



# E<sup>3</sup>A: Solar Electricity for the Home, Farm or Ranch

## Steps in the Solar Electricity Series

Building and Site Assessment

Conservation and Efficiency

**System Options**

System Components

System Sizing

Costs

Installation

Operation and Maintenance

Electricity Use Worksheet

### System options

This guide provides flow charts for the four most common solar electric system options. Each system is designed based on the electrical load, whether it includes batteries and whether it is connected to the utility grid. Grid refers to a utility company's system of transmission and distribution lines that carry and deliver power plant-generated electricity to your home or business. The *System Components* guide provides information about each major component.



### PV-direct systems

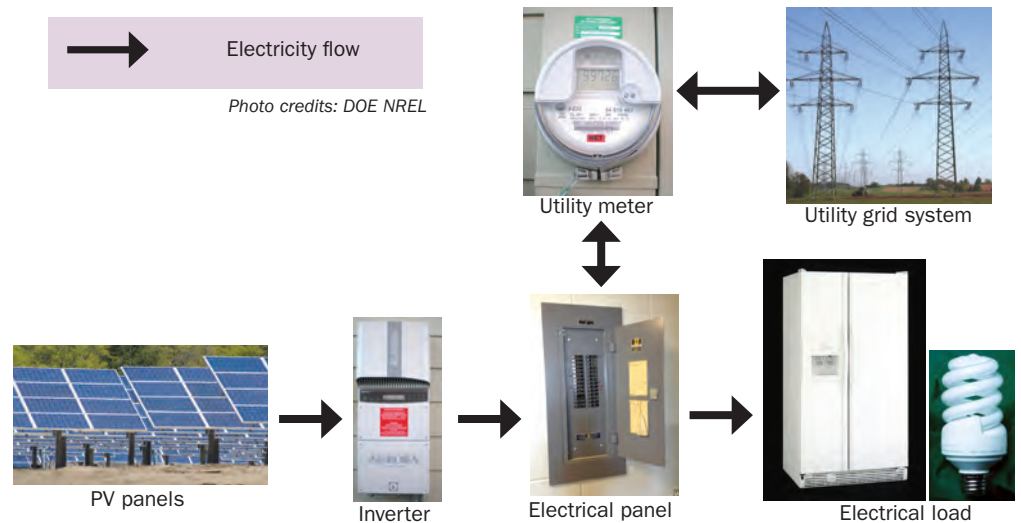
These systems do not include batteries and are not tied to the utility grid, so they only generate power when the sun shines. Although they can have moving parts, these systems have the fewest components and are used with DC-powered appliances or equipment. Applications of this system type include water pumping and building ventilation.

Also, simple DC-powered systems can have batteries for applications such as electric fences that need to be powered at night.

Whether from the ground or a river, this system can be used to pump water for crops or livestock.

