



Switch Reliable Energy from Renewable Sources

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Energy Efficiency for Farms

Farms use a great deal of energy. The energy is necessary for pumping water, controlling the temperature in barns and buildings, lighting, drying or curing, and other activities. The costs of this energy can be significant. Studies indicate energy costs account for about 6% of expenditures on the average farm. The relative costs are even higher for greenhouses, aquaculture, and raising livestock. The costs also vary regionally based on climate and the types of farming done. For instance, energy expenditures are about 8% of total costs for farmers in New York. Some of the major end uses of energy are:

- Space conditioning (heating, cooling, and ventilation)
- Water heating
- Motors and pumps
- Lighting
- Motors and pumps
- Refrigeration

Efficiency and Profits

Improved energy efficiency is a way for lowering energy costs of a farm and thereby increasing net profits. In some cases, this can be accomplished very easily. For instance, simply switching to energy efficient lighting or upgrading pumps and motors can increase efficiency and reduce energy costs.

Renewables and Efficiency

Renewable energy also offers a way to increase energy efficiency and reduce costs. Some of the ways for accomplishing this are:

- Solar thermal water heating
- Solar space conditioning
- On-site power for lighting, motors, and/or pumps
- Combined heat and power (CHP) using renewable energy

Solar Water Heating

Solar water heating is economically feasible in most areas of the United States. It works best in areas with a sunny climate, but can also work in northern latitudes for most of the year. The simplest kind of solar water heaters are essentially metal plates that absorb the heat from sunlight. They then pass the heat to water that is circulated between the plates. These systems are inexpensive and simple to operate and maintain. They offer the greatest reduction in energy costs and can be used to partially or fully replace water heating systems that rely on fossil fuels or electricity. However, in colder climates they can only be used seasonally and must be drained of water to prevent freezing.



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Another type of solar water heater uses a refrigerant to absorb solar energy. The refrigerant then passes heat to water. This kind of system can work year round, but is more expensive than the water circulation type. It also requires more energy for pumping, so it should be used in places that have large hot water requirements or want to maintain solar heating all year.

Solar Space Conditioning

Energy from the sun can be used to heat air as well as water. Transpired collectors are panels that may be mounted on a wall or roof. They collect energy from the sun and use to heat air entering a heating system. They can raise the air temperature by as much as 40 degrees. This can partially offset or replace heating requirements for a building. This technology will work throughout the year and requires little or no maintenance. It is very effective for large buildings and barns.

On-site Energy

On-site energy can increase energy efficiency and decrease energy bills on farms that have access to an abundant energy resource, such as sun, wind, hydropower, or biomass. On-site energy systems can harness these resources and use them to operate lighting, motors, pumps, and other energy intensive fixtures.

Farms can also be potential energy producers for the national electric grid. This means the farm produces more electricity than it uses and sells the excess to utilities. Farms are well suited for this because they have an abundance of space for solar panels, wind turbines, and other energy generators. On-site energy provides farmers with a means of increasing the value added from resources on their land.

Combined Heat and Power

CHP systems make use of heat that may be a waste product of electric production. Rather than just venting the heat off to the air, it is used to heat water. The hot water can be used by itself, or it can also be used as a means of space conditioning. Agricultural settings often have abundant biomass resources such as manure, crop residues, or wood chips. These resources can be converted into electric energy using a [biomass](#) or biogas energy system. Waste heat from this process can then be used in a CHP application. CHP is a very efficient and cost effective use of energy resources. They can potentially decrease both the electrical and fuel requirements of a farm. These systems do have a relatively high capital cost, so they are best used on large farms or among a collective.

There are many sources available for you to learn more about powering remote sites:

[Study of farm energy use in the U.S.](#)

[Overviews of Energy Efficiency for Agriculture](#)



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[Lessons learned from energy efficiency projects on farms](#)

[Overview of energy and energy efficiency for agriculture](#)

[Solar water heating overview from the U.S. Department of Energy](#)

[Solar water heating](#)

[Solar space heating](#)

[Transpired air heating](#)

[Farms as energy producers](#)

[Value added farming through energy production](#)

[Is my facility a good candidate for CHP? By the EPA](#)

[Biomass CHP project on a dairy](#)