SOLAR UNITED NEIGHBORS

Battery storage guide for homeowners

Navigate the world of battery storage with confidence



Table of contents

Introduction

Who is Solar United Neighbors? 4

Battery storage: A growing industry

Interested in battery storage for your home? 5

Battery storage basics

What is battery storage? 6
How does battery storage work? 7
How does battery storage relate to solar? 9
Should I consider storage? 9
Why can't I just power my entire home with battery storage? 10

Shopping for batteries

What kinds of batteries are on the market? 11
Determining your battery storage needs 12
How does battery storage relate to solar? 14
Where will you install your battery bank? 15
What's your solar status? 17
How much control do you want over programming your system? 20
How much does battery storage cost? 21

Getting the most out of your investment

Three tools and resources to help with costs 24

Virtual Power Plants: Get paid to support the grid

Good Virtual Power Plant programs 26

Finding an installer

What criteria should an installer meet? 27
Reviewing your proposal 28

Installation and maintenance

What to do after installation..... 29
Adding more batteries to your system..... 31
Replacing your batteries..... 31
Recycling your batteries..... 31

Common questions and answers (FAQ):

What will my battery actually run, and for how long?..... 32
How fast will my solar refill the battery during an outage?..... 32
Will a battery pay for itself?..... 33
How long do batteries last, and what happens after the warranty?..... 33



Introduction



Welcome! We're glad you're here.

A battery storage system installed in your home lets you use your electric appliances when the power goes out. It's something more and more homeowners are looking into. That's why we created this vendor-neutral guide.

We want to help homeowners like you navigate the world of battery storage systems. If installing battery backup in your home makes sense for you and your family, we want you to be able to do it confidently.

So, what's in the guide?

We'll tell you about the costs, incentives, and financing. Plus, we'll guide you through finding an installer, provide tips for making sure you get what you need, and tell you what happens once your batteries are installed.

Who is "we"?

Solar United Neighbors (SUN) is a national nonprofit that helps people go solar, join together, and fight for their energy rights.

Battery storage: A growing industry

Interested in battery storage for your home? You're not alone.

Natural disasters such as Texas' Winter Storm Uri and the California wildfires show the need to be prepared, and it's no surprise that the adoption of residential battery storage has grown steadily over the last decade. In 2025, we saw the largest number of battery storage installations in U.S. history, with a 40% increase over the prior year. There are many reasons for this enduring growth. The events discussed above have shown that electric service is less reliable than people thought. Plus new battery storage technologies and partnerships between battery vendors and solar installers are making it easier to install solar and storage together (source).

Today, residential battery markets are especially strong where:

- People face frequent or long outages due to grid unreliability, extreme weather events, or advance shutoff in advance of wildfires (for instance the Western U.S., Puerto Rico, and parts of the Southeast).
- Fire, hurricane, extreme wind, or ice-storm risks make resilience more important.
- Policies or rates (like lower solar export credits in California, Illinois, and Arizona) make it more valuable to use some of your own solar energy on-site instead of sending it back. With battery storage you can keep the electricity you generate rather than exporting when the price for electricity is low. This allows you to use your battery as an on-demand resource to lower your power bill.

"I chose a battery backup option because, in an extended outage, it would not run out of fuel (the sun)."

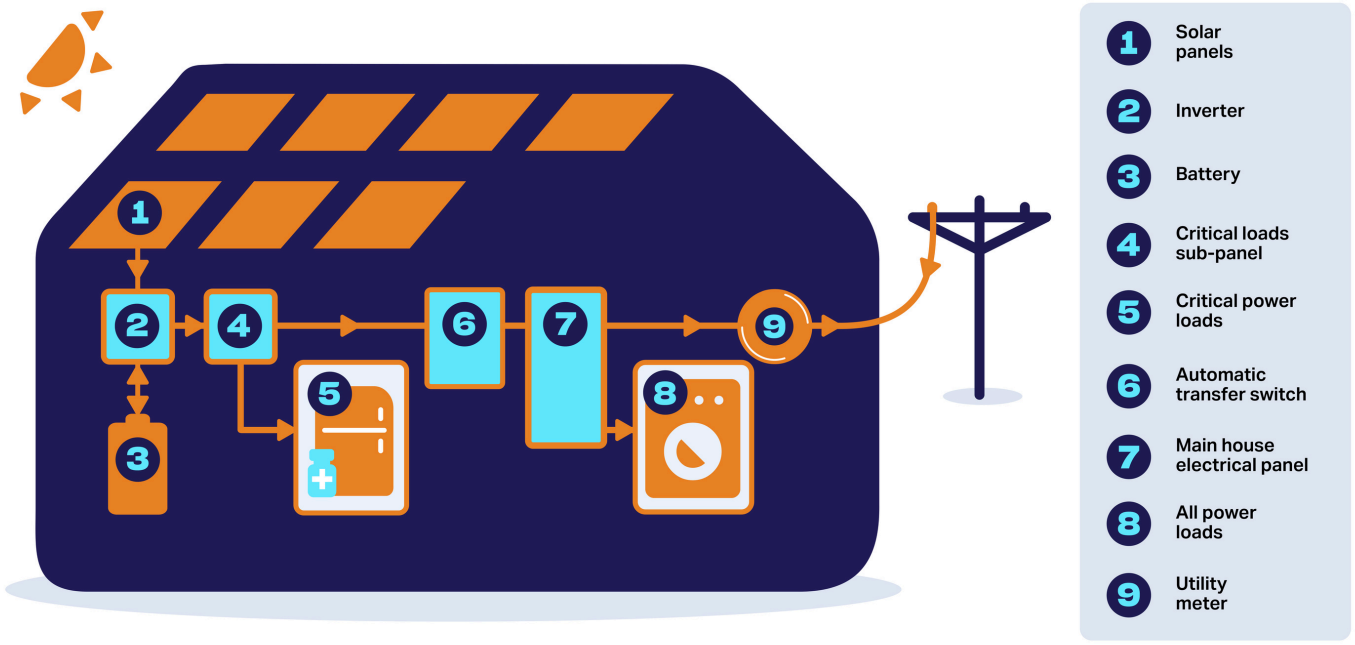
John Hedlund, Virginia



Battery storage basics

What is battery storage?

A battery is a device that stores electricity for later use. A battery storage system installed in your home lets you use electric appliances even when your neighborhood experiences a power outage.



A typical home battery system will have a couple of batteries and take up a space no more than three feet wide and four feet high, often on one wall of a garage.

With electricity stored in your battery bank, you can endure a power outage more comfortably and safely. With battery storage you can use your lights, heat water for a shower, and avoid disruptions to lifesaving tools like well pumps or medical equipment.

Think of a backup battery like a traditional generator. They're often used for the same purpose, though there are distinct and important differences between the two:

Battery storage banks:
Use electricity from the grid or from solar to operate automatically once installed.

Generators:
Run on fossil fuels such as diesel, gasoline, propane, or natural gas and require you to buy and store fuel or rely on fuel delivery during an outage.