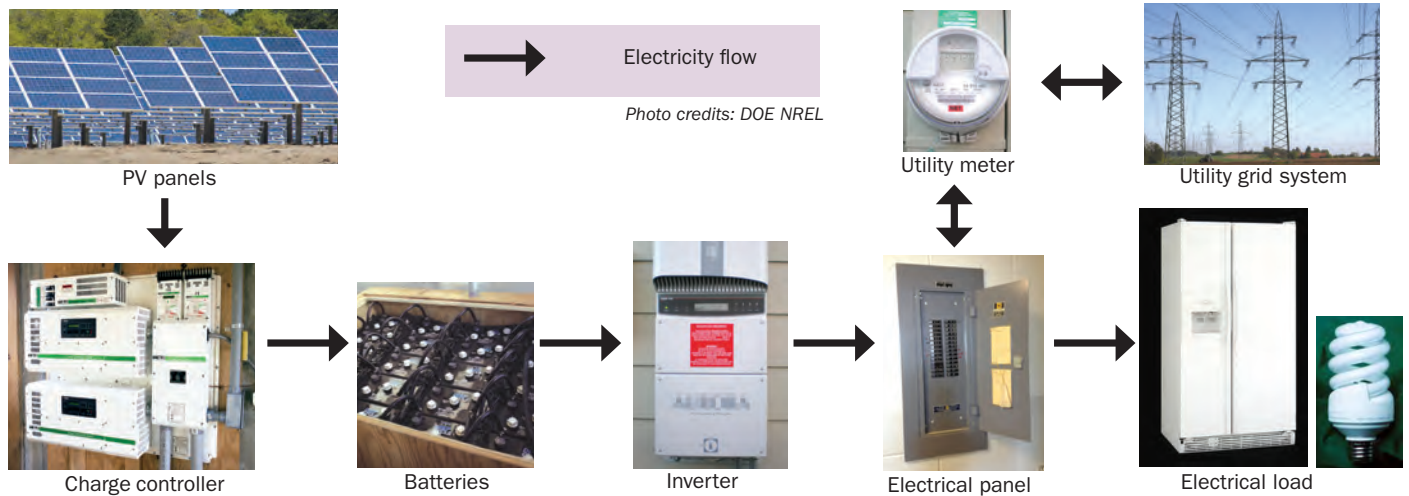
### Grid-connected systems

Grid-connected, or grid-tied, systems are connected to the utility power grid. A grid-connected system without batteries is currently the most popular system type. During the day, solar panels produce electricity from sunlight. At night, the system draws electricity from the utility grid. If the system needs more electricity than the solar panels are producing, it draws electricity from the utility grid. If the PV panels produce more electricity than is needed, the extra electricity is fed into the utility grid. If there is a daytime power outage, the PV system automatically shuts down and ceases supplying electricity for utility worker safety.



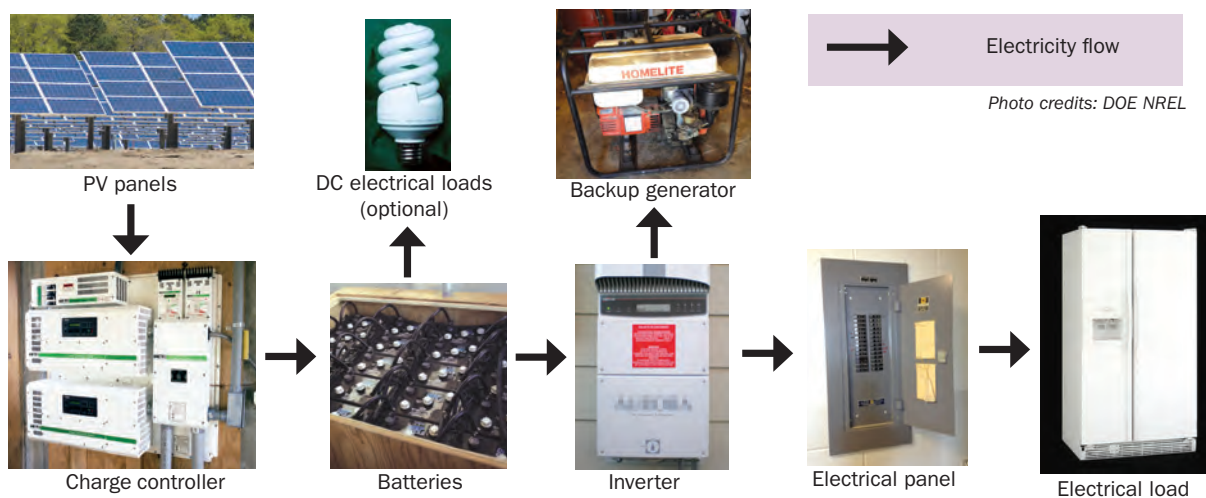
## Grid-connected systems with batteries

Grid-connected systems with batteries work the same way as grid-connected systems, except electricity is stored in batteries for use during a utility power outage. Homes or buildings can have dedicated critical electrical loads powered by the batteries. These loads might include a refrigerator, water- and heat-related pumps, furnace fans, medical equipment or a computer for a home-based business.



## Off-grid systems

Off-grid systems are not connected to the utility grid. They are also called stand-alone systems. Solar panel-generated electricity is stored in batteries. These systems are typically installed in remote areas where connecting to the utility grid is more expensive than installing an off-grid system. Off-grid solar electric systems typically have supplemental and backup power from a small wind turbine or a generator.



## References

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- U.S. Dept. of Energy. (2011, Feb.). *Equipment Required for Stand-Alone Systems*. Retrieved February 16, 2011, from [http://www.energysavers.gov/your\\_home/electricity/index.cfm/mytopic=10620](http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10620)

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