



Home Backup Power Systems

Determining Home Power Usage

Below are typical power usage values you can use to determine your power needs. Make sure to verify the power usage of your larger appliances and decide what you will need to run at the same time. Depending on your refrigerator and your willingness to turn on and off some items, a 2000-watt system may meet your needs. The backup up system must be able to supply the starting watts to turn on the items below. See following pages for examples.

Commonly used at the same time

Description	Running Watts	Starting Watts	Comments
Refrigerator / Freezer	200	1200	See Note 1
4 Lightbulbs (incandescent)	240		Turn these off when not in use to reduce power consumption.
Flat Screen TV	100		
Blu-ray player	50		
Laptop Computer	100		
Local Area Network / WiFi	100		
Smart Phone Charger	20		
Needed Power		1810	

Note 1: The refrigerator/freezer will turn off and on during the day so plan on supporting starting watts. You also need to verify your specific refrigerator/freezer power use.

Items that can be used selectively or not at all to reduce power consumption:

Description	Running Watts	Starting Watts	Comments
Garage Opener	720	1420	See Note 2
Tankless Hot Water (Gas)	1000	1200	Turn off when not using to conserve power.
Coffee Maker	600		Avoiding using these at the same time to reduce power consumption.
Toaster	800	1200	
Printer	300		
Microwave (1100 watts)	1600		
Dishwasher	220	540	
Hair dryer, Washing Machine, Clothes dryer (each)	1200		Decide if you need to use these during a power outage.
Portable Heater (5K BTU)	1500		
Crock Pot (estimate)	250		
6-quart Instant Pot (estimate)	1000		

Note 2: Door can be opened manually. If you need to open electrically, consider opening the garage door and moving cars outside before you power other systems.



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Backup Power Systems

Backup home power systems are either inverters (convert DC to AC power) or AC generators. The following sections review portable and whole house backup power systems.

The lowest price backup systems use inverters and usually provide AC power through a 3-prong plug. Some inverters are designed for light use like camping and cannot be relied on for home use. Home appliances need stable power. Inverters for home use should state that they can power appliances such as refrigerators.

Inverters for home use should have a pure sine wave output, not a modified sine wave. A pure sine wave produces a cleaner current which is better for refrigerators, laptops and newer electronics like LED TVs, CFL light bulbs, clocks and audio equipment. A modified sine wave inverter is usually less expensive but the power signal is noisier. This may cause systems with AC motors or fans to require more power and may also damage newer electronics.

Vehicle Battery Powered Inverters

Inverters designed to attach to the 12V batteries in fuel powered and electric vehicles are lower cost and weigh less than fuel-based power systems but they have limitations. They can only power devices that accept a standard 3-prong plug and you will have to limit what you power at the same time. Your car will also need to be running while you use the system. You will need to make sure that the vehicle converter cable terminations easily connect to your car battery, converts DC 12V to AC 110V, provides a pure sine wave, and supports household appliances like refrigerators.



Vehicle inverters should state continuous power and starting power (required to turn on motors in refrigerators, water heaters, etc.). See [12V pure sine wave inverters](#) (Amazon) for examples. If you purchase an inverter through the link make sure it has pure sine wave output and try it out at home. Even the best rated inverters on Amazon had some negative reviews. You don't want to find your system has problems when you need it most. You can also search by vehicle type but be careful. Most of these results are designed for camping, not home use.

Pros: Least expensive solution. Portable. Does not require a separate fuel source. It is possible to get a couple of days power (limited number of devices) but this depends on the vehicle. Putting the car in neutral and setting the parking brake provides the best fuel efficiency.

Cons: Only provides a limited amount of power and cannot be connected to a circuit breaker panel or power a device without a standard plug. Available power is governed by the inverter and the car's ability recharge the battery. A typical alternator (gas-powered



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vehicle) puts out about 48 Ah (amp hours) or about 5kW hours while idling. Consuming more than this over time can drain the battery. Check your vehicle. It may be different.

Gas-powered cars will need to be running and outside due to carbon monoxide. Car Inverters usually come with cables to connect the inverter to the battery but these are short. You may need additional long, heavy duty cables if you don't want to leave the inverter by the car. You will need a long extension cord(s).

Fuel Powered Inverters and Generators

The following product information is from [Consumer Reports, Choosing the Right Size Generator](#). Generators come equipped either as single fuel or multi-fuel units and run on either gasoline, natural gas, or liquid propane. Any single fuel generator can be configured to run on different fuels via [Fuel Conversion Kits](#).

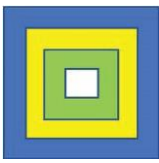
Larger power inverters/generators can be heavy, and usually are mounted on wheels (see portable and large inverters). Smaller Recreational Inverters are easily transportable and can be ganged together to meet most home emergency backup needs as shown in the previous tables. The reduced weight of these units also makes it easier to move them when needed.

Recreational Inverter: Up to 2,000 continuous watts, \$400–\$1,000

Pros: The lightest type of generator. Most models weigh less than 60 pounds. Extremely quiet. No installation costs. Easy to store and transport. You can pair most units to increase output. Many come with user-friendly features such as fuel-level indicators and smartphone apps.



