

COPING WITH POWER FAILURES

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When the electricity goes out, candles and flashlights can be fun for a few hours. In the event the power is out for a longer period, being prepared for emergency heating and lighting can make a difficult situation easier.

Your options for coping with a power failure depend on how cold it is outside, how long you're without power, and whether you have equipment that can meet your needs without external power sources. This publication will help you make decisions to prepare for short- or long-term power failures.

Planning Ahead

You can lessen the impact of a power failure by weatherizing your home to reduce its energy requirements and by installing energy equipment that operates independently of external supplies.

It's a good idea to store flashlights, extra batteries, candles, and candle holders in a convenient place that you can easily find in the dark.

A well insulated and air sealed house can hold heat and remain

comfortable for 12 hours or longer. To be sure your home is prepared for power failures, take advantage of a free energy audit provided by your utility or fuel provider. Then work to implement as many recommendations as possible.

Most natural gas water heaters will continue to work without electricity, so you should have hot water during a power failure. Most electric water heaters will keep water warm for 6–12 or more hours depending on location.

Most central heating systems use electricity and will not operate during a power outage. You may be able to connect a portable generator or inverter to a gas or oil furnace or boiler and heat as usual (see *Portable Generators*).

Although most wood or gas fireplaces are inefficient, they may be used to heat the space where they are located. If your house has a wood stove, you probably already know how well it warms your home. Be sure to have enough dry firewood on hand for an emergency.

If your home doesn't have a fireplace or wood stove, you may want to consider installing a space heater that can be used during a power failure. Heaters are available that operate on wood, pellets, natural gas, propane, kerosene, or heating oil. One factor in your choice among these options should be how you would like to use the heater in normal conditions, not only during power failures.

For details on various space heater options, see *Keeping Warm*.

When the Power Goes Out

After the power goes out, turn off all lights and appliances. Equipment that operates with a remote (instant on), contains electric clocks, or is always running, has an "active" connection to the grid and can be damaged if there is a power surge or voltage drop (sag) when power is restored. To protect such appliances, you may want to unplug them.

To conserve existing heat within the home, concentrate your activities in one or two adjacent rooms. Keep these areas isolated from the rest of the house by closing doors or hanging blankets over doorways. The kitchen and an adjoining room usually are good choices during a power outage.

Food in refrigerators and freezers may be safe to eat for up to 24 hours. Do not open refrigerators or freezers any more than needed to remove items. When power is restored, you may need to completely defrost the freezer and throw away any items that may have been thawed for too long. Check with your local county office of the OSU Extension Service for more information about food safety.

Although you may be tempted to heat your house in an emergency with a gas cooking range, these are designed for short-term cooking situations and

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can discharge large amounts of odorless, deadly carbon monoxide. They also release substantial amounts of moisture into the air that can lead to mold and condensation problems.

Portable kerosene heaters and camping propane heaters also may seem like a natural choice for emergency heat, but they are strongly discouraged. Because they are not vented outside, camping heaters and portable kerosene heaters exhaust all

fumes and large amounts of moisture into the room. Opening a window slightly for fresh air, as recommended by manufacturers, still may not provide adequate ventilation.

If you use any fuel-burning device in your house, be sure you also have an operating battery-powered carbon monoxide alarm to alert you to dangerous situations. If the alarm sounds, shut off the heater, evacuate everyone out of the house, and open windows for

ventilation. After an alarm, do not use the fuel-burning device until it has been checked by a licensed technician.

Extended Power Outages

If the utility company announces your area may be without power for several days, your best choice may be to move in temporarily with friends or relatives in another part of town not affected by the power outage.

Keeping Warm with Room Heaters

Some new wood stoves and space heaters vented to the outside are very efficient. If you are considering the purchase of a room heater, consider the following.

Fireplaces. Existing open fireplaces, even those with glass doors or air circulating fans, are poor space heaters although they may be useful in an emergency. If you haven't had your chimney inspected, now is a good time. Mortar may be loose or missing, which can lead to fires if the chimney is used constantly for several days.

Gas logs. If you don't want to haul wood, the least expensive alternative is to install artificial "gas logs" in an existing wood-burning fireplace. Like wood-burning fireplaces, they primarily are decorative but may be able to heat one room in an emergency.

