

## Introduction

Electricity is a great example of something many homeowners don't think much about – until it's not available. Any homeowner who has had to throw out a freezer's worth of meat after a power failure knows that even fairly short outages can be very expensive. The right electric generators can prevent this kind of loss. And in some situations, having power is even more important: once the power goes out in your home and you can't open your garage or get water from your well, you may begin to see why so many homeowners invest in electric generators.

Of course, you may sometimes need power in places that don't have electric service at all – the most common examples are construction and camping sites, but there are plenty of other uses.

Generators come in a wide range of sizes and setups for every situation. This BuyerZone.com Home Generators Buyer's Guide will help you understand what the basic types are, how to choose the right size generator for your home, and how much you can expect to pay.

### Table of contents

Basic types of generators.....	2
Sizing electric generators.....	2
Buying considerations.....	3
Installing standby generators.....	4
Choosing a dealer.....	5
Generator prices.....	6
Electric generator buying tips .....	7



## Pricing guidelines

Actual costs vary quite a bit depending on the size and type of generator you need, but standby generators typically run \$300 to \$500 per KW installed. Here are some estimates that include delivery, setup, and installation –more details and costs for much less expensive portable generators are on page 6.

Standby generator power	Estimated cost
12 kW	\$4,000 to \$6,000
15 kW	\$4,500 to \$7,000
25 kW	\$9,000 to \$13,000
40 kW	\$12,000 to \$16,000

## Basic types of generators

All electric generators have two main components. A **motor** burns fuel – usually propane, natural gas, gasoline, or diesel – to supply power, and a **generator head** turns that power into electricity. Together, the motor and the generator head comprise a standard generator.

The electricity created by a generator is measured terms of voltage and watts. Voltage is a measure of the “pressure” of an electric current. Wattage is more like a measure of the “volume” of electricity being created. When choosing a generator, you’ll need to know the specific voltage your situation calls for, then you can pick the model that supplies enough wattage for everything you’ll be running.

### Voltage

In the U.S., standard household current is single phase, 120 volts. Most houses have 120/240v service, meaning they have two 120v circuits. The two are combined to provide 240v for power-hungry appliances such as electric ranges, clothes dryers, central air conditioning, and water pumps. Many small businesses use this 120/240v service as well.

Businesses often use three-phase power, which is better for running heavy-duty motors than the residential-standard single-phase service. In the U.S., three-phase power usually produces 120/208 volts or 277/480 volts. Generators are available for all common voltages – make sure you know what voltages you’re using now and you’ll be able to find a match.

### Wattage

Unlike voltage requirements, which are set based on your existing circuits and electric service, wattage requirements increase with each additional appliance you want the generator to power. Choosing the right wattage is critical – we’ll discuss **Sizing Your Generator** in the next section.

The smallest generators produce around 800 watts, while large industrial generators can produce 500,000 watts (500 kilowatts, or kW) or more. Home generators average around 10 to 40 kW.

## Types of generators

There are two basic types of generators to consider: **standby generators** and **portable generators**.

**Standby generators** are used to offset the harmful effects of power outages: they’re installed permanently as an emergency power source for your home. They are hardwired into your house’s electrical system and often get fuel from city gas or propane lines. They start at around 7 kW and can easily be as large as several hundred kW.



In contrast, **portable generators** are used to provide power in places that don’t have any, such as construction sites or other remote locations. In a pinch, they can also be used to power essential appliances during a power outage, just like standby generators. However, unlike standby generators, they’re designed to be used for short periods of time – only a few hours at a stretch. As a result, they tend to be much smaller and less expensive.

Built-in fuel tanks allow them to run anywhere, and standard power outlets let you plug in ordinary extension cords. The smallest gasoline-powered portable generators are under 1 kW, and the largest reach around 15 kW.

## Sizing electric generators

The right “size” electric generators provide just enough wattage to operate all your essential appliances. Too few watts and you can overwork the generator, potentially damaging it and anything plugged into it. Too many and you’ll

waste money on the initial purchase and on the fuel to run it.

### How to measure wattage

There are two main ways to assess the size generator you need – and one way to avoid. First, you can determine the power you're using directly. Using an ammeter, a device that measures electrical current, a qualified electrician can determine exactly how much power each electrical device in your home uses. Total up the watts the electrician measures for each item to be powered by the generator and you'll have the baseline power you'll need. Some generator dealers will visit your home and do this as part of the sales process.

The second way is to determine how many watts your appliances will draw on your own. Most appliances will list their power requirements either in the instruction manual or on the nameplate found on most electronic devices. The number you want to get to is watts, and as you may remember from high school physics,  $\text{watts} = \text{volts} \times \text{amps}$ . Many devices will list amps at a given voltage, so just do the multiplication to see how many watts they draw.

The way *not* to decide what size you need is to estimate. Dealers can often come up with a good guess as to what size electric generators your home might need – but they should work with you to total up all the devices you want to power before finalizing the decision. Rules of thumb based on the square footage of your home are never a good substitute for actual investigation of the devices your generator will be powering.