Cons: Can generally power only 110 VAC items with a standard 2-prong or 3-prong plug. Enough to power a fridge, some lights, and a phone charger but not much else. Cannot be connected to a circuit breaker panel or used to power any device without a standard plug.



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Midsized Inverter: Up to 3,500 watts, \$1,000–\$1,700

Pros: Most models weigh less than 150 pounds. Quiet. Efficient, capable of keeping the fridge running and the lights on for 8 to 18 hours using only 2 to 3 gallons of gas.

Cons: They can generally power only 110 VAC items with a standard two or three prong plug which eliminates heating and cooling equipment. Should not be used in rain or snow without protection, such as an open-sided tent.



Portable Inverter: Up to 7,500 watts, \$700–\$2,800

Pros: The best value in terms of cost vs. capacity. Certain models produce enough energy to meet all the power demands in your home. Can be connected to your breaker panel with a transfer switch to run hardwired equipment, such as a well pump.

Cons: Requires professional installation if you want to connect to your house circuit breaker panel which costs as much as the generator itself. Noisier than large inverter and home standby generators. They usually run only on gasoline and use a lot of it compared with other class inverters. Most weigh close to 300 pounds and are bulky. Should not be used in rain or snow without protection, such as an open-sided tent.

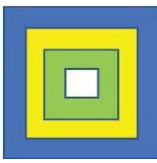


Large Inverter: Up to 7,500 watts, \$1,400–\$4,000

Pros: Most produce enough energy to run a refrigerator, lights, and other essentials such as a furnace or small central air-conditioning unit. Can be connected to your breaker panel to run hardwired equipment, such as a well pump. Quiet. Fuel efficient.

Cons: Expensive. Third party assessments of these units indicate that only models costing \$3,000 to \$4,000 perform well enough to warrant serious consideration. They cannot run on natural gas or liquid propane, so you still need to keep stabilized gasoline on hand.





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Whole House Backup Power Systems

Battery Backup Systems

Tesla Powerwall (Example 1):

This example is based on the Tesla Powerwall. You may be able to find less expensive alternatives. The Tesla Powerwall is used as an example because we know it can be easily interfaced with Tesla panels used in Trilogy. You can determine your Powerwall requirements at [Powerwall Usage Need](#). This system is usually installed inside your garage.

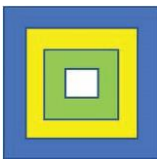


Pros: Fully integrated into your home electrical system. Activates automatically during a power outage. Does not require any fuel to operate.

Cons: Most expensive option. Multiple Powerwalls will be required if you wish to run 240VAC systems. Requires professional installation. Cannot be moved.

The following estimate by Tesla is based on a small home with a yearly usage bill of \$240. Many Monarch Dunes homes will require more power than that used in this estimate. The stated cost is from the Tesla website. You can check current pricing on their site. Also verify if you are eligible for the Federal tax credit.

Item	One Powerwall (No large appliances)	Two Powerwalls	Three Powerwalls
Lights	Yes	Yes	Yes
Electrical outlets	Yes	Yes	Yes
120V small appliances	Yes	Yes	Yes
Gas Dryer	Yes	Yes	Yes
Compatible central air conditioners	No	1	2
Electrical range / stove / oven	No	1	1
Tesla/non-Tesla EV charging	No	1	1
Electric dryer	No	No	1
Electric water heater	No	No	1
Power Wall Cost	\$7,000	\$14,000	\$21,000
Installation	\$4,500	\$4,000	\$3,500
Total	\$11,500	\$18,000	\$24,500
After Fed tax credit	\$8,500	\$13,320	\$18,130
Number of Days of Power (estimate - based on home size and usage above)	3	6	9



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Generac PWRcell (Example 2):

This is an alternative product to the Tesla Powerwall with similar operational characteristics and installation requirements. Like the Powerwall the PWRcell system must be professionally installed. Go to <https://www.generac.com/for-homeowners/clean-energy/clean-energy> for more information about this system.



Fuel Powered Generator Backup Systems

Champion Generator (Example 1)

Fuel Powered Home Standby Generator: Up to 20,000 watts, \$2,000–\$6,000 plus installation cost

This system functions identically to the battery systems discussed previously during a power outage but uses natural gas or liquid propane for fuel while operating. It is normally installed outside the home (usually next to the house) due to the need to vent exhaust fumes while in operation.



Pros: Fully integrated into your home electrical system. Activates automatically during a power outage. Less expensive than the solar power alternatives discussed previously.

Cons: Requires professional installation including a transfer switch. Cannot be moved. Requires fuel supply.

Generac Generator (Example 2)

Fuel Powered Home Standby Generator: Up to 24,000 watts, \$2,000-\$6,000 plus installation cost

This is an alternative product to the Champion generator with similar operational characteristics and installation requirements. Like the Champion generator this system must also be professionally installed. Go to <https://www.generac.com/home> for more information about this system

