

# What to Do When the Power Fails

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# Introduction

It may be romantic to eat by candlelight, but the romance quickly dies when the power fails and stays off, especially when it includes frozen pipes, a flooded basement, and the loss of a freezerful of food. Such catastrophes cost thousands of dollars. If electric service to your home was interrupted, would it be a calamity or an adventure for your family? Would you have a source of heat? Light? Would your pipes freeze? Would you lose all the food in your freezer? If the sump pump stopped working, would you have a basement full of water? Do you have the necessities for surviving a power failure?

The frequency of power failures varies with different geographical locations; sleet, ice, snowstorms, tornadoes, floods, volcanoes, hurricanes, lightning, and earthquakes can quite unexpectedly cut your electric lifeline. Recent natural disasters have included Hurricane Andrew in Florida, the Los Angeles earthquake of 1994, and the New England ice storm of 1998. There have also been man-made power outages, such as the 1977 blackout in New York City. Now, with computers running so many of our utilities, large-scale power failures seem almost inevitable.

When the lights go out, don't be left in the dark. With a little planning, you can reduce the inconvenience or calamity possible from a brownout or blackout. This bulletin tells you what to do before, during, and after a power outage to safeguard your family, your appliances, your heating system, and your water pipes.

## Before the Power Fails

The best way to prevent a power outage from becoming a catastrophe is to plan ahead. Assess the potential disaster, natural or man-made, that you might face, and plan to eliminate or minimize its impact on your household. Start by considering your needs. Physical survival comes first. Can you provide your family with adequate food, water, and heat until power is restored? Can you guarantee the family's safety? Are there infants or elderly people in your home whose health would be threatened by loss of heat or cooling? What about animals and family pets?

After physical safety is ensured, think about your home and furnishings. Will your pipes freeze in a prolonged outage? Do you

have an alternate source of power? Do you need one? Do you know what to do to prevent ruined appliances due to power surges and spoiled foods from lack of refrigeration?

Educating yourself and your family is the first step toward surviving a power failure. Start with the infrastructure of your house.

## Know Your Plumbing

If you do not know how your plumbing works, you will be unable to drain your pipes to prevent a freeze-up. Before the next power failure, locate the main-supply shutoff. Usually it is a large blue handle located near the water meter in your basement, but it could be near the hot-water tank, under the kitchen sink (in a house with no basement), hidden behind some paneling, outside the house near an outdoor spigot, or in a curb box. If you cannot locate the main shut-off valve, ask your plumber to locate it for you, then label the handle with a tag and make sure all family members know its location and function. If a wrench is needed to close the valve, be sure you can find it quickly in an emergency. You may want to practice draining the system if your heat comes from circulating hot water. Details for draining a hot-water system are given on pages 18–19. Don't wait until an emergency to discover you have a basement full of valves and no idea what they connect. If you find there is no easy way to drain your system, talk to a plumber about other solutions, including installing additional shutoffs.

**BRIGHT IDEA**

Using the illustrations in this book, your owner's manuals, and information from professionals, take several hours and go through your entire house to **learn where all your plumbing and heating equipment, pipes, drains, and shut-off valves are.**

Label everything with tags and indelible marker and assemble an outage emergency kit consisting of any wrenches and other tools you will need to protect your home.

## Electrical Preparedness

Locate your main electrical box and make sure everything is clearly labeled. Know which appliances should be unplugged during an outage to prevent damage. Keep a list. Choose a lamp as

your “tell-tale” and label the switch, if possible, so you will know which position is on and which is off — when a power outage occurs during peak hours, you may not remember which lights and appliances were on. During an outage, leave on this lamp at all times. It will tell you when power is restored.

## Gather Food and Supplies

Store supplies that are essential for survival: food, water, and fuel (in winter). When gauging quantities, figure that an outage may last two to four days. You can stay in your home during longer outages (two to four weeks) if you have an alternative heat source, adequate water, and a well-stocked pantry.

If you have the space, dedicate a kitchen drawer or other convenient area to emergency supplies. Always keep flashlights, batteries, candles, matches, a can opener, first-aid kit, tape, and other small necessities in the drawer. Make sure your family knows its location and also knows not to borrow (and forget to replace) the contents. Make sure you use and replace the batteries so you always have fresh ones on hand.

Ideal foods for an emergency are items that your family enjoys eating but that require little or no water or heat for preparation. They should have a long storage life. Foods that contain water, such as canned fruits and vegetables and canned or bottled juices, are especially valuable. At least part of your emergency supply should be edible without any cooking at all.