Wood stoves. All new wood stoves must be tested and certified by the U.S. Environmental Protection Agency (EPA). The cleanest burning and most efficient have an "EPA Phase II certified" rating. Although used wood stoves without EPA (or Oregon DEQ) ratings are available, they are not as clean burning and are a poor choice for regular use. No matter what kind of wood stove you purchase, be sure your local fire department inspects the chimney and stove installation. Otherwise your homeowner's insurance may not provide coverage in the event of a fire. You also should have a supply of dry (at least 6 months old) firewood because wood may be difficult to obtain in an emergency.

Pellet stoves. Some people consider pellet stoves more convenient than wood stoves because the pellets automatically feed into the combustion chamber as needed. Pellet stoves burn very efficiently. Most are vented through an outside wall and do not require a

chimney to the roof. Since most pellet stoves have fans and electric controls, be sure the model you're considering can operate during a power failure.

Vented natural gas, propane, or oil fireplaces or inserts. Most vented gas fireplaces are designed as "decorative devices" but may be useful for heating in an emergency. The more efficient models have a yellow EnergyGuide efficiency label indicating they are rated as space heaters. Some models are "direct vented" through an outside wall, simplifying installation if installing a chimney is a problem. Avoid models with pilot lights because they waste considerable energy when not in use. Verify that the models you are considering can be lit manually during a power failure. Some oil dealers carry an oil fireplace with visible flame.

Vented natural gas, propane, kerosene, or oil heaters. These "stoves" do not have a visible fire but have a fan to circulate heat. Some are "direct vented," which simplifies installation. Verify that the models you are considering can operate during a power failure. A few high efficiency models are available that use gas/propane, kerosene, or #1 heating oil.

Unvented natural gas or propane fireplace heaters. Although legal in Oregon, most health experts do not recommend unvented or "vent-free" gas fireplaces in residences. Because they have no chimney or vent to the outside, these heaters release potentially dangerous combustion byproducts into the room. Continuous use can introduce substantial amounts of humidity into a room causing condensation and mold problems.

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If temperatures are below freezing, drain the plumbing system to help avoid frozen pipes. Turn off the incoming water at the main water valve. Open all water faucets in the house including showers and hose connections on appliances. Be sure water drains from a faucet at the lowest level in or outside the house. Shut off power or gas to the water heater and drain it as well.

When heat is restored to the house and pipes begin to thaw, check for cracks and breaks and listen for concealed leaks.

Portable generators

Using a portable generator during a power outage can be a convenient way to keep your house comfortable and maintain a somewhat normal lifestyle. Portable generators are sold at home hardware stores, home centers, and outdoor supply stores. Prices range from \$150 for small units that can power several light bulbs to more than \$1,000 for whole-house units. Some models have automatic electric starting capability. Better generators have an automatic shutdown if the crankcase oil is low. Larger generators can produce both 120 volt AC (standard line power) and 220 or 240 volt AC for larger appliances.

You can determine what capacity generator you need by comparing the wattage rating of the generator to the wattage of lights and appliances you intend to operate (see *Calculating Generator Size*). Depending on fuel tank size, a generator may be able to operate for 2–10 hours between refueling.

A portable generator can operate a gas or oil furnace during a power outage. You may need to hire an electrician if the furnace is “hard wired” rather than with a plug-in connection. Most generators do not have sufficient capacity to operate heat

pumps, electric furnaces, electric baseboard heaters, or electric water heaters.

Do not plug a generator into an electrical outlet to feed power into your house wiring. Besides being illegal in Oregon, the generator can feed electricity back through the utility power lines and possibly electrocute those working to repair the power outage. It's also likely you will overload the generator.

Connecting to a portable generator can be safely done two ways:

- Direct hookup using extension cords to connect to lights and appliances. Use only heavy duty orange or yellow extension cords with adequate capacity to handle the wattage. Do not connect more wattage than the continuous duty rating of the generator (the generator will slow down when it's overloaded). See the table included in this publication to determine the correct extension cord to use.

- Permanent connection using a transfer switch. This provides a safe way to connect a generator and usually is installed by an electrician. It assures that no power from the generator can reach the grid. Because most people do not want to power their entire house, the transfer switch usually controls a sub-panel, which feeds a few circuits for lights, outlets, and critical appliances throughout the house. Be sure the transfer switch and all wiring meets requirements of your local building department and the National Electrical Code (NEC). Manual and automatic transfer switches for use with electric start generators are available.

Locate the generator outside so exhaust fumes do not enter the house or attached garage. Follow all safety instructions included with the generator.

