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126. Alternative power sources - what are the options? Bartok, J. W., Jr. Greenhouse Management 31(11):50-51. 2011.

Q Alternative power sources – What are the options?

Although there have been many alternative sources of small-scale electricity generation developed, there are only a couple—solar and wind—that are practical for most growers. Other alternatives that apply to special situations or are under development include hydro, fuel cells, microturbines, steam turbines and methane-fired cogeneration units.

Photovoltaic solar and wind turbines are readily available in many sizes. With federal and state grant money, the cost can be affordable to many growing operations, both large and small. Before considering an alternate energy electricity producing system, it is important to reduce power consumption to a minimum. Let's start there and look at some of the steps that need to be taken.

From my audit of many greenhouses, a greenhouse operation will typically use from ½ to 2 kilowatt hours (kwhr) of electricity/square foot of floor area per year. On the low end of the scale are hoophouses that are only used for spring production. On the high end of the scale are greenhouses with fan ventilation and supplemental lighting.

Reduce power consumption first

Evaluate these first:

Ventilation. Fans are generally the largest electricity user. They operate an average of 2,000 hours per year. Converting the greenhouse to natural ventilation—roll-up sides, vents or open roof—can save many dollars per year.

Energy efficient motors. In larger sizes (more than 1 horsepower), replacing existing motors on compressors, pumps and materials handling equipment with energy efficient or premium efficiency motors can save 5-10 percent in electricity use.

Insulation. Reducing heat loss with perimeter, sidewall or energy screen insulation will reduce winter heat loss and therefore furnace/boiler operation time.

General considerations

Site evaluation. Solar requires good southern exposure for a minimum of six hours per day. Wind requires a minimum average wind speed of 12 mph. Insolation and wind maps are not very accurate and it is best to have an on-site solar or wind resource survey done that gathers a year's data. Gather data on total solar energy supply or hours of adequate wind speed. Many installers can supply the equipment for this.

Permits. Investigate before you proceed. Wind turbines and solar systems are restricted by zoning regulations in some communities. Both require building permits.

Electricity needs. Analyze power bills to determine daily totals and seasonal changes. Consider installing a system that will supply 50-80 percent of the total requirements.

Utility company interconnection. Contact the local power company to see what their requirements are and how much they pay for net metering (electricity supplied by you to the power grid).

What matches your needs? Gather information on system size, installation requirements, maintenance and cost. Develop a return on investment for the projected life of the equipment.

SMALL BUDGET SOLUTION

Solar – These systems are modular with a typical photovoltaic panel generating 100 to 200 watts at 12 volts. Small systems with battery storage and an inverter will power equipment where electricity is not available. These systems are in the $2,000 to $3,000 range. Other small-scale solar equipment includes solar vent openers, horizontal air flow fans, water pumps and LED lighting.

Wind – Turbines in the 600- to 1,000-watt size can be set up for $2,000 to $2,500. With battery storage and an inverter, they can operate fractional horsepower motors and lighting.

Solar requires good southern exposure for a minimum of six hours per day.

LARGE BUDGET SOLUTION

Solar – To meet the needs of larger operations, a 5- to 10-kw output system is usually installed. Depending on the location and weather conditions, a 5 kw array will generate more than 6,000 kilowatt hours of electricity annually and save $600 to $1,200 in electricity costs. Installation cost of this size system before incentives is $40,000 to $50,000. Federal and state grants and tax credits can reduce the cost by more than half.

Wind – For power generation in larger operations, 10- to 100-kw wind turbines have been installed. Output depends on the amount of wind available, but is in the range of 1,000 to 2,000 kwhr of electricity per year per kilowatt of capacity. For example, the 10-kw unit will generate 10,000 to 20,000 kwhr of electricity. Installed cost varies from $50,000 for a 10-kw unit to $400,000 for a 100-kw turbine. Grants usually cover at least half the cost.

A combination of solar and wind systems can even out the yearly performance. In some areas, wind resources are greater during the spring, winter and fall, while the sun is most intense during the summer. Ed Cook of Cider Hill Farm (www.ciderhill.com) in Amesbury, Mass., has three, 10-kw Bergey wind turbines and two banks of Evergreen solar panels that supply about 100,000 kwhr/year. That amounts to about 80 percent of the electricity needs of his eight greenhouses, garden center and fruit storage. GM

A 10-kw unit will generate 10,000-20,000 kwhr of electricity.

HAVE A QUESTION? You can write John at jbartok@rcn.com.