NOTE

If you do not pair your batteries with solar, the battery will charge and recharge only from utility-supplied grid electricity. This limits its usefulness for backup power purposes during a utility outage. This is because it will only be able to discharge once before it needs the utility grid to be restored for it to recharge.

How does battery storage work?



Florida homeowners Steven Murphy and Betty Jo Henson lost power for two weeks during Hurricane Charley in 2004. “It was miserable,” Betty Jo said. “We didn’t want to go through that again.”

Most homeowners who use battery storage do so for the backup power it provides during grid outages. When the electric grid goes down and you lose service, you can use a battery system to power some or all of your household electricity needs (called “loads”).

Before installing battery backup, Florida homeowners Steven Murphy and Betty Jo Henson lost power for two weeks during Hurricane Charley in 2004. “It was miserable,” Betty Jo said. “We didn’t want to go through that again.” Now, the couple has solar, plus a 10 kW battery that powers six circuits in their home.

This is enough to cover the majority of their home except for guest rooms, stove, dryer, and their central air conditioning unit. They have a portable AC unit that can run off their battery instead.

Battery backup systems work by isolating some or all of your loads from the main utility system with something called an “automatic transfer switch.” Batteries then power those loads with electricity stored in the battery bank. The backed-up loads in your home then automatically reconnect to the grid when the utility grid power returns. The result is that these “critical” loads receive power even when the grid is down, switching seamlessly between utility electricity and stored electricity from your battery.

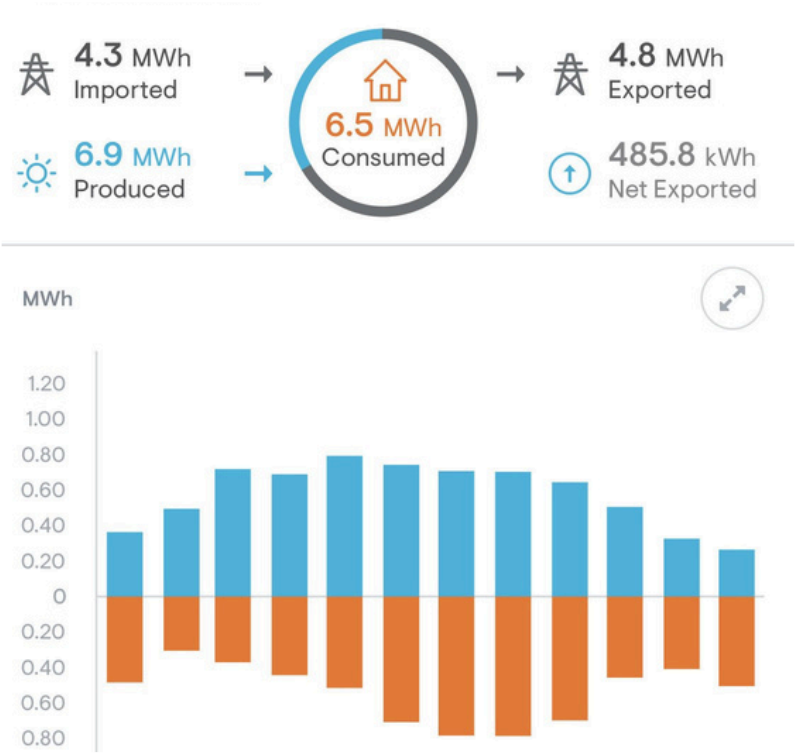
A “load” refers to anything in your home that requires electricity to run. Loads can range from small (light bulbs, toasters, a laptop computer) to large (a refrigerator or a well pump).

Your battery storage system will be installed with a device called an inverter. The inverter is needed to convert your battery power, which is DC, into power usable by your loads (AC). See page 16 for more. Many battery storage systems include a separate electric panel, called a subpanel. Your most important loads are wired to the subpanel. When a power outage occurs an automatic switch transfers power supply to your backup batteries.

It does this in a split second, meaning you won’t notice a loss of power. Your batteries, which have been sitting fully charged and ready to be used, begin to power those select loads. As advances occur and costs decrease, more homeowners are integrating smart technology into their homes. Instead of a separate subpanel, they have just one electric panel — a smart panel.

Using an app you can rank your home’s loads in order of importance. This allows your smart panel to choose which devices should be powered by the battery during an outage.

With a smart panel, you can also see real-time energy consumption data on their app, like how much power is flowing to each appliance, and control the power supply as needed, including turning loads on and off.



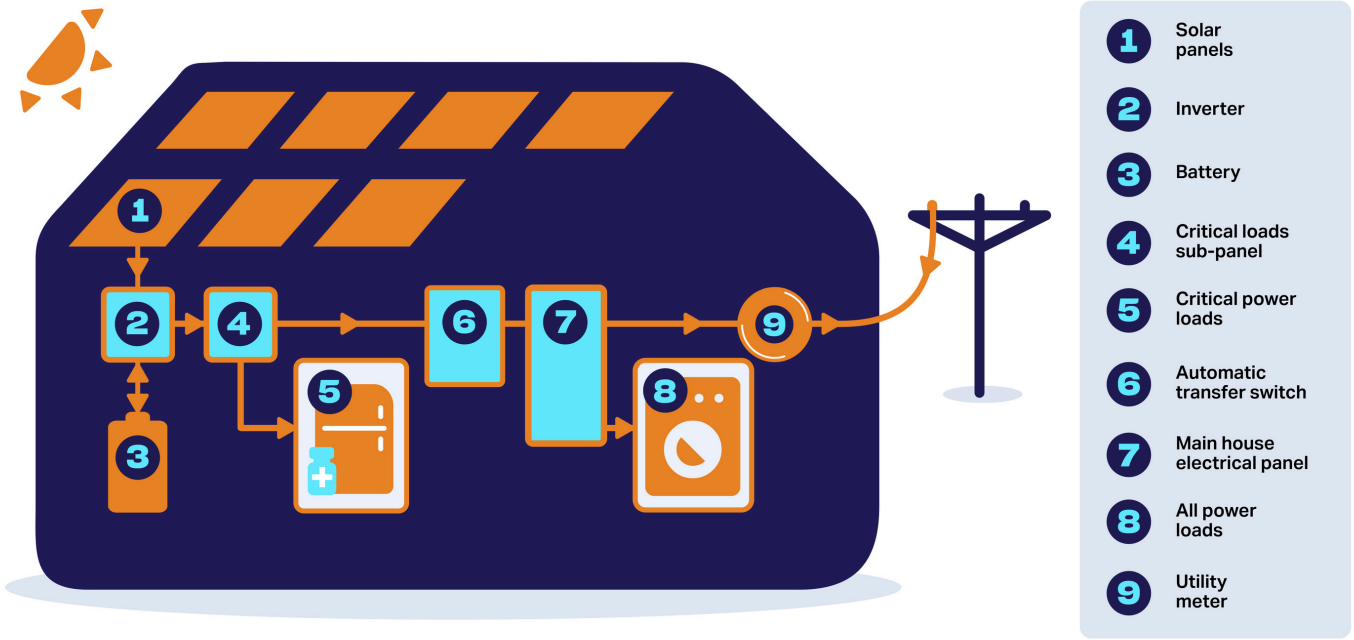
Why can't I just power my entire home with battery storage?

