Solar panel battery storage capacity

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With net metering policies under attack and grid outages increasing in frequency and duration, it"s becoming more and more beneficial to pair battery storage with solar panels.

Grid-connected solar systems typically need 1-3 lithium-ion batteries with 10 kWh of usable capacity or more to provide cost savings from load shifting, backup power for essential systems, or whole-home backup power.

According to a 2022 study by the Lawrence Berkeley National Laboratory, a solar system sized for 100% energy offset with a single 10 kWh battery is enough to power essential household systems for 3 days in virtually all US counties and times of the year. When heating and cooling are included in the backup load, a home needs a larger solar system with 30 kWh of storage (2-3 lithium-ion batteries) to meet 96% of the electrical load.

In areas with unfavorable or non-existent net metering policies, battery storage is crucial to maximizing the energy cost savings of home solar. For example, under California"s NEM 3.0 Solar Billing, it"s far more cost-effective to store and use your solar electricity (a strategy known as load shifting) than to export it to the grid for little-to-no compensation.

If you are strictly interested in load shifting and have no need for backup power, a single 6-10 kWh consumption-only battery will typically suffice since you only need enough usable capacity to avoid buying grid electricity at peak time-of-use rates.

A consumption-only or "no-backup" battery is a new type of energy storage system that provides all the load-shifting capabilities of a traditional solar battery but is not capable of providing backup power when the grid goes down. Without the equipment, programming, and labor that enable backup power, consumption-only batteries typically cost around two-thirds the price of a traditional backup battery and therefore offer a greater return on investment.

Solar-only systems are typically shut off during grid outages to prevent the backflow of electricity from harming utility lineworkers and thus do not provide backup power. Adding battery storage not only allows you to store kWhs for evenings and outages; it also allows your solar system to remain active and productive when the grid goes down.

Most home battery systems are configured to power a select number of essential systems, like lights, Wi-Fi, TV, medical devices, refrigeration, and other kitchen appliances. As noted above, the Berkeley Lab found that a solar system designed to produce 100% of your annual electricity consumption and a single 10 kWh battery can power essential systems during a 3-day outage for most US households.

It’s worth noting that backup batteries can also provide energy cost savings through load-shifting, although the higher upfront cost of enabling backup capabilities makes for a longer return on investment.

If your goal is to power your entire home during grid outages, then you"ll likely have to combine three or more lithium-ion solar batteries to meet the large load demands and power surges of heating, air conditioning, laundry machines, electric water heating, and possibly EV charging.

For instance, three 13.6 kWh Franklin Home Power batteries can be combined to provide 40.8 kWh of usable electricity and 15 kW of continuous power, which is enough to fully back up an average home.

It"s worth noting that for whole-home backup power, you"ll need additional solar capacity to charge the additional battery storage. According to the Berkely Lab, a large solar system with 30 kWh of battery storage can meet, on average, 96% of critical loads including heating and cooling during a 3-day outage.

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