ENERGY-RELATED AGRICULTURAL BEST PRACTICES

General Energy Efficiency

For All Types of Farms

Farms can use less energy, save money, and be more resilient through equipment upgrades that pay for themselves

There are several measures and technologies available to reduce energy use and save money on all types of farms. This fact sheet applies to farms of any sector or size in New York State.

Produced by the New York State Energy Research and Development Authority (NYSERDA), the intent of this fact sheet is to help New York State farmers be aware of opportunities for efficient energy use, including in equipment operations, through preliminary information as well as access to ongoing resources. Support for farm energy efficiency includes NYSERDA's Agriculture Energy Audit Program enabling farmers to get individual, site-specific recommendations and guidance to improve their operations and productivity.

The ways energy is used on farms varies by sector, size, and individual farm context. Table 1 shows estimates of how electricity is used across New York State farms, and Figure 1 estimates how much energy savings and cost reduction can come from efficiency improvements in different end uses.

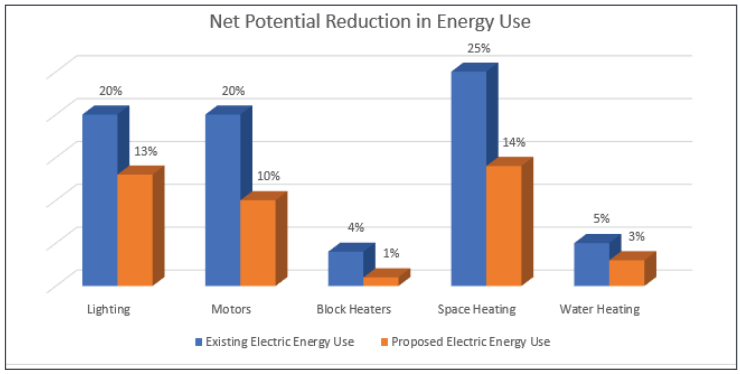
The end uses that make up the largest portion of energy utilized on farms tend to be priority areas for efficiency improvements that reduce costs. Across end uses, some have more savings potential than others for efficiency improvements.

Table 1 underlines what might be areas of highest priority for cost savings on a farm and Tables 2 and 3, on the following pages, highlight what technologies and preventative maintenance can get the biggest savings from efficiency improvements. A farm-specific energy assessment provides a clearer and more accurate look at energy use and recommendations in a particular context.

Table 1. Percent Ranges of Annual Electric Consumption for End Uses Across Farm Sectors

End Use	% of Annual Electric Use (Range)
Lighting	10–30%
Motors	5–25%
Block Heaters	1–5%
Space Heating	1–6%
Water Heating	5–15%

Figure 1. Net Potential Reduction in Energy Use from Efficiency Audit Recommendations



NEW YORK STATE | NYSERDA

Technology Recommendations for General Farm-Energy Efficiency

Table 2. Technologies for Energy Efficiency Commonly Recommended Across Farm Sectors.

Technology and Description	General Operational Requirements	Potential Energy Savings[1]	Typical Simple Payback[2]	Possible Barriers	Non-Energy Benefits
LED lighting LED to replace moderate- to high-use non-LED lighting.	Weekly use more than 5 hours.	5–50%	0.5–5 years	Cost barrier in areas of low use.	Labor savings from less bulb changes.
Controls Lighting controls: occupancy sensors, light sensors, dimming; thermostats; time switches; environmental controls; process controls.	Utility costs many times the cost of the controls.	5–80%	1–6 years	Certain controls can have high-install costs.	Improved comfort for humans and livestock.
Motors Purchase premium efficiency motors when obtaining new motors. If possible, purchase EC (brushless) motors.	Weekly use more than 10 hours.	5–67%	5–12 years	Cost; application limitations.	Increased equipment life, decreased. repair costs, decreased downtime.
Tractor block heaters Time switches should be installed to limit block heaters to only operate for 1–2 hours prior to equipment use.	Timers are not intended for tractors powering electrical backup equipment.	65–85%	0.5–1.5 years	None	Decreased fire hazard.
High-efficiency (HE) space heating Heating using devices such as an HE boiler, infrared heater, condensing unit heater, he at pump, etc.	Annual use more than half the winter.	10–70%	6–15 years	Cost; application limitations.	Increased equipment life, decreased repair costs, decreased downtime.
HE water heating Heating using devices such as an on-demand/instant water heater, heat pump, indirect water heating, etc.	If nominal use, then switch to a small electric tank.	10–70%	5–14 years	Cost; application limitations.	Increased equipment life, decreased repair costs, decreased downtime.
Building insulation This applies to farms with heated buildings. Seal windows and doors, add attic and wall insulation	Annual building heating occurs more than half the winter.	1–20%	5–17 years	Cost	Improved comfort for humans and livestock.

