



## RESIDENTIAL BATTERY STORAGE

Residential battery storage systems are growing in popularity as the technology improves, prices decline and homeowners recognize the benefits of energy independence and resiliency, renewable energy integration and financial savings.

### RESIDENTIAL MEMBER BENEFITS

**Energy Independence** - A home battery storage system pairs well with a solar photovoltaic (PV) array and an electric vehicle, allowing you to spend less on electricity from the grid and/or fossil fuels. Especially when bundled with solar, battery storage yields a greater sense of control over your energy usage and can lead to near total energy independence.

**Profitability Without Solar** - While the benefits of battery storage are enhanced by combining it with solar, some electricity markets are structured such that battery storage on its own can be profitable. If you live in an area with higher electricity costs, greater than around \$0.14 per kWh, and can switch to a time-of-use rate, a battery storage system may be able to pay for itself and start earning money within its warranty period.

**Electricity Rate Savings** - Time-of-use rates, demand charges and real-time pricing are payment structures that charge more for electricity when demand is high and less when it is low. With battery storage, you can store power when it is cheaper and use it when it is more expensive, saving money.

**Peace of Mind** - Whether your reasons for installing battery storage are environmental or financial, having a quiet battery backup that automatically takes over during outages can be much more convenient than a noisy gas-powered generator. It can also provide a more streamlined and permanent solution if you are in an area with frequent outages.

**Make Renewables More Viable** - One of the biggest issues for solar power is that its production peaks at midday, while demand for electricity peaks in the morning and evening. Battery storage can help mitigate this mismatch by storing the power generated by solar for later use, lessening your co-op's need to switch on fossil fuel-burning capacity to meet peak demand.

**Help the Grid** - In addition to saving you money by using less power from the grid during expensive times, widespread home battery storage could lead to less stress on the network and consequently fewer required upgrades and less frequent outages.

## HOW BATTERY STORAGE WORKS

Charge Controller, Inverter, Batteries - The three essential components of any battery storage system are the batteries that store energy as direct current electricity, an inverter that converts the direct current to alternating current that can be used by electronics and appliances in your home and a charge controller to direct the system.

Lithium-ion vs. Lead Acid - The most common chemistries used in battery storage are lithium-ion and lead acid. Lithium-ion batteries can accommodate varying daily charge levels, while lead acid should be brought back to 100% every day. Though generally more expensive, lithium-ion batteries are also available in simpler and more attractive all-in-one wall-mountable packages. Lead acid batteries require more maintenance, safety and venting considerations.

Controller Functionality - Controllers for your battery storage system are available with different features and capabilities, but most can operate in some form of these three modes:

- Emergency Backup Only - The system will always keep the batteries charged, for use during an outage.
- Self-Powered - The system will focus on using as little grid power as possible by balancing the power generated from a solar array, the charging/discharging of the batteries and the power used in your home.
- Time-of-Use Load Shifting - In markets where time-of-use pricing is available, the system can charge the batteries when power is cheaper and discharge them when it is more expensive.

## HOW BATTERY STORAGE IS INSTALLED

Assessment by Contractor - Many solar installation companies have the expertise and experience to properly assess your home's needs and design an appropriate battery storage system. A key factor in deciding your system size will be whether you want to run your whole house from the batteries or just a few critical circuits (refrigerator, HVAC, lights, etc.). Making your home energy efficient prior to pursuing battery storage (or solar) will maximize the dollars you invest in the technology and may allow you to go with a smaller size. Your contractor should also be familiar with your co-op's permitting and interconnection requirements for battery storage installations as well as any tax incentives or rebates available in your area. Be sure to keep your co-op informed as you move through the process.

AC vs. DC Coupling - One of the first decisions you and your contractor will have to make is whether to install an AC or DC coupled system. An AC coupled system uses an inverter to convert the DC from your solar array to AC, and a separate inverter to charge and discharge your batteries. A DC coupled system uses a charge controller to directly charge the batteries from the solar array and only one inverter to connect to your house and the grid. DC coupled systems are generally more efficient but also more complicated to install, especially when integrating with an existing PV installation.

Retrofitting an Existing PV System - While it is easier and more cost-effective to install a battery storage system while installing solar PV, it is never too late to add storage. Your contractor will likely recommend an AC coupled system, which will require less retrofitting. A new subpanel and other equipment will also need to be installed to enable your solar PV to power your home and charge the batteries while the grid is down.

Equipment Size, Shape, Location - Depending on the size and features that you and your contractor choose, the equipment could range from something small that can hang on the wall in your garage to a larger system outside, similar to an air conditioning outdoor unit.

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