Put simply: it's expensive. Many homeowners install a smaller battery bank or single battery to power their most important appliances (referred to as "critical loads"). However, if you feel strongly about powering your entire home during an outage, a whole-house fossil fuel-powered generator may be more cost effective.

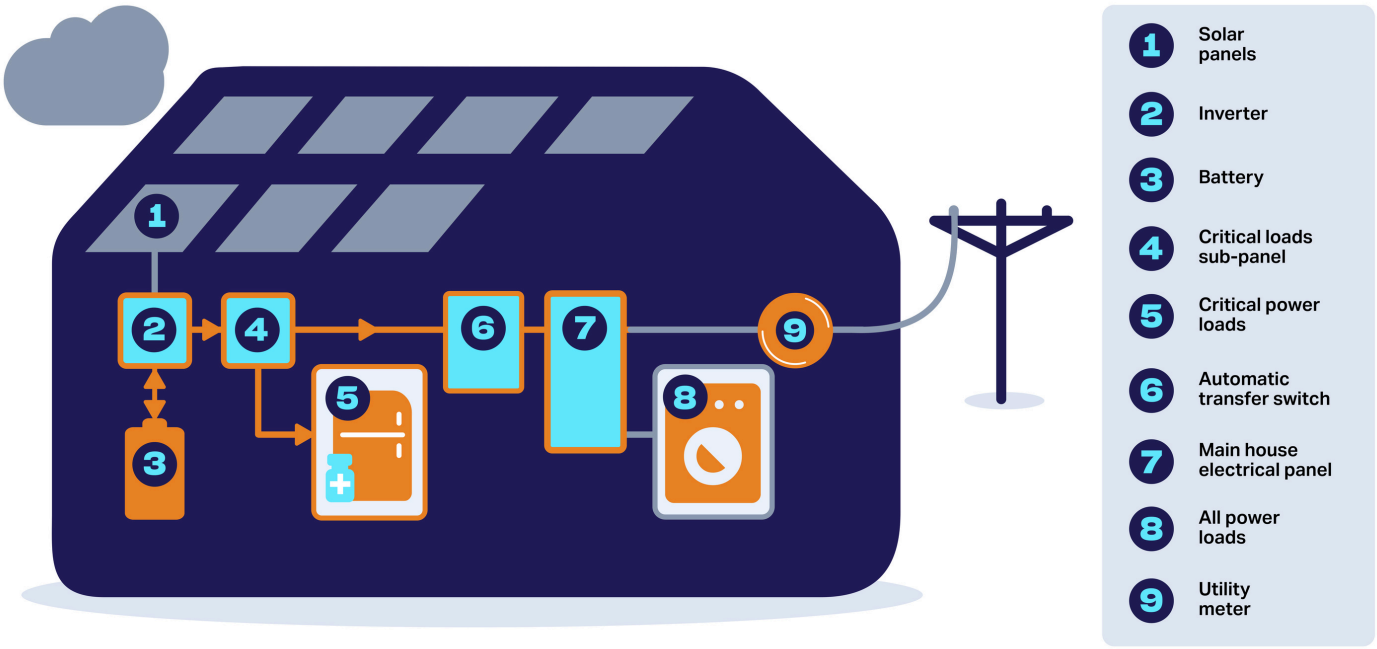
How does battery storage relate to solar?

Solar panels let you generate your own electricity to power your home. Adding battery storage means you also get to keep any extra electricity and store it for later use – like during a power outage.

A common myth about solar is that it'll provide your home with electricity during a power outage. This isn't the case, unless you have battery storage. Solar systems are tied to the grid and required to automatically shut off. This requirement is a safety measure if the grid goes down. This ensures systems don't "backfeed" power onto the lines and injure workers that may be repairing the electric line.



When you have battery storage paired with solar, you can both generate and store your own electricity.



The electricity produced by your panels will power your home's appliances and charge your batteries so they're ready when you need them. We'll talk more about solar and storage in a later section.

Should I consider storage?

Benefits of battery storage

- Protect your home and family from power outages and grid failures, which are unfortunately increasing in many areas due to hurricanes, wildfires, and other weather events.
- Meet your critical energy needs in an emergency if you rely on medical equipment or a well pump.
- Enjoy increased independence from your utility.
- Show off your cool tech and join the clean energy club!
- Save money if your utility employs advanced rates like Time of Use (see page 20).
- If you also have solar, protect its value from net metering changes (see page 20).

Potential drawbacks to consider

- The initial cost to install batteries is still relatively high, though it has been declining steadily year over year.
- With a complex system, there is a learning curve. Increasingly, battery storage systems are being pre- packaged for easier installation by professionals, and we hope this guide is helpful too!
- Added maintenance for your home (see page 23).
- It's still economically impractical for most people to back up their entire home's energy needs.

Shopping for batteries

In this section we cover:

- The types of batteries available
- How to determine your storage needs
- Ways to install solar and storage together or separately
- What different batteries cost

What kinds of batteries are on the market?

Most home battery systems sold today use lithium-ion batteries. For most homes today, lithium-ion, especially Lithium Iron Phosphate (LFP), offers the best mix of safety, longevity, and low maintenance.

Lead-acid batteries, which were more popular until recent years, can still be appropriate for low-budget, rarely-cycled, indoor applications. These batteries are heavier, larger, and typically shorter-lived.

Lithium-ion batteries offer a higher density of energy (more energy per unit of space) than lead-acid batteries. Lithium-ion can be used (or "cycled") more often during their lifespan. Latest figures indicate that 98% of battery installations in 2025 were lithium-ion batteries.

Lithium-ion is the same broad "battery family" used in electric vehicles and consumer electronics. Home batteries are built as stationary appliances with robust safety features and monitoring controls.

Lithium-ion batteries are popular for home energy storage because they:

- Pack more energy into less space than older battery types.
- Can typically be used more deeply, meaning more of the stored energy is usable.
- Are designed for frequent charging and discharging (cycling), which is useful for backup power and for money-saving strategies like self-consumption during peak times with time-of-use rates or participation in a Virtual Power Plant program **(see page 26)**.
- Usually come with longer warranties than legacy battery types.

Lithium-ion batteries often cost more upfront, but they tend to deliver lower lifetime costs because they last longer and can cycle more.

While lithium-ion is dominant in the market today, latest estimates say that their share of the market will begin to decrease as sodium-ion, zinc-base, metal air and flow batteries gain momentum.

Comparison	Sealed-lead-acid	Lithium ion
Average number of battery cycles	Less	More
Regular maintenance	No	No
Typical lifespan	5 years	10 years
Upfront cost	Less	More
Weight	Around 15 pounds	Averages 55% lighter, around 8 pounds

We will update this guide as those batteries grow in market share, but for now, almost all options on the market are lithium-ion.