Wander through stores that supply campers with food. Many packaged foods can be prepared without heat, refrigeration, or water. Remember that water and fuel may be scarce, and you do not want to open the refrigerator or freezer more than is absolutely nec-

### Emergency Supplies

- Battery-operated radio and extra batteries
- Bottled water
- Camp stove
- Candles
- Can opener
- Cooking and eating utensils
- Emergency blankets and/or sleeping bags
- Fire extinguisher
- First-aid kit
- Flashlight and extra batteries
- Household essentials (detergent, towels, etc.)
- Jackknife
- Kerosene or gas lantern
- Masking or duct tape
- Matches
- Medications
- Nonperishable foods
- Personal care items (soap, toothbrush, toothpaste, shampoo etc.)
- Pet food
- Sanitary supplies
- Spare fuel
- Warm clothing
- Water purification tablets

essary. Dried fruits and nuts are especially good for quick energy, as are the “energy bars” popular with athletes.

Eat the food in the refrigerator first. Refrigerators will stay cool for many hours, although much depends on the season and the house temperature. Open the refrigerator as infrequently as possible; know what you will be retrieving before opening the door. Then use freezer foods, eating first what has thawed.

**Canned Foods.** Canned foods available from supermarkets are meant for a shelf life of a year (or the amount of time it takes to grow and process another year’s crop). However, canned foods are generally safe as long as the seal isn’t broken; to be certain, rotate the cans by using and replacing them regularly. Determine can size by the amount the family will eat in one meal. If a can shows any signs of damage — the ends of the can bulge, the can leaks, liquid spurts when the can is opened, or there is mold or an odd odor — discard the food without tasting.

Remember also that some family members may have dietary restrictions that prevent them from relying on canned foods. For example, many canned vegetables and soups are very high in sodium, which can be a problem for people suffering from high blood pressure. And many canned fruits are packed in heavy syrup that is loaded with extra sugar, a problem for diabetics. Make note of any dietary restrictions in your family and plan your canned-food supply accordingly. And if you have infants, make sure you have what they need on hand at all times.

**Air-dried, Freeze-dried, and Dehydrated Foods.** Stores that cater to campers stock foods that are either vacuum-packed or packed in an inert gas to prevent spoilage. Some of these foods need to be reconstituted with water; others do not. They have a long shelf life, are precooked, which saves you on cooking fuel, occupy very little storage space, are extremely tasty, produce no waste, and are quick and easy to prepare — but they are expensive.

Some companies now provide emergency foodstuffs in bulk (mixed supplies of seeds, dried fruits, nuts, seed grains, beans, etc.) for 8-day, 35-day, 6-month, and 12-month periods

### • BRIGHT IDEA •

Power failures due to snowstorms, sleet, hurricanes, and other natural disasters are often preceded by a warning. In such cases, heat stews, soups, beans, spaghetti, and other one-pot meals and pour them into insulated thermos bottles, where they will keep warm for up to 12 hours.

of survival. Check with your local natural food store or major supermarket.

**Home Canning.** Fruits and vegetables canned by USDA-approved methods (open kettle, water bath, or steam pressure) provide a ready supply of nutritional sustenance and are good for long-term storage. Jams, jellies, fruits, and vegetables are popular home canning choices.

## Cooking Alternatives

If the power fails, you may be without your usual cooking facilities. Electric ranges will be inoperative during a power outage; even home gas stoves ignite electrically. Know in advance what your alternative cooking source will be.

Fireplaces can be adapted for cookout-style cooking. Take a grate from a barbecue pit or gas grill (or even an oven shelf), support it with bricks in the hearth, and prepare one-pot meals using an old pot or kettle. Pots used in a fireplace will be easier to clean if their outer surface is rubbed first with soap. Woodstoves are also great for cooking during an outage. Any one-pot meal can be cooked on a woodstove, and, depending on the size of the top cooking surface of your woodstove, entire meals can be prepared easily.

Two- and three-burner Coleman stoves that burn white gas and stoves that use disposable propane cylinders are available for a modest investment. If your family camps, you may already have one. These stoves are good in an emergency, but before buying one, check that you have pots that will fit the stove; the cooking area for a two-burner stove may be a small 13 inches

### Emergency Food Idea List

#### MAIN DISHES IN A CAN

Baked beans  
Beef stew  
Chicken and noodles  
Chili  
Corned beef  
Hash  
Pork and beans  
Sardines  
Soups that do not require additional water  
Spaghetti/macaroni dinners  
Tuna or salmon

#