31, 2016. A taxpayer who receives a USDA grant under EQIP or REAP for solar or wind may apply for this cash payment, and the taxpayer is not required to reduce his or her tax basis in the property on account of the grant because the taxpayer must include the grant in taxable income. By accepting payments, eligible individuals are choosing to forgo federal tax credits for the qualified property in subsequent years. Under the tax law, the taxpayer does not include this cash payment in taxable income but must reduce the basis of the property by one-half of the payment. **All applications, including post-installation and project-in-progress applications, must be received before the statutory deadline of October 1, 2011**. For projects that will be placed in service from 2011 and after, applications may only be submitted after beginning construction.

RESOURCES

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

1. *10 Easy Ways to Save Energy and Money,* published by John W. Bartok Jr.

2. *Greenhouse Energy Conservation Checklist,* published by John W. Bartok Jr., University of Connecticut

3. *Increase Efficiency of Heating and Cooling Systems*

4. *Horizontal Air Flow,* published by John W. Bartok Jr.

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

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

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

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

9. *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. *New Jersey NRCS Environmental Quality Incentives Program*
   http://www.nj.nrcs.usda.gov/programs/eqip/index.html

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

3. *Photovoltaic Solar Resource Map*
   http://www.nrel.gov/gis/images/map_pv_national_hi-res.jpg

4. *PV Watt Calculator*
   http://www.pvwatts.org/

5. *UMass Amherst – Greenhouse Energy Conservation Checklist*
   http://www.umass.edu/umext/floriculture/fact_sheets/greenhouse_management/jb_energy_cklst.htm

6. *Exploring Underbench heating options*
   http://www.hrt.msu.edu/energy/Notebook/pdf/Sec3/Exploring_Underbench_Heating_Systems_by_Bartok.pdf

7. *Tax Incentives Assistance* http://energytaxincentives.org/business/renewables.php

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