Two main types of lithium-ion batteries dominate the market.

1. Lithium Nickel Manganese

Cobalt Oxide ("Li-on-NMC") Lithium Nickel Manganese Cobalt Oxide or "Li-ion-NMC" is the more commonly available lithium-ion battery type. It's also the least expensive lithium-ion battery on the market.

While it's rare, Li-ion-NMC batteries can overheat and catch fire due to overcharging or improper use. This is called "thermal runaway". You may have heard of this happening with cell phones, e-cigarettes, and other small consumer devices. Thankfully, there have been very few instances of home battery storage systems catching fire. Their sophisticated management software is designed to prevent overcharging and thermal runaway. Unlike phones and e-cigarettes, home storage batteries are stationary. This means they are better protected from things that would trigger thermal runaway.

2. Lithium Iron Phosphate ("LiFePo")

Lithium Iron Phosphate or "LiFePO" is the second type of lithium-ion battery. LiFePO batteries are more expensive but do not experience thermal runaway. Sonnen, SimpliPhi, and Enphase are several of the manufacturers who use this chemistry in their battery backup solutions.

Determining your battery storage needs

When figuring out your storage needs, you'll want to ask an important question with two parts:

1. **What do I need to power?**
2. **For how long?**

What do I need to power?
Maybe it's your home's lighting, refrigerator, TV, and a few electrical outlets to charge your mobile devices. You'll want to determine how much power these items use. Your battery installation contractor can help you with this.

Keep in mind that certain electrical loads will likely use more energy than you can realistically provide from a battery system that fits your budget. Appliances with resistive heating elements (electric stoves, electric water heaters, and space heaters) use a large amount of energy. They can also draw lots of power all at once. Whole house air conditioners also use a lot of energy and may not be realistic to power from batteries. As an alternative, you may choose to power a smaller window-based AC unit for a particular room.

A typical home with battery storage will use the system to power loads like:

- Some or all house lighting
- Ceiling fans
- Personal consumer electronics
- Cable modems/routers
- Food refrigeration
- Limited air-conditioning (window units)
- Well pumps
- Medical equipment

Now, let's cover the second part of our question: "How long?"

For most battery backup systems the standard length of run time is one day. This is especially true if you have solar on site to recharge your batteries. Your contractor will guide you through how long you want to be able to run your appliances. You'll need to consider both the size of the battery and its capacity.

Battery Size

Batteries are typically rated in amp- hours (Ah) or kilowatt-hours (kWh). For example, you may purchase a 2 kWh or 5 kWh battery system for your home. A battery system that operates your appliances and lights for one day would be smaller than a system that can operate the same equipment for two days without being recharged.



Meet John Hedlund, Virginia Homeowner

John Hedlund has a 25 kW solar array consisting of 84 panels. He also has a battery rated at 9.3 kWh. He sized his system so that during an outage he could power his water pump, refrigerator, the air handler for his propane furnace, electrical support for his propane stove, and several general circuits for lighting and device charging.

In addition to knowing the kWh size, it's also important to know the battery's "relative capacity." This refers to the amount of energy ("depth of discharge, or DOD") that can safely be drained from a battery before it needs to be recharged. For lithium-ion batteries, the DOD is often 90% to 100%. For lead-acid batteries, on the other hand, it is around 50%. This means you can only discharge half of a battery's energy before you must recharge it.

A 100% DOD for a 2-kWh lithium-ion battery can deliver up to 2 kWh before needing to be recharged. A 2-kWh lead-acid battery might only deliver around 1 kWh (50% capacity) before needing to be recharged. Lead-acid batteries can be discharged further than their recommended depth of discharge. But, doing so regularly will shorten their lifespan.

How does battery storage relate to solar?

Solar panels let you generate your own electricity to power your home. Adding battery storage means you also get to keep any extra electricity and store it for later use – like during a power outage.

A common myth about solar is that it'll provide your home with electricity during a power outage. This isn't the case, unless you have battery storage. Solar systems are tied to the grid and required to automatically shut off. This requirement is a safety measure if the grid goes down.

This ensures systems don't "backfeed" power onto the lines and injure workers that may be repairing the electric line.

> **NOTE**
>
> You can also think about your energy needs in terms of **power** (what you need to run) and **energy** (how long you need to run it).

What is power?
Power is instantaneous and measured in watts (W). 1000 Watts equals one kilowatt (kW). Power measures the ability to do (electrical) work in a given moment. Think about the "Test Your Strength" game at a carnival. You hit the lever with a hammer. This moves a weight up a tower. How high the weight goes is a measure of your power in that instant.

What is energy?
Energy is measured in watt-hours (Wh). It is what the electrical loads in your home consume over time in order to operate. A thousand watt-hours equals one kilowatt- hour (kWh). It's the total amount of (electrical) work that can be done.

It's what we pay for every month on our electric bills.

Wait, energy is different from power?
Yup! While these terms are often used interchangeably, they are two different parts of our electricity system.

It takes an equal amount of energy (measured in kWh) to heat a cup of tea in:

- a 1000 Watt microwave for two minutes
- a 2000 Watt microwave for one minute
- Either way, your tea will come out just as hot.

Where will you install your battery bank?

The type of battery you buy will determine where you should keep it in your home. Different types of batteries have different temperature requirements, space constraints, and siting conditions. You may need to place the battery bank indoors, or outdoors in a shady, temperate area. Your contractor may also need to adjust the size of your battery system to accommodate your available space. Because lithium-ion batteries are by far the most common type of battery, we will detail where they should be placed below.

Comparison	Lithium-ion batteries
Temperature	Preferred range is 32° - 100°F.
Positioning	Smaller batteries, contained in a singular unit.
Other equiptment	Depending on the manufacturer, Li-ion batteries may or may not contain an integrated inverter.
General recommendations	Install indoors or outdoors, unless your area experiences extreme temperature swings. If outdoors, away from extended direct sunlight is best.

In very hot weather, many batteries can temporarily reduce power output or shut down to protect themselves. If you live somewhere that regularly sees temperatures of 115ºF and higher, ask your installer:

- "Where do you recommend installing the battery so it stays cooler?"
- "What happens if it's hotter than the rated temperature? Does the battery shut down, or just reduce power?"

A good installer should be able to show you the product's temperature spec sheet and propose a location that meets it. Even in the hottest places, batteries can be operated safely and effectively.



Virginia homeowner John Hedlund had his 9.3 kWh battery bank installed in a room attached to his garage.

The rest of the components for his solar and storage systems are on the outside wall of his home. These include two inverters. One provides AC power during normal operation. The other provides AC power during grid outages. John also has surge protection for his system.

What's your solar status?

If you're reading this guide, you're probably curious not just about storage but about solar too. Or, perhaps you already have a solar system at your home. Where you're at in your "solar journey" can have an impact on how you purchase and install battery storage.