### Running versus startup power

One important characteristic to know about electric motors is that they take much more to start than they do to run. Any electronic appliance with significant moving parts – fans, pumps, compressors on refrigerators or air conditioners – can require up to three times as much electricity to start up than it does to run continuously.

Because of this, you need to increase your wattage requirements. However, multiple appliances rarely start up at exactly the same time: even a refrigerator that's plugged in only uses the compressor occasionally. So you only need to add enough power for the biggest startup requirement. Figure out what device has the largest difference between running load and startup load. Add that number to the running load of all your appliances added together to get your wattage requirement.

### What size electric generators to buy

Once you've factored in your startup requirements, you'll have an idea how many watts you need from your generator. To avoid overworking your generator, you should plan on purchasing a generator with a rated capacity of around 20% more than your exact requirements. This will give you room to add a few small devices, in addition to helping extend the lifespan of the generator.

Be sure the generator you choose has enough wattage so you don't risk overworking the equipment.

## Buying considerations

Once you determine the size generator you need, there are several considerations to keep in mind about your generator purchase.

### Fuel choices

Generators can run on several different types of fuel. Home generators almost always run on natural gas or propane. The primary advantage of this is that no fuel storage is required – the generator is simply connected to your utility lines and draws fuel when it needs to. The choice between gas and propane is based solely on which is available in your area.

Diesel fuel is popular for larger, commercial generators, but very rare for home models. They tend to be dependable and somewhat cheaper to operate than generators that run on natural gas or propane. However, they require deliveries of diesel fuel and a large holding tank, and while they've cleaned up their act considerably in recent years, diesel generators are still not as clean-burning as other types.

For portable generators, the most common choice for fuel is gasoline. However, the major drawback is that gasoline can't be stored for very long, so if you intend to keep a portable generator around for emergencies, you may want to consider propane instead. In no circumstances should you run a portable generator indoors: they produce dangerous fumes and cause serious health problems or even death.

Both portable and standby generators are sometimes available in dual- or tri-fuel configurations, where switching from natural gas to gasoline to propane is as easy as reconnecting a hose.

### Motor speeds and cooling systems

Like any motor, a generator motor creates quite a bit of heat and needs a cooling system to prevent overheating. Standby generators can be either air-cooled or liquid-cooled. The major difference is that air-cooled systems are louder and not quite as effective. Liquid cooled systems are quieter and more dependable – and also more expensive to purchase and to maintain.

A related aspect of generator motors is the speed at which they run, as measured in RPMs. Generators made for the US market operate at one of two speeds: 1800 RPM or 3600 RPM. 1800 RPM motors will last longer and run quieter; 3600 RPM motors are smaller and lighter.

20 kW and larger generators are typically liquid-cooled, 1800 RPM units, which give the best combination of quiet operation and reliability. Portable generators are almost always air-cooled, 3600 RPM models. In some cases, you may be able to choose between the two RPM settings – go with 1800 RPM unless portability is important.

It's important to note that generator manufacturers don't actually build their own motors. They use engines from well-known names like Ford, GM, and Honda to power their generator heads. When choosing a generator, look for one that comes with a brand name motor: it will be much easier to find parts and service for a well-established brand than for some no-name model.

### Additional features

- Safety features can prevent injuries as well as damage to your generator. Quality standby generators will shut down if they lose oil pressure, overheat, or are being worked too hard.
- Portable generators should have large fuel tanks for the best running time, a fuel indicator gauge, and enough receptacles to allow you to plug in all the devices you want to run.
- Standby generators should have solid steel or aluminum enclosures, good mufflers to reduce noise, and be compliant with all relevant emissions regulations.

### Installing standby generators

For homeowners who purchase standby generators, dealers usually come out and evaluate what it will take to install the system. Depending on your location, some dealers may offer delivery, installation, and maintenance services directly. If they don't, they'll certainly be able to put you in touch with qualified electricians and plumbers to help install your system.

### What to include

Before choosing a standby generator, you'll need to decide what equipment you want it to run. Some of the most common choices are refrigerators, freezers, electric ranges, water heaters, security systems, sump pumps, essential

lights, electric garage door openers, ejector pumps, well pumps, and septic systems.

Keep in mind that every electronic device you add to the list will increase the wattage you need – and drive up your costs. While a single light bulb will only add 70 watts to your needs, a mid-sized central air conditioner can draw 4000 watts or more. Limit your choices to those devices that are truly essential during a power outage and you'll keep your total costs down.

## Getting it installed

Because standby generators are wired into your home's electric system, proper installation is critical. Shoddy installation work can cause the generator to overheat or even damage your existing wiring and appliances.



The location of your existing electric service panel and gas line is important. The generator will sit outside but near your home, much like a central air conditioner, and for ease of installation, it's best if it can be positioned near the electric panel.

The generator will need to be installed on a level surface – most commonly, a concrete pad but occasionally hard rubber. Some dealers cover “everything” in their installation charge, including pouring a concrete pad – others won't. Get to know exactly what the installation of your generator will involve before committing to a purchase.

You'll need a plumber to connect the gas or propane line, if applicable. Generators can be sensitive to both fuel pressure and volume, so high-quality connections are important.

