



## SOLAR SYSTEMS: WHAT SIZE IS RIGHT FOR YOU?

As your Touchstone Energy cooperative, we are your source for energy and information. Since interest in solar power generation is growing, we put together a series of fact sheets to help answer questions you might have. Contact us for more information about solar and assistance in making decisions about whether solar is a good option for you.

### SOLAR SYSTEMS: WHAT SIZE IS RIGHT FOR YOU?

All solar systems begin with a series of small photovoltaic (PV) cells that produce electricity directly from sunlight. These PV cells are combined to form a module or panel. Several panels are connected together to form an array or a solar system. Arrays can be small—from a few panels to power a roadside warning sign or a remote cabin—up to a large array covering hundreds of acres as part of a utility-scale solar farm.

Solar systems generally can be divided into three types, based on size.

### ROOFTOP SYSTEMS

This type of system is most often thought of as a residential system, although rooftop systems may also be installed on commercial and industrial facilities. However, for the most part, rooftop systems are smaller in scale, and for practical purposes, have far less capacity to produce solar than other types.

- As the name suggests, rooftop systems are mounted on a roof. This may be a home, a commercial/industrial building, a public building, or even a parking garage
- The actual amount of energy produced depends on the location. Typical home rooftop systems are sized to produce between

2 and 10 kilowatts (kW). On average, 75 square feet of solar panels are needed to produce each kilowatt of direct current (DC) power during peak solar periods.

- While prices vary, residential system prices have fallen to an average of \$3.50 per watt peak capacity of direct current Wp-DC. Watt peak capacity is the maximum capacity of a module under optimal conditions.
- Ownership of rooftop systems can vary: The system may be owned by the building's owner. A leased solar system may be owned by the company installing the leased system, or a community solar system may be owned by the electric cooperative installing it.
- The energy produced by the rooftop solar system helps offset energy use of the building on which it is installed. During some times of the day or months of the year, it may produce more energy than is used within the home or commercial building.
- The number of solar panels installed on the building can be expanded over time, depending on the size and configuration of the building, and the owner's desire to install additional capacity.

## UTILITY-SCALE SYSTEMS

- Utility-scale systems may range from a capacity of 500 kW to hundreds of megawatts (MW).
- For perspective, a 1-MW alternating current (AC) solar array can produce enough energy to power about 200 homes (depending on location) and may cover 5-7 acres. Because of the amount of land required, utility-scale projects are often located in more rural, less populated areas.
- Because of their size, most utility-scale solar systems are installed in a fixed-tilt ground-mount configuration. This means that the panels are placed on the ground (rather than on a building), and are tilted in place to gain maximum exposure to sunlight.
- A solar array can be installed on marginal land that can't be used for agriculture or building sites, such as brownfield sites, landfills, and airport buffer areas. However, the site must be relatively flat or south-sloping without significant shading from vegetation or other obstructions.
- Utility-scale solar systems owned and/or operated by an electric cooperative usually feed electricity directly into the transmission or distribution grid. The utility provides solar power to customers in one of two ways: by adding the power to the co-op's power portfolio—which benefits all cooperative members; or by selling power directly to individual members who are motivated to purchase solar energy. Selling directly to consumers may be done in one of two methods, also. First, members may sign on to a cooperative-offered Green Power Purchase program that sells the renewable attributes of the power directly to members. Some cooperatives also support a community solar program, described below. Though utility-owned programs come in many variations, most programs feed power to the grid, rather than directly to a home or business site.
- Economies of scale have a direct impact on costs. The 2015 calculations indicate that a large (20 MW-AC) solar system can be installed for an average of \$1.55 per Wp-DC; the cost is even less in some areas.

## COMMUNITY SOLAR SYSTEMS

- The size and scope of community solar systems typically fall between rooftop systems and utility-scale systems. Community solar systems are larger than residential rooftop systems but usually smaller than utility-scale projects. The capacity of these systems is typically between 20 kW and 1 MW (enough to power between 4 and 200 homes).
- Local cooperatives build, operate, and maintain their own community solar systems. Often these systems are located within the cooperative's service territory. Smaller systems are most likely to be local. One advantage: members can actually see the system "in action."
- Ground-mounting is the most common installation method, although some community solar installations have been placed on top of parking garages and public buildings.
- Ownership models vary, but in all cases, members who purchase solar through the cooperative community solar system receive credit on their bill for their share of the output from the solar system. The two most common ownership methods are:
  - » Members may purchase or lease a portion or unit of the system.
  - » Members subscribe to a unit of capacity from the project they don't own any part of it.
- There are significant advantages to community solar projects for both the co-op and the member. These include being able to participate in solar even if your home is not suited to supporting a solar system or if you don't want the upfront investment. Participating in a community solar program offers economies of scale. That is, it's cheaper per unit to build a large system rather than a small one, and there is more flexibility for consumers to participate. Cooperative advantages also include the economy of scale and the ability to manage the power inputs to a greater degree.

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