Battery storage systems receive and put out direct current (DC). This is also what solar systems produce. The devices in our homes, on the other hand, require alternating current (AC). A device called an inverter is needed to convert DC to usable AC power. Whether you're interested in installing battery storage, solar, or both, you'll need an inverter.

What does AC vs. DC power mean?

Electrical current is the flow of charged electrons. With direct current (DC), the flow of electrons moves in one direction. With alternating current (AC), the flow of electrons oscillates, creating a wave-like pattern.

It's much easier to change the voltage level of AC. Plus, it transmits better over long distances. That's why most household appliances and buildings are powered by AC. Still, many devices, such as batteries, use DC.

If you don't have solar and you want to install it along with your battery system, read on.

Installing solar and storage at the same time will let you plan a fully integrated system. Adding both at the same time makes setup and usage more efficient and cost-effective.

You'll probably want a single inverter that can be used by the battery system and solar system. Electricity from your solar panels (in DC form) will flow through the inverter, convert to AC, and flow to your home.

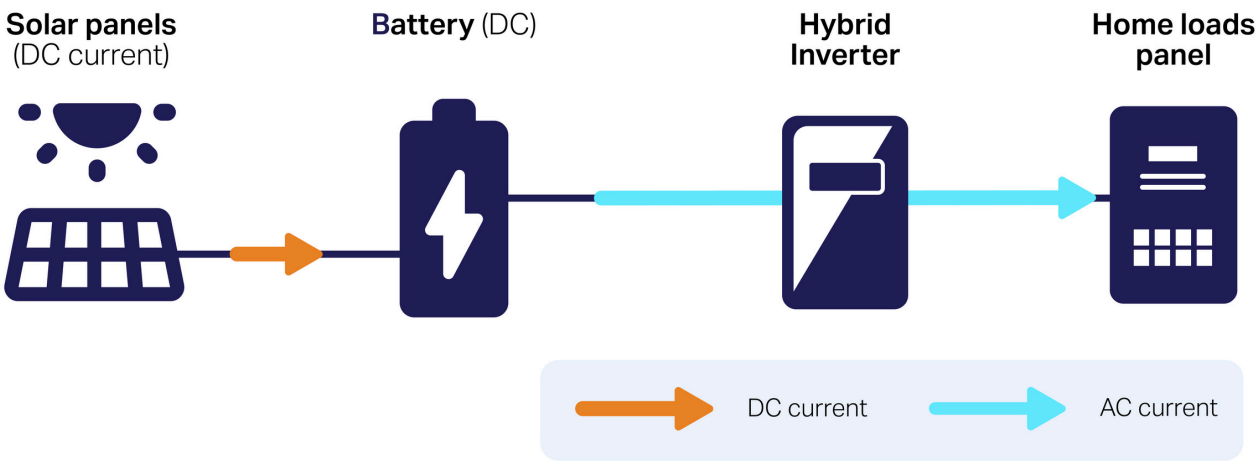
The extra electricity will be fed directly from your solar panels into your batteries in DC form. When there is an outage it will flow back through the inverter to convert to AC. This setup is called DC coupling. It is currently the most common setup for homes where solar and storage are installed simultaneously.

Learn more about going solar and check out our Go Solar Guide.
Click here to download it.



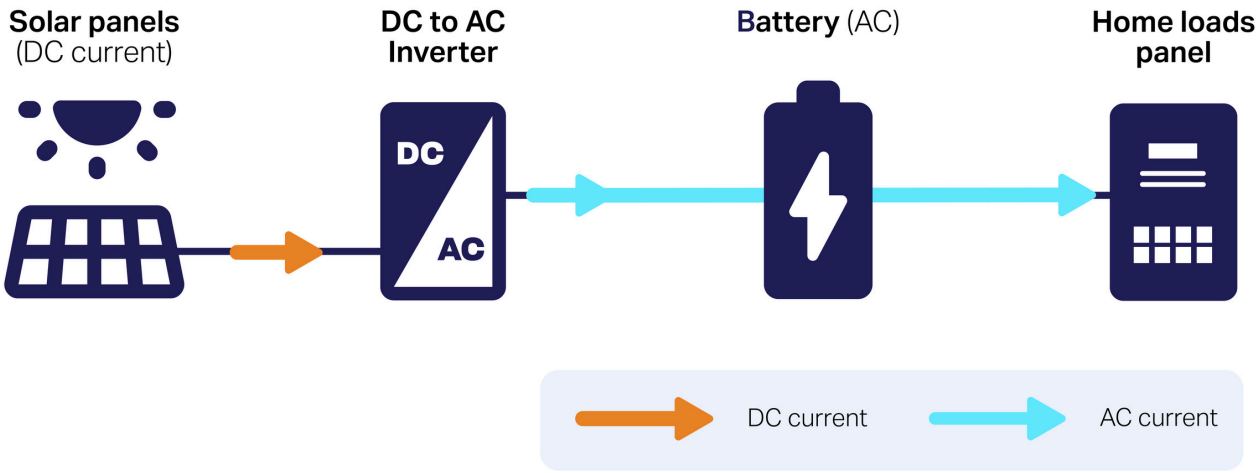
If you already have solar and want to add battery storage, we've got you covered too. This setup is called DC coupling. While your two systems will work together, DC coupled systems will be independent of each other. This means you'll have two inverters, the one you already have for your solar and the one you'll add for your storage system.

DC coupled system



Your existing inverter converts your solar electricity from DC to AC so it can power your home. The inverter you'll add for your battery will convert the solar electricity (now AC) back to DC so that it can be used to charge the battery.

AC coupled system



This setup is called AC coupling. **AC coupled systems** allow you to keep your existing solar inverter and wiring (saving you time and money). They also require your solar inverter to communicate with your battery's inverter during an outage.

If you go with an AC coupled system, be sure to have your installer explain exactly how your existing solar inverter and your new battery inverter will talk to each other.

Typically, the energy produced from your solar system enters your house and then your excess electricity (not used by your home) is stored in your battery.

NOTE

Whether or not you have solar, keep in mind that sizing is an important factor for using solar to charge batteries.

How much control do you want over programming your system?

All battery storage systems require an inverter to convert DC power to AC. These inverters can all be programmed to operate based on your needs and preferences. Standard inverters can only be programmed to work in a predictable, static manner, smart inverters can do much more. Smart inverters are becoming increasingly common.

Here are three options to consider:

1. A smart inverter can be programmed (through a mobile app or web portal) to run when it makes the most sense. This may depend on physical, financial, or owner-preference signals. Smart inverters give battery owners more programming control over when and how their battery is used.

2. Maybe you have solar but your area doesn't offer net metering. Net metering is a billing system that provides you fair and full credit for the electricity you generate but don't use yourself. In such a case, you may want to consume as much solar-produced energy as possible in your own home. Doing so will cut down on how much excess you produce. You can program a smart inverter to do that. This is typically called "self-consumption".