## Electrical connections

To connect a standby generator to your existing electrical system, you'll need a separate device called an **automatic transfer switch**. The transfer switch is an essential safety system that prevents your generator from feeding electricity back to the neighborhood power grid. When the power goes out, the generator will start up automatically, and after a few seconds to let it stabilize, the transfer switch will connect the generator to your home. When power comes on again, the switch will disconnect the generator and return your setup to normal.

*Do not attempt to install a transfer switch yourself.* Installation of transfer switches may require local permits – but it always requires a professional electrician. The model of transfer switch will depend mainly on the size of your generator.

In addition to the generator and transfer switch, you may want to invest in a dedicated electrical sub-panel, as well. Only your essential appliances are connected to the sub-panel, which is in turn connected to the generator. That way, when power fails, your critical devices will get the emergency power without the risk of overworking your generator or having to turn off or unplug other equipment. Setting up an electrical sub panel may be included in an installation charge, or may carry a separate fee.

## Choosing a dealer

A competent generator dealer can make a big difference in your overall satisfaction with your backup power system. You'll need understandable answers to complicated questions – look for a dealer who is knowledgeable and dedicated to home generator sales and service and has been for a while. Large industrial or construction equipment dealers who happen to sell generators as a side business may offer a good price – but they won't have the expertise of a dealer who's more dedicated to selling and servicing residential generators.

Because maintenance and service are so important, you'll most often want a generator dealer in your local area. A more distant dealership can sometimes connect you with licensed service technicians who are in your area, which

can be okay but is generally not the preferred arrangement.

Ask what maintenance services they'll provide. At a minimum, a standby generator requires an annual checkup of oil levels, air flow, and other factors.

Other questions to ask:

- How many technicians do they have? How many trucks?
- How long have they been in business?
- How many home generators similar to yours have they installed in the last year?
- Which brands do they work with the most?
- How long have they carried the brand you're interested in?

## Generator prices



You can spend \$400 on a hobbyist generator at a chain hardware store, or \$20,000 on a massive standby generator. Accurately determining the watts you need will help you get a generator that can meet your electrical demands without spending too much.

### Portable generators

A basic commercial-quality gasoline-powered 5kW portable generator will cost around \$600 or \$800. Bump the power up to 11kw and you're looking at spending around \$2,300. These "contractor-grade" generators are designed to be hauled around and stand up to rough usage.

While this is more than you'd pay for a retail store generator, those won't have the durability, dependability, and power that a portable generator from a dealer offers. You also won't be able to find much in the way of service if your low-end generator needs repair – the usual solution is to toss it and get a new one.

Portable generators are very commonly rented, too. Prices can be as low as \$75/week, so for short-term power needs, renting is a viable option.

### Standby generators

As a *very* loose rule of thumb, standby generators cost \$300 to \$500 per kW, installed. The prices listed below include delivery, setup, connecting to your home, and the required transfer switch, which can cost around \$800 to \$1,500 on its own.

- 12 kW: \$4,000 to \$6,000
- 15 kW: \$4,500 to \$7,000 (the most common size for residential generators)
- 25 kW: \$9,000 to \$13,000
- 40 kW: \$12,000 to \$16,000
- 75 kW: \$20,000 and up

### Generator service contracts and warranties

If well-maintained, a generator can last quite a long time. However, they do require consistent maintenance. Most of the wear is concentrated on the motor: changing oil and spark plugs, checking coolant, and other engine

maintenance all need to be done on at least an annual basis

For this reason, it's best to choose a dealer who offers a service plan that includes yearly visits. Pricing for a service plan will vary according to the size and type of generator you select – for example, large, liquid cooled generators take longer to service.

Your dealer should offer at least a two year parts and labor warranty with the sale of a new generator. Make sure you know what the warranty covers: some are bumper-to-bumper, while others cover only certain parts of the generator.

## Electric generator buying tips

- **Don't push it to the max.** Make sure you're comparing the **rated** capacity of various models, not **maximum** capacity. An electric generator can deliver its maximum capacity for no more than 30 minutes before starting to overheat – rated capacity is the level of power a generator can deliver on an ongoing basis. Usually, it's around 90% of the maximum power.
- **Include everything you need ...** Some of the more important devices to connect to a standby generator are some of the least visible: sump pumps, sewage ejector pumps, and ventilation fans. Do a careful inventory of your electrical devices before committing to a certain wattage level.
- **... and nothing you don't.** The single best way to save money on an electric generator is to limit the amount of devices you expect it to power. Consider that most power outages last less than a day – can't you live without air conditioning for a few hours?
- **Turn to the pros for installation.** Experienced residential electricians may not be as familiar with electric generators as they are with other types of electrical systems. Choose someone who's installed standby generators before and make sure they do all work up to code.
- **Expect occasional exercise.** Standby generators start themselves up around once a week to "exercise" – making sure they're ready when needed. This only takes around 15 minutes, but if noise is a concern, some generators have a "low idle exercise" feature that lets them run quieter than usual during this weekly workout.