If you hear the motor slow down while using the generator, it means the generator is overloaded. If a generator is overloaded for prolonged periods, it will overheat and shut down.

12-volt inverters

If you want to operate a few lights or small appliances, another possible power source is a small inverter connected to a storage battery. An inverter changes 12 volt DC power from a storage battery to 110 volt AC power used by lights and appliances.

Compact inverters are sold at hardware stores, home centers, and outdoor and electronic stores. Inverters are designed to plug into a cigarette lighter of a vehicle or to be connected to a deep cycle storage battery (those used for boats, recreational vehicles, and electric golf carts). Depending on the capacity of the storage battery and the wattage of what you're trying to operate, inverters can provide power for several hours to 1 day.

To maintain the life of a storage battery, no more than 50 percent of the rated capacity should be used before recharging it. Plug lights or appliances directly into the inverter or select the proper sized extension cord.

Using fluorescent lights with an inverter provides more hours of operation since they consume less energy than incandescent lamps. An overloaded inverter automatically will shut off from overheating.

A storage battery can be recharged with jumper cables using an automobile alternator. If you use a non-sealed battery indoors, be sure to remember it is filled with corrosive, toxic acid and is very dangerous. Sealed batteries provide more protection.

If you plug an inverter into the cigarette lighter of a car, do not use it for more than a few hours before starting the car to recharge the battery. Car batteries are designed to provide high power for short time periods, not the slow, deep discharge needed for emergency power sources.

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Calculating Generator Size

The capacity of a generator or inverter is usually listed in watts. Many appliances are rated in amps listed on a specification plate on the back or bottom of the appliance. Keep in mind that motors, such as those used to operate a refrigerator or freezer compressor, take about three times more power (watts) to start up than to keep running. Most generators or inverters list both their continuous and temporary overload capacity.

The Ohms law formula converts watts and amps: $\text{Watts} = \text{Amps} \times \text{Volts}$. For example: the blower on a gas room heater is rated 0.3 amp. What is the wattage? (The following calculation assumes the typical house voltage of 120 volts.)

$$0.3 \text{ amp} \times 120 \text{ volt} = 36 \text{ watts}$$

Start-up Power

$$3 \times 36 \text{ watts} = 108 \text{ watts temporary "overload"}$$

Storage Battery Capacity

To determine how long a battery can power a light or appliance using an AC power inverter, you need to know the rated amp-hour capacity of the battery (this is not the "cold cranking amp" rating of automotive batteries). Use the Ohms law formula above to figure this example.

For example, a deep cycle 12-volt storage battery is rated for 50 amp-hours. Using a small inverter, about how long could it power the 36-watt blower from the above example:

$$\begin{aligned} 50 \text{ amp-hours} \times 50\% \text{ rate capacity} &= 25 \text{ amp-hours useful battery capacity} \\ 25 \text{ amp-hours} \times 12 \text{ volts} &= 300 \text{ watt-hours battery capacity} \\ 300 \text{ watt-hours} / 36 \text{ watts} &= 8.3 \text{ hours of continuous power} \end{aligned}$$

Recommended Extension Cords for Use with Generators

It's important to use extension cords of adequate current-carrying capacity when using a generator to operate electric equipment. Undersized cords result in excessive voltage drops and additional generator loading. This also can lead to reduced performance of the electric equipment.

Wire Gauge for Various Extension Cord Lengths

Watts	50 ft	100 ft	150 ft
240	18 ga.	18 ga.	18 ga.
480	16	16	16
720	16	16	14
960	16	14	—
1,680	14	12	—
2,000	12	12	—

For more Information

Oregon Energy Line. The OSU Extension Energy Program provides detailed information on home weatherization and energy efficiency. Call 1-800-457-9394 for a list of publications.

Oregon State University Extension Service. The OSU Extension Service has a variety of publications and videos. Visit your local county office (listed in local phone books under "county government") for a copy of their catalog or browse "Publications & videos" on the Web: <http://eesc.orst.edu/agcomwebfile/edmat/>

Utility weatherization programs. Call the utility that provides your heating fuel (or the State Home Oil Weatherization Program for oil and propane heated homes) for a free energy audit to determine the best steps to weatherize your home. Call 1-800-452-8660.

American Red Cross. Order a copy of *Before Disaster Strikes* by sending a self-addressed, stamped, business-sized envelope to the American Red Cross, Community Relations, P.O. Box 3200, Portland, OR 97208; or visit their Web site: <http://www.redcross.org/disaster/index.html>



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