3. Perhaps your utility offers a rate structure that allows storage to provide you economic value, such as Time of Use (TOU). This is increasingly common. The utility charges customers more for using grid electricity during peak times. Electricity usage usually peaks in the evening when everyone is at home cooking, heating or cooling their homes, and using entertainment devices. You can program a smart inverter so that your batteries power your appliances during peak hours and grid electricity powers them at all other times.

How much does battery storage cost?

As we've mentioned, most homeowners use battery storage to power their most important loads during power outages. It would be prohibitively expensive for most people to install and maintain a battery system capable of regularly powering their entire home.

In fact, when deciding what battery system is right for you, cost is the limiting factor for most homeowners. Of course, incentives and financing make it easier for many people to afford battery systems. **(See page 24 to learn more)**.

But, unlike solar which generally pays for itself after 7 to 12 years depending on where you live, the value of battery systems lies in the protection and peace of mind they provide. In the event of a power outage, a homeowner with battery storage knows they can continue to power lifesaving medical equipment and critical appliances. And, if you live in an area where using battery storage has some economic value like we talked about above, you can think of that economic value as paying down the cost of the resiliency and peace of mind the batteries provide.

The cost of NOT having a battery backup system

Often left out of the equation, the cost of losing power to your home is important to consider. Going without electricity can lead to a host of situations that have economic and quality of life impacts during an outage.

Florida homeowners Steven Murphy and Betty Jo Henson estimate that their 10 kW battery costs them $1.40 per day. "Think of it like an insurance policy," Steven said. "For the price of a cup of coffee, you'll have power during the next outage."

The Lawrence Berkeley National Lab (LBNL) Interruption Cost Estimate (ICE) Calculator (at icecalculator.com) allows you to input your location and household type to estimate the real dollar value of lost reliability.

Item	Cost
Food loss	$50 - $500
New refrigerator	$500 - $1000
Staying at home vs. a hotel	$500+
Keeping a sump pump running vs. your basement flooding	$5,000+
Home medical equipment working vs a hospital visit	$10,000+
Fish tank pump working and pet fish happy	Priceless

Three categories of cost to factor in when installing battery storage:

1. Hardware costs
Battery costs vary significantly between manufacturer and battery type. They range from $3,000 to more than $15,000. Much like solar, batteries are priced based on the amount of electricity they provide. Batteries are sized according to their power (dollars per kW) and energy (dollars per kWh). While lead-acid batteries have historically been cheaper per unit than lithium-ion batteries, the cost of lithium- ion batteries has fallen rapidly. It's now close to reaching parity with lead-acid.

AC coupled battery systems added to existing solar arrays will oftentimes require a second inverter. This can cost an additional $3,000 - $5,000. Some manufacturers, like Tesla and Sonnen, integrate the additional inverter functionality into the battery itself. This eliminates the need to purchase and install a second inverter.

2. Installation, permitting, and design costs (also called "soft costs")

The second biggest cost to add battery storage is for design, installation, permitting, and project administration (referred to as a whole as "soft costs"). These costs vary significantly between geographies and between battery types. While it is hard to estimate a standard installation cost, we suggest budgeting $3,000 - $5,000 for a standalone battery installation. If you need a second inverter too, budget an additional $1,000 - $2,000 for those installation costs.

3. Maintenance costs
The more commonly used chemistries for battery backup (sealed lead-acid batteries and lithium-ion) require little to no routine maintenance. Still, we recommend budgeting $1,000 over the lifetime of your system for maintenance-related activities like system check-ups by the contractor. Your contractor should be able to tell you the manufacturer's recommendations for

your particular system. Your lithium-ion batteries and lead-acid batteries will likely be under warranty for 10 years and 2 to 5 years, respectively. Battery warranties depend on the “cycles,” the extent to which a battery is charged and discharged. It’s important to note that battery warranties have a shorter timeline than that of solar panels (usually 25 years). This means that if you pair battery storage with solar panels, you will likely have to replace the batteries at some point during the life of the solar array. At that time, you’ll incur the cost of both hardware and labor to install the new battery. We’ll talk more about warranties in the post- installation section.

Popular battery types			
Tesla Powerwall 3	FrankinWHaPower 2	SolarEdge Home Battery	Enphase IQ 10T
13.5 kWh	15 kWh	9.7 kWh	10 kWh
$13,473	$17,955	$13,250	$14,190

Source: EnergySage full list of common battery costs
Note: This is the average installed cost before incentives.

Getting the most out of your investment

Producing and storing your own electricity benefits everyone. This is why governments at the state and local level are providing incentives to add solar and storage via rebates or performance payments through Virtual Power Plants, which coordinate the injection of battery storage capacity from thousands of battery systems to help reduce peak demand and provide essential grid services **(see page 26)**. Read on for tools and programs that will help you pay for your solar+battery system and even earn income.

Three tools and resources to help with costs

The federal Investment Tax Credit (ITC) expired at the end of 2025 for residential-owned systems. This means if you buy your solar or battery storage either outright or through loan financing you will no longer be able to qualify for the credit. However, third party ownership models (solar leases and power purchase agreements) qualify under the commercial tax credit. This is still in effect through 2027 for solar. Batteries can qualify for ITC via a third-party owned option through 2032. In these cases, the system owner would be eligible for the federal tax credit as long as certain requirements are met. There are some nuances in order to qualify in time so please contact your installer in order to make sure you qualify. Savings from the federal ITC incentive should be passed along to the homeowner, resulting in lower monthly payments.

1. **Federal ITC**

The federal ITC used to allow you, as the battery owner, to get a 30% tax credit that you could count towards your federal tax burden. The credit expired at the end of 2025 for residential ownership models (meaning you own the battery), but for third-party owned leases and PPAs you may be able to qualify through 2032 for battery storage. Additionally, for battery storage, to qualify, your system must be "placed in service" by 2029. The safest way to ensure your installation will qualify for the tax credit is to have it completed and ready to be connected to the electric grid. You file for the tax credit when you file your taxes for the year the battery was installed. As with any tax matter, we recommend you consult with your tax advisor.

Here's an example of how the commercial ITC can benefit you:
You install a $15,000 lithium-ion battery system at your home. While you may not be able to claim a residential federal tax credit directly, you may still benefit from federal incentives if your system is offered through a lease or PPA. In that case, the company that owns the system may be able to use federal commercial clean energy tax credits to reduce its cost of providing the

project. Some of that value may then be passed on to you through lower upfront costs, lower monthly payments, or more favorable contract terms.

> **NOTE**
>
> SUN is not a tax advisor. You should consult a tax advisor to determine the extent to which your installation is eligible.

2. Local Incentives

State and utility incentives come in many different forms from various types of tax credits (income and property), tax exemptions, and rebates. Check for incentives in your area:

- DSIRE incentive database
- SUN's solar incentives website

3. Financing

Once you've determined if you're eligible for incentives, you'll have a clearer idea of what your battery storage system will cost. Most buyers rely on financing to help pay for their systems. Several good options exist:

  - Home improvement loans
  - Home equity lines of credit (HELOC)
  - Storage financing from select solar loan providers
  - PACE (Property Assessed Clean Energy) financing, which may be available for storage.

