

Disaster Relief Emergency Standby Electric Generators



Many people want emergency backup generators as a result of weather-related power outages. Before obtaining a unit, it is important to consider several factors.

Generator Size

Generator size is probably the most important factor. If your goal is to keep a freezer cold and run a few lights and a television, then a small portable generator might be appropriate. MSU Extension Information Sheet 1921 has more details on small portable generators. However, if you want to operate larger appliances, such as whole-house air conditioners or heaters, then you need a larger generator. These generators are generally wired directly into a building's electrical wiring. Information Sheet 1954 *How Much Electrical Power Do You Need?* has advice to determine the amount of power you will need. For example, every 1,000 watts will require 2 to 2¼ horsepower.

Automatic or Manual

One major decision you make is whether the unit will start automatically when the power goes off. An automatic-starting generator saves the trouble of starting and possibly moving a generator. This type of generator starts and automatically switches the electrical connections to run from the generator instead of the utility line that normally powers the house. These units are very convenient but usually cost more than their manual counterparts. The other option is to manually start the generator and manually switch the electrical transfer switch. Automatic starting could be important for emergency operations centers, poultry houses, dairies, or other operations where you might not have time to start a generator manually. Automatic starting is also useful if the people operating the system do not have the technical or physical ability to manually start a generator system.

Voltage and Phase

Voltage and phase of the electricity must match the wiring of the building. Generally, a residential building is powered by single-phase and 220-volt electricity. Commercial and farm buildings may need three-phase power. Check with your electrician to verify the correct configuration.

Fixed or Portable

Do you want the generator permanently wired to the building's electrical wiring, or would you like to be able to move the generator to another location? If you are using the auto-start function, it is necessary to permanently wire the generator. If you are not using the auto start, the generator can be wired permanently, or the transfer switch can have a receptacle that the generator can be plugged

into. If you decide to depend on a generator that must be relocated, remember it is likely you will have to move it in bad weather or in the dark. Plan your operations according to your abilities.

Transfer Switch

Connecting a generator to the building's circuits requires a transfer switch to remove power from the main supply. Connecting power directly to the building wiring without this transfer switch is illegal and could injure or kill electrical workers (and you would be legally liable). Most areas require the transfer switch be installed by a licensed electrician and wired according to the National Electric Code. Some cities may have additional regulations. Check with your building inspector's office for more information.

The transfer switch can be an automatic switch used in conjunction with a self-starting generator, or it can be a manual switch. The transfer switch can also activate all of the circuits in the building or only a selected few. Automatic-start generators must be sized correctly so that all the activated circuits can be started at once when the generator turns on. This is important because you will have no control over which circuits are active at the time of a power failure. Using a manually operated switch makes it possible to turn off appliances before the generator is activated, and it can allow you to use a smaller generator. Regardless of the method used, the generator should be capable of supplying the required power for the circuits you wish to engage. See Information Sheet 1954 to determine how much power you will need.

Fuel Type

The fuel type for your generator is another very important factor to consider. You will need to have a supply of fuel that will last for several days to cope with disasters. Don't depend on buying fuel after the disaster has struck.

Several different types of fuel are available to operate your generator. Generally, large generators are powered by diesel fuel. Home-sized units can be powered using diesel, gasoline, propane, or natural gas. One important thing to consider is that some types of fuel become old and useless after a certain amount of time. Diesel has a lifespan of approximately 6–12 months at temperatures above 86 degrees. If you are using gasoline or diesel fuel, you need to have a plan to regularly use or replace the fuel so that the generator will be able to run without issues when an emergency does occur.

If using diesel fuel, you may use off-road, tax-free diesel. You can exchange fuel in a tractor, irrigation pump,

or vehicle. If you use your old diesel fuel in an on-road vehicle such as your truck, you should buy on-road diesel for your generator to avoid road tax problems.

Be sure to have enough fuel on hand to operate your generator throughout the emergency because it is difficult to obtain fuel when a large area is without power. If you are considering using gasoline or diesel fuel, a large generator will easily use 1 gallon of fuel per hour, even with light loads. Operating a larger generator for several days after a hurricane or ice storm could require 50–100 gallons of fuel. The generator manufacturers will usually provide information to help you determine how much fuel the generator will burn under your conditions.

Some fuels, such as natural gas and propane, don't have the age-related issues that liquid fuels have. Natural gas seems to be the perfect fuel for emergencies, but, during bad storms, trees get uprooted and can damage gas lines. Whole towns have lost gas pressure during ice storms due to high usage, as well. Liquid fuel does have the advantage of allowing you to go to the nearest functional fuel station to refill your generator.

Location

Generators need to be protected from the weather. Some units come with a protective cover that allows you to mount the generator outside. Other units should be mounted under a protective awning.

In either case, you must **route the exhaust outside of the building** to an area that is open and will not allow exhaust to come back into the building. Carbon monoxide poisoning is a major hazard. Carbon monoxide detectors should be installed in a building with any generator system. Exhaust pipes should be kept away from combustible materials.

Any internal combustion engine gives off considerable heat and needs to have this heat vented to prevent overheating and fires. Many standby generators come with an external housing that meets these requirements.

Another consideration is noise. Large generators are noisy. Consider this when you decide on a location to run your generator. Also consider your neighbors. Insulated covers and noise shields can help with noise abatement.

Maintenance

Backup generators should be tested regularly to make certain that they start and operate correctly. If the unit is hard to start, it should be repaired immediately so that issues will not arise when there is an emergency. Follow the manufacturer's recommendations for maintenance. Typical recommendations from manufacturers include testing the generator every 2–4 weeks. Higher-end units will do this automatically. Regardless of the method, it is important to monitor the generator to make certain it will work when needed.

All generators should have a volt meter. Monitor this meter to make sure voltage stays in the appropriate range. Don't forget to perform the recommended maintenance or you will find yourself without backup power when you need it.

A backup generator method that is useful for farmers is a power take-off (PTO) generator. These units attach to a tractor and use the tractor engine to power the unit. Using a PTO can lower the initial cost of power generation since tractors are used for other things and are typically maintained as general operation dictates. These units do require that the generator be attached to the tractor and attached to the power system through a transfer switch just like any other generator. Since the fuel in the tractor is regularly used, fuel maintenance is not an issue. If the time delay in starting the generator is not an issue, PTO generators could be a useful solution to backup power. One drawback of using this method is that tractors running at proper speed can use several gallons of fuel or more an hour, even at low loads. Farms typically have a tractor fuel supply on hand that can be used for emergencies.

Checklist for Purchasing a Generator

- What type of fuel will be used? Be sure this fuel will be available in the event of an emergency.
- How big does the generator need to be? Remember that you might not want to run everything, such as air conditioners.
- Do you need automatic start, or can you wait while you start a manual system?
- Do you have a tractor that could be used to power a generator?
- **Install carbon monoxide and fire detectors.**

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