

Choosing and Installing Emergency Generators



Electricity, once a luxury, is now essential. To beat weather-related electrical outages, many rural households and businesses are investigating emergency and stand-by power generators for use in an emergency.

Generators are widely available in a range of sizes and configurations. Some come equipped with either gas or diesel engines. Others operate from the power take-off (PTO) attachment found on farm tractors.

These devices all have one thing in common. They produce electricity at levels high enough to cause serious injury, death and property damage. That doesn't mean they should not be used. But, like any other electrical equipment, they must be correctly sized and properly installed in order to be used safely.

If you plan to provide enough electricity to power your entire home during an outage, you will need a generator with a relatively large capacity. Generators are rated by the wattage they produce, which is usually expressed in kilowatts, and are sized according to the loads they need to serve. Also important is matching the generator to the kind of service you receive, either single-phase or three-phase power. Most homes and farms have single-phase power with 120/240 dual voltage.

Sizing a Generator

To determine the size of the generator needed, total the rated watts of the appliances and fixtures you want to operate during an outage. Some loads are easy to determine. For example, a 100-watt light bulb uses 100 watts. Ten bulbs would require 1,000 watts or one kilowatt (kW). To find the power requirements of appliances, look in the owner's manual or on the specification plate on the appliance.

While the power needs of individual appliances vary, those that produce heat or use large motors tend to require higher wattages.

An average 14-cubic-foot refrigerator with automatic defrosting, for example, requires about 615 watts while an electric range at 12,220 watts needs nearly 20 times as much power. Electric space heaters and water pumps are usually rated at 1,000 to 1,800 watts (1.0-1.8 kW) and electric water heaters require as much as 4.5 kW.

Motors Require Extra Calculation

Power needs for motors, such as those powering refrigeration, well pumps or furnace fans, are more difficult to determine. Electric motors require more current when starting than they do in continuous operation. Often, this is three to six times as much.

Motors are commonly rated by horsepower (hp). A one-horsepower motor requires about one kilowatt to run and a surge of five kilowatts to get started. An electric motor rated for two-horsepower needs about two kilowatts to run and a surge of 10 kilowatts to start, etc. So while a motor-powered appliance may run with only one kW, the generator must be able to provide five kW to get it started. Again, those ratings appear on the motors' face plates. Without sufficient starting power, motors may overheat, burn out or trip the generator's circuit breaker.

Manual or Automatic Start?

Generator systems can be purchased as either manual or automatic start.

Manual start systems are less expensive and can often get by with smaller generators. After a power failure, disconnect all equipment. Once the generator is running, restart motors one at a time beginning with the largest motor. This procedure reduces needed power since the extra start-up power is not required for all the motors at once. After all of the necessary equipment is running, power for other equipment, such as lamps and appliances, is available.

Automatic standby systems come on automatically as soon as utility power is lost. They must be capable of starting and running all equipment connected to them, and therefore, must be large enough to provide both start-up and continuous power for all motors, as well as that needed by the lights and appliances in the home.

Keeping It Affordable and Safe

In order to cut costs when sizing an emergency power supply for a home or business, consider providing sufficient capacity for only essential appliances and lights. Do not power the "frills" until normal service is restored. Your electrician can assist you in determining which circuits should be powered and connecting these to your generator's transfer switch.

More important than sizing is correct installation. Auxiliary power sources must be completely isolated from utility lines attached to your meter in order to avoid "backfeed" into your utility's system.

During an outage, line workers trying to restore power, or anyone who contacts a downed line, could be seriously injured or killed by backfeed from an improperly installed generator.

A special switch is required to transfer a building's wiring from utility power to a standby power source. This is called a transfer or double-throw switch. Its purpose is to prevent a generator's feedback from passing into the utility lines and hurting other people and equipment or destroying your generator. It is required by the National Electric Code when connecting an auxiliary power source to an existing system connected to utility power.

Remember, the transfer switch and its wiring will carry the entire load for the building it serves when connected to the utility lines during normal operation. These switches, like the generators they connect, are available in several configurations and power ratings.

Choose one matched to your utility service connection, not one matched to the generator.

In most areas, local codes and utility policies require that auxiliary power connections be inspected and approved by a recognized electrical inspection agency before they can be used.

If you are considering installing an emergency back-up generator, contact your electric utility or co-op as well as generator equipment dealers to help select a system that will safely provide temporary power when needed without creating additional problems or hazards.