



BACKUP POWER OPTIONS

In the event of a disaster or a PG&E Public Safety Power Shutoff/Enhanced Power Safety Shutoff (PSPS/EPSS), the power grid may be unavailable for an extended period of time. You may need partial- or whole-house backup power during this time for:

HEAT AND COOKING



Furnaces, even gas-powered, require power to operate, and heat may be necessary in the winter time. Electrical stove tops need power although gas may not.



SAFETY

Lighting is needed at night, and candles can be a fire hazard. Alarm systems, security cameras and other safety devices may have backup batteries, but these rarely last for more than a day or so.

REFRIGERATION



Food, including milk for children, and many medicines require being kept cold. Ice may only last a few days in the freeze or in a cooler during hot weather.



WORKING FROM HOME

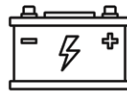
Many people work from a home office, and being unable to work for several days can become a financial burden. A backup battery/UPS can power Internet equipment usually only for a short time.

OPTIONS

3 common partial- or whole-house alternative/backup power sources are:



gasoline/natural gas generator



medium sized storage battery



solar panels with very large storage battery or batteries

CALCULATE POWER USAGE

To determine which option above is best for you, and what size system you require, you need to calculate your power demand:

First, it's useful to understand power and energy. Electric power is the rate of doing "work." Common units of power are the watt (W) and kilowatt (kW) or 1,000 watts. Energy is power used over a time period. A common unit of energy is the kilowatt-hour (kWh), or 1,000 watts used for 1 hour.

For example, running a 10 watt LED light bulb for 100 hours would consume 1 kWh (10 * 100) of energy.



Note that generators and solar panels are sized by power (watts), which they produce as long as they operate. Batteries are sized by stored energy, as they produce power only for a certain time until they run out.

Then, list every device and appliance that you want to operate at the same time during an outage, and note how much power each one uses. An electricity monitor like the "Kill-A-Watt" can measure how many watts each draws, or refer to the device label or owner's manual. **(This is a good time to make sure that all your light bulbs are LEDs.** LED bulbs use far less energy than incandescent bulbs, and even less than compact fluorescent, and they last much longer.)

Add these figures up, multiply by 1.5 (safety factor) and that's your rough power need.

Typically around 4,000 watts is enough for partial-house backup, but you can get by with less if you don't run higher-load appliances such as a microwave and a refrigerator at the same time.

OPTION 1 - GASOLINE/NATURAL GAS GENERATOR

The cheapest source of backup power is a portable gas-powered generator

PROS

- + Cost is currently around \$3,000 for 6,000 watts (6 kW) of power output
- + Replenishable fuel (you can siphon gasoline from a vehicle in an emergency)
- + Durability – brand names will last for many years if properly maintained
- + Flexibility – generators can be fueled by gasoline, natural gas and/or propane



CONS

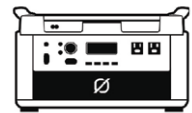
- Some models can be loud (Honda has a reputation for being quieter but more expensive)
- Supplies power regardless of demand, although some models have an Eco mode
- Must be run outside using electrical cords or a transfer switch to connect to inside devices
- They pollute (especially gasoline fueled) and fuel storage may be a safety issue
- For additional information refer to the [Guide #21 – Emergency Generators](#)

OPTION 2 - MEDIUM SIZED STORAGE BATTERY

A medium sized storage battery with AC outlets can provide power for a short time depending on use. This is re-charged while the grid is up or via smaller solar panels.

PROS

- + No maintenance
- + Only supplies power upon demand



CONS

- Higher cost, currently \$1,000 for a 1,000 Wh (1 kWh) battery, and capacity typically degrades over time

With a storage battery you also have to consider your energy usage. E.g, if you average 200 W per hour of energy use (0.2 kWh), a 1 kWh storage battery will be drained in a bit over 4 hours.

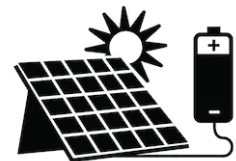
Note – if you have an electric vehicle, you can connect a “pure sine wave” inverter to the 12v battery and draw 500 to 1000 watts of emergency AC power, enough to power lights or a small appliance. The vehicle must be on and in Park to keep the 12v battery charged, so make sure it’s secure and well-monitored. Leave enough in reserve to drive the vehicle to a charging station.

OPTION 3 - SOLAR PANELS & VERY LARGE STORAGE BATTERY

The best long-term solution that provides immediate, clean power during an outage

PROS

- + A properly sized system can power an entire house indefinitely during a power outage, as long as enough solar energy is available
- + Little maintenance required over the life of the system
- + >40% cheaper than PG&E energy over a 20-year time-frame



CONS

- Highest upfront cost (\$15,000 to \$30,000+ depending on panels, features and batteries)
- Power production is reduced by clouds/rain and foliage shading over the solar panels