Ask your installer about financing options they can offer from the manufacturer or from third-party financiers. Compare them to what you can acquire on your own.

Examples of local incentives as of 2026

- California's Self-Generation Incentive Program - provides an upfront rebate for installing a paired solar with battery storage system.
- Colorado has various local and state incentives, so it's best to research if your municipality has specific incentives. Renewable Battery Connect in Xcel territory offers up to $5,000 in rebates for new battery installations.
- Minnesota offers substantial incentives for new battery installations cutting the cost of installation down by thousands of dollars. There are extra incentives for income-qualifying customers.
- Maryland's Residential and Commercial Energy Storage (RCES) Grant program offers up to $5,000 for residential battery storage.

Virtual Power Plants: Get paid to support the grid

In some places, your battery can do more than just keep your lights on. It can also join a Virtual Power Plant (VPP) program. In these programs, hundreds or thousands of home batteries are linked together and controlled as a single source of power. Because your battery is an inverter-based resource, just like your solar system, it can both send energy to your home or send capacity to the grid.

These programs do not require additional infrastructure like power plants and wires, instead they are an interconnection agreement between the utility, a third-party aggregator, and the battery owner. It is different from solar because your battery's stored energy is available on-demand to be dispatched to the utility when it is needed most.

During a period of high demand, like a very hot summer evening, the program may use some of your stored energy to help keep the lights on for everyone. In return, your utility compensates you for the capacity your battery provides to the grid. VPPs most often include what are called performance payments. These are typically averaged over a season or period of time based on what your battery contributes. Some VPPs also include an up-front incentive payment. This is essentially a bonus you can receive for enrolling your battery in a program. This could help pay for some of the initial costs of a battery system since it is on top of any rebates you have already received.

Good Virtual Power Plant programs:

- Let you keep a backup reserve, so you still have energy set aside for outages and home use.
- Tell you when and how often they may call on your battery (typically at most 40-60 times a year, but it varies program to program).
- Spell out payments clearly (e.g., $/kW per season).
- Have voluntary enrollment with no penalty to leave, the ability to opt-out of any individual event, clear event times and limits, day-ahead notice, and transparent payment terms.

If you're interested in joining a VPP, visit SUN's webpage for VPPs to search a list of programs or reach out to SUN's Help Desk to ask about VPPs in your area. SUN is also actively advocating for new programs and to improve existing programs, so if you don't have a VPP in your area yet, but would like to help us get one going, please get in touch.

Finding an installer

What criteria should an installer meet?

When shopping around for a contractor to install your battery system, it's important to consider their background, experience, and qualifications.

Here are a few things you should look for:

- Experience in your area (number of battery installations completed).
- Experience with the specific technology/ equipment you are interested in.
- Availability for your preferred equipment (lead-acid vs. lithium-ion, specific brands, etc).
- Installer workmanship warranties.
- NABCEP certification, a common certification for solar installers that includes skills related to battery system design and installation as well.
- Open and honest communication: Your installer should be talking to you about what you want to back up in an outage and helping you to choose equipment that meets your energy (kWh) and power (kW) needs.

How to find a trusted installer in your area

Virginia homeowner John Hedlund was one of five members of his solar co-op to add battery storage to their solar systems. "Producing [and storing] our own power makes me more aware of where it's all being used, and where our home could be more efficient," John said.

If you've never thought about battery storage installers, where do you even start looking for a contractor? Great question.

Ask your neighbors

- Community Facebook Groups and NextDoor are great resources to connect with neighbors who may already have battery systems.
- SUN hosts a number of state- based Facebook Groups for solar owners and advocates. You can find those at facebook.com/ solarunitedneighbors/groups.

Join a Solar + Storage bulk purchase group
SUN is a nonprofit organization that helps people go solar. One of the most important ways we do this is by facilitating neighborhood groups to go solar together.

In many of our solar co-ops (which are free to join), members have the option to install battery storage systems in addition to solar.

See if there's a SUN solar buying group near you.
Click here to check SUN's website.

Reviewing your proposal

Once you find an installer, or a few you're choosing between, your next step will be to request a proposal. We recommend looking at proposals from two to three contractors before deciding on an installer.

What should be included:

1. Full cost of the storage system, installation, and additional equipment
2. Payment milestones, what do you owe and when
3. Equipment details
4. Battery size (kW and kWh), model and manufacturer
5. Inverter model and manufacturer (if separate from battery)
6. Battery management system (if used)
7. List of all warranties (battery, inverter, installer workmanship)
8. Details of additional work needed (electrical work, inverter swap, etc.)
9. Pricing guarantee for all equipment
10. Installer information (office location, point of contact, contact information)

Want help? Connect with our Solar Help Desk today!
If you'd like vendor-neutral guidance from our experts, we can help you to review and compare your proposals.

1. **Sign your contract**

Once you're happy with everything in your proposal, you'll sign a contract with your installer and set a date for the installation.

2. **Obtain the required approvals**

Then, your installer will connect with your local permitting office and secure the required permits to install your storage system. Because battery systems are still relatively new, some local permitting jurisdictions may not have updated their code requirements yet to incorporate residential battery storage. Your installer should help you navigate this process. Because you're connecting an electrical resource to the electric grid (called "interconnection"), some utility companies require their own review and approval of your battery installation. Work with your installer to identify your utility's requirements.

3. **Getting your system installed**

Most battery storage system installations take one day or less to install. The process may vary depending on whether you're installing solar with storage or adding storage afterward.

A critical part of this process is for you to be clear on where your storage bank will be installed. While your local electric codes will determine some aspects about the location of the storage, you may also have preferences that your installer can accommodate. Be sure to speak with them about this beforehand.

Installation and maintenance

What to do after installation

Once your system is installed, be sure to check these few boxes to wrap up your project and ensure your new system lasts as long as possible.

1. **Inform your insurance company**

Just as we recommend with solar, it's a good idea to let your insurer know that you've installed a battery system in your home. This way, your system can be added as an additional appliance that is covered by your homeowners insurance. Installing battery storage should not change your insurance payments.

2. **Keep your batteries healthy**

While the commonly used batteries (sealed lead-acid and lithium-ion) don't require much, if any, maintenance, be sure to ask your installer about manufacturer's recommendations for keeping your batteries as healthy as possible for as long as possible.

3. **Understand your warranty**

For most systems, the most important maintenance aspect to consider is how long they're under warranty in case anything goes wrong. Warranties for batteries can be measured in two ways:

   a. Number of guaranteed operational years, or
   b. Number of guaranteed cycles.

What is a cycle?	Manufacturers' warranties	Workmanship warranties
A "cycle" refers to the battery being discharged and then recharged. The number of cycles used in a given year will depend on how you operate your storage system. For instance, if your system is only used to provide backup power during grid outages, you may only cycle your batteries a few times a year. However, if you configure your storage system to maximize self-consumption of any solar electricity you produce, your storage system may cycle once a day.	On average, lithium ion batteries are under warranty for 10 years or for 7,500 to 10,000 cycles. Lead-acid batteries are under warranty for much less time, typically three to five years.	In addition to manufacturers' warranties, your installer should also provide a warranty for their workmanship. This warranty covers things like wiring and electrical work. Its length will depend on the installer and the local market.