Table Notes:

*1. The column for **Potential Energy Savings** represents the potential savings as a percentage of the total energy use for each technology category. For example, if lighting as an end use was 20% of a farmer's electricity usage, and if the above table showed a potential energy savings of 25%, then the net effect would be a 5% overall electricity energy savings (20% * 25% = 5%). A farmer can then predict **Annual Cost Savings** by estimating 5% off the annual bill. If that farmer's annual electricity bill is $10,000, then the potential cost savings for implementing LED lighting would be 5% * $10,000 = $500 per year.*

*2. Simple Payback is the installation costs divided by the potential energy cost savings, showing how long it takes for annual cost-savings from an upgrade to pay for the initial costs. A farmer can use this information to predict the **Expected Implementation Cost** by taking the cost savings from note #1 and multiplying it by the Typical Simple Payback for the technology under investigation. If this example of LED lighting had a Typical Simple Payback of 3.0 years, then the estimated implementation cost would be $500 * 3.0 = $1,500.*

Maintenance Recommendations for General Farm-Energy Efficiency

Table 3. Maintenance for Energy Efficiency Commonly Recommended Across Farm Sectors.

Maintenance and Description	Potential Energy Savings[1]	Typical Simple Payback[2]	Possible Barriers	Non-Energy Benefits
Lighting Components need cleaning, checkups, or replacement as needed.	N/A	N/A	Equipment access (which should be corrected).	Avoiding premature equipment failure.
Fans and ventilation Clean fan blades, air inlets, motors, guards, shutters, thermostats, and air ducts. Lubricate shutter hinges, check fan belts, ensure ridge vents are properly sized.	1–3%	1–3 years	Equipment access (which should be corrected).	Avoiding premature equipment failure.
Water heating Insulate water pipes, repair leaky faucets, flush water heater monthly for optimal performance and longevity, annual tune-up and combustion test, add a water softener.	1 –5%	1–3 years	Cost (particularly for water softener install).	Avoiding premature equipment failure.
Space heating Insulate pipes and ducts, clean air exchangers and thermostats, annual tune-up and combustion test.	1–5%	1–3 years	Equipment access (which should be corrected).	Avoiding premature equipment failure.
Well and irrigation Check nozzle package of irrigation system; test well and pump annually.	1 –5%	1–3 years	None	Avoiding premature equipment failure.
Controls – all Clean controls and sensors, verify settings.	1–5%	1–3 years	Labor	Avoiding premature equipment failure.
Motors Clean dirt and dust, ensure sufficient ventilation, check for loose connections, remove drain plugs as needed to drain condensation, lubricate bearings, check and change belts, add or replace weather protection.	1 –5%	1–3 years	Equipment access (which should be corrected).	Avoiding premature equipment failure.
Compressed air systems Lower setpoint to 90-110 psi, when multiple compressors are run in series to ensure the lead-lag arrangements are tuned to spread wear-down and optimize performance. Use an air leak detection device. If using air dryers, ensure proper operation and link to compressor operation to avoid running air dryer unnecessarily. Purchase and use a handheld blower instead of using an air compressor for cleaning tasks.	1–15%	1 –5 years	Time, cost (leak detection, blowers).	Avoiding premature equipment failure.

All footnotes are described in the prior table.

Industry Information and References

Industry Information and Resources	
LED lighting and controls	Design Lights Consortium is a non-profit supporting energy optimization, with resources to help end users find efficient lighting for commercial and horticultural applications.
	U.S. Department of Energy report "Energy Savings Potential of SSL in Agricultural Applications" (June 2020).
Motors	Explanation of electronically-commutated (aka brushless) motors from Cx Associates Engineering.
HE space and water heating	U.S. Department of Energy page on geothermal heat pumps.
Building insulation/ air sealing	U.S. Department of Energy page on weatherizing buildings to save money and energy.

	Glossary of Farm Energy Efficiency Terms
CO_2	Carbon dioxide
DHW	Domestic hot water
HE	High efficiency
LED	Light emitting diode. A modern type of lighting.
O&M	"Operations and maintenance" describes a category of activities related to operating a farm and maintaining the equipment used on a farm.
O_2	Oxygen
Temp	Temperature
VFD	A variable frequency drive controls a motor so that the speed of the motor can be changed to meet the requirements of the load.

Resources

Energy efficiency resources are being developed for farmers by Cornell Cooperative Extension and the New York State Energy Research and Development Authority, in collaboration with topic-experts in New York State. Visit AgEnergyNY.org to find cost-saving resources for farms:

- Recommendations for energy-efficient technologies
- Conservation practices to optimize energy use
- Easy access to funding resources

SCAN ME

Ready to get started?

Visit AgEnergyNY.org to learn more and to get advice on energy efficiency and farm operations, learn about available grants and incentives, or obtain a free energy audit of your farm operations.

NEW YORK STATE | NYSERDA