

## Comparing Backup Power Options for Your Home

Homeowners concerned about power outages have multiple options for backup power. If you already have a solar system, adding a home battery system is the obvious best option. If you do not have solar, you'll need to decide between standalone battery energy storage, solar plus storage, or a generator fueled by natural gas, propane, or gasoline.

### Pros & Cons of Backup Power Options

	Portable Fossil-Fueled Generator	Backup Fossil-Fueled Generator	Energy Storage Only	Solar + Storage	Adding storage to solar system
<b>Base Cost for Typical Size</b> <i>Includes tax credits and rebates</i>	\$400 - \$1100	\$7,000 - \$16,000	\$7,000 - \$14,000	\$15,000- \$22,000	\$5,000- \$10,000
<b>Benefits</b>	Low cost	Duration limited only by gas service or propane supply	Clean; silent; minimal maintenance; reduces utility bills throughout the year	Clean; silent; minimal maintenance; can recharge daily with solar; reduces utility bills throughout the year	
<b>Drawbacks</b>	Loud; polluting; foul odor; carbon monoxide danger; maintenance concerns; only powers an extension cord; difficult to operate; on-site fuel stock needed	Loud; polluting; maintenance concerns; gas can be turned off during blackouts	1-2 day duration before external power supply needed	Duration dependent on size and availability of sunlight	

The costs of a generator tied into the home electrical system and a standalone energy storage system are comparable. Installing energy storage with solar allows you to reduce the cost of the combined system with the federal renewable energy tax credit.

Portable generators are cheaper but only power individual appliances and are more difficult to manage. They have electrical outlets that you plug into with an extension cord but do not connect to the electrical wiring of your house. Most of them run on gasoline and require you to maintain gas containers to refill the tank. During an outage, local gas stations may not be available to obtain additional fuel. Portable generators are loud, produce foul odor, and can be challenging to keep operational. They are difficult to operate for elderly or disabled people. Some cities have noise ordinances that limit operating hours. There is a risk of lethal carbon monoxide emissions.

Like energy storage, non-portable generators for home backup power that run on natural gas or propane connect to your main electrical panel, with a fuel line from your natural gas service or propane tank. When they are fueled by natural gas they depend on uninterrupted gas service.

When installing home backup power, most customers choose to back up only a portion of their energy needs. The installer will rewire essential appliances to go through a new electrical subpanel. Connecting the battery or

generator through that subpanel ensures that non-essential appliances do not drain the battery during an outage. This will also help you select the proper size battery or generator once you decide which appliances you want to be able to use during a grid outage.

## Incentives

State incentives are available for energy storage from the Self-Generation Incentive Program (SGIP). There is currently a waitlist for residential customers, but new funds will be available by next April. You can install now and get a rebate later, as long as you submit your application within a year of installing. Current incentives are \$250 per kWh for residential systems, which pays around a quarter of the cost. The federal tax credit additionally pays 30% of the cost when storage is paired with solar for systems installed in 2019 and 26% for systems installed in 2020.

Taking an incentive from SGIP requires that you charge and discharge the battery on a regular basis, rather than keeping it fully charged at all times for backup purposes only. If you charge when utilities have ample energy supplies at mid-day and discharge when energy supplies are tight in the late afternoon and early evening, you are helping the grid and reducing carbon emissions in exchange for the financial incentive you have received.

Even with this requirement, your battery is still valuable as a backup power source. You can cycle the battery in some months of the year and reserve the battery for backup purposes in months that are more vulnerable to wildfires and blackouts. Also, if the utility announces a potential grid outage a day ahead of time you can make sure to keep the battery fully charged.

In addition to having a battery for backup purposes, targeted charging and discharging reduces your utility bill. Electricity rates are higher from 4-9 pm, so running your appliances off the battery rather than the grid at those times saves money.

For customers in low-income housing and customers with special medical needs in high fire threat districts, the SGIP incentive pays for the full cost of a storage system up to \$1000/kWh. Customers in low-income housing that are not in high fire threat districts qualify for an incentive of \$850/kWh.

## Installers and Equipment

Most solar installers also install energy storage, including small local contractors and national clean energy providers. Systems can be purchased or leased. Purchasing can be done through upfront payment, getting a storage-specific bank loan, or agreeing to a property tax assessment.

Common energy storage system sizes for residential customers are 10-14 kWh, though some are smaller and high usage customers can install multiple units. A typical home uses 20 kWh of electricity per day. A large home with lots of air conditioning can use 50 kWh per day. Essential loads are often kept to less than 10 kWh per day.

The following table contains a sampling of energy storage devices currently available for residential customers in California. Most companies listed have additional products that are not included in this abbreviated list. Some of these are complete energy storage systems and some require additional components. The list is intended only to indicate a diversity of available products. Your storage installer can provide additional information on the relative benefits of different options.

## Residential Energy Storage Products

Manufacturer	Model	Continuous Power Output Capability (kilowatts)	Usable Energy Over Time (kilowatt-hours)
BYD	Battery-Box	5.1	5.1
BYD	Battery-Box	10.2	10.2
Darfon	B05LM	3.5	9.8
Darfon	B12LF	7	12
Discover	AES 42-48-6650	6.7	6.7
Equana Technologies	Evolve 0513U	5	12.1
Electriq Power	PowerPod	5.5	13.5
Electriq Power	PowerPod	16.5	100
Energport	Ep Home L0510	5	11
Energport	L3040	29	45
KiloVault	HAB 7.5	7.5	7.5
KiloVault	1500 RES-Q	1.5	1.28
LG Chem	RESU10	5	9
LG Chem	DC 7.6	7	20
NeoVolta	NV14 ESS	7.7	14.4
Outback	SE-414PHI-300	4	14
Outback	SE-860XLC-300	8	60
Panasonic	Evervolt Mini	2.4	5.7
Panasonic	Evervolt Plus	5.5	17.1
Pika	Harbor 3	3.5	8.6
Pika	Harbor 6	7	17
SimpliPhi	ExprESS 24V	2	5.8
SimpliPhi	AccESS	8	15
Sonnen	Eco	8	16
Sonnen	EcoLinx	8	20
Sunpower	Equinox	6.8	13
Sunpower	Equinox	13.6	26
Sunrun	Brightbox	5	9.3
Tesla	Powerwall	5	13.5