Equiptment	Battery type	Warranty
Tesla Powerwall 3	**Lithium-ion**	**10 years (unlimited cycles)**
FranklinWH aPower 2	**Lithium-ion phosphate**	**15 years or 60 MWh throughput**
SolarEdge Home Battery	**Lithium-ion**	**10 years (unlimited cycles)**
Enphase IQ 10T	**Lithium-ion phosphate**	**15 year or 6,000 cycles**

Adding more batteries to your system

- What if after you've installed your battery system, you decide to add additional storage capacity (more batteries)? Maybe your budget limited the amount of storage you could install originally. Maybe your household situation has changed: you've added more appliances, bought an electric vehicle, or added more people to your home.
- Only add batteries that are identical to your existing ones in the same battery bank. Never mix and match.
- New batteries will inherit the capacity of your existing (used) batteries. This is because they all charge and discharge in unison. So, when you add new batteries to used ones, know that the new ones won't operate at 100%, as they would if operating alone.
- Luckily, if you have the longer-lasting lithium-ion batteries, it's more effective to add new to old than it is with lead-acid batteries.
- Some brands of lithium-ion batteries also allow you to easily "stack" an additional battery onto your existing one to add capacity.

Replacing your batteries

Batteries wear out over time. When they wear out you'll have to replace them. An installer can remove your existing battery or batteries and replace them in your system with the same kind. You'll have to pay for the cost of labor and hardware.

Recycling your batteries

Lead-acid batteries can be easily recycled. This is because they have been available for decades in the automotive and energy industries. Several home improvement stores take old lead-acid batteries for recycling. Some municipalities do as well. Recycling options for lithium-ion batteries are more difficult to find. It's best to contact your installer or the battery manufacturer to find out about recycling options.



Common questions and answers (FAQ):

What will my battery actually run, and for how long?

The answer depends on how big your battery is and how much you try to run at once.
A rough rule of thumb: **Runtime (hours) ≈ usable battery capacity (kWh) ÷ total load (kW)**

Example: A 13.5 kWh battery running:

- Refrigerator (0.15 kW average),
- Wi-Fi + phone charging (0.05 kW),
- A few LED lights and a fan (0.1 kW),
- Occasional microwave use (0.02 kW, if used 20 minutes per day)
- **So: 13.5 kWh ÷ 0.32 kW avg. ≈ 42 hours of runtime on that battery**

If you try to run central AC, electric ovens, or dryers, your load could easily jump to 3–5 kW or more, and your runtime might drop to just a few hours.

This is why many homeowners put only their most important devices, their "critical loads," on the backup panel. Ask your installer to help you choose which circuits make sense so the battery can last as long as possible during an outage.

How fast will my solar refill the battery during an outage?

During a sunny outage day, your solar panels can both power your home and refill the battery, but only what's left over after your loads.

Roughly:
Daily charge (kWh) ≈ solar array size (kW) × sun hours (hrs) – daytime usage (kWh)

Example: A 6 kW rooftop system in a sunny area can produce approximately 30 kWh on a clear summer day. If your daytime usage during an outage is 10 kWh, you would have 20 kWh available for battery charging. This is enough to fully replenish a 13.5 kWh battery with energy to spare.

Keep in mind that you may not fully refill the battery during cloudy weather or winter months, so it is helpful to ask your installer for outage scenarios based on your specific usage andlocal climate.

Will a battery pay for itself?

Sometimes, but not always. A battery can save or earn money through:

- Incentives and rebates:
  - Since the 30% federal tax credit for homeowner-owned systems expired at the end of 2025, many homeowners are now choosing leases or Power Purchase Agreements (PPAs). In these cases, the solar company (the owner of the battery) can still claim the credit and pass those savings to you through lower monthly payments
- Bill savings (using stored energy when rates are highest).
- Using your battery to meet home demand (which reduces your bill at retail rate) vs. exporting more solar to the grid and getting compensated less than retail rate if your state has moved away from 1:1 net-metering for solar.
- Demand or time-of-use charge reductions in some rate plans.
- Payments from VPP or demand response programs.

But many people buy batteries mainly for resilience.
If you want to estimate the financial side, ask:

- "How often and how long do we lose power each year?"
- "What do we usually spend or lose each time there's a long outage?"
- "How much can we save on time-of-use charge reductions?"
- "What bill savings or program payments might be available if we join a VPP?"

Then compare that against your battery's cost and warranty period. SUN's Solar Help Desk or your installer may be able to help you run numbers.

How long do batteries last, and what happens after the warranty?

Most home batteries today come with a 10-year warranty, though sometimes they offer 15-year warranties. The warranties are sometimes expressed as:

- X years or Y megawatt-hours of energy throughput, whichever comes first; and/or
- A guarantee that the battery will still have about 60–70% of its original capacity at the end of the warranty.

After the warranty ends, the battery doesn't suddenly stop working, it just slowly loses capacity. You might decide:

- To keep using it until the capacity loss bothers you, or

- To add more modules or replace it with a newer model.

Ask installers to explain the warranty in plain language and to estimate how much capacity they expect you to have left after 10 years of typical use.

Which batteries can join VPP programs?

VPP programs usually require:

- A stationary home battery.
- A way for the program operator to communicate with and control the battery (often through a platform like the battery manufacturer's app, a third-party software company that your utility contracts with, or a utility app).

Many current programs support batteries from Tesla, Enphase, FranklinWH, LG, Sonnen, SolarEdge, Generac, and others, but the exact list is different in every state and utility territory.

If joining a VPP is a priority for you, ask your installer, program operator, or reach out to SUN's Help Desk for information about programs available near you.

Solar Help Desk

Support you need, free of charge.

Whether you're exploring solar, comparing proposals, or optimizing your system, we're here to help.

Want Solar, but don't know how?

Everything you need to make confident, informed decisions.

Going Solar, but need help?

Personalized support, from quotes to contract signing.

Have Solar, but have questions?

Get the tools and support you need to get the most from your system.

Contact us online or by phone

solarunitedneighbors.org/helpdesk

Toll-Free: **(844) 336-0300**

Direct: **(202) 888-8601 (Option #1)**



Join Us

At Solar United Neighbors, we believe we should all have the right to produce — and store — our own power!

SOLARUNITEDNEIGHBORS.ORG

Solar United Neighbors is a 501(c)3 nonprofit. We're a community of people building a new energy system with rooftop solar at the cornerstone. We help people go solar, join together, and fight for their energy rights.

SOLAR UNITED NEIGHBORS

Solar United Neighbors
1350 Connecticut Ave NW, Suite 412
Washington, DC 20036
info@solarunitedneighbors.org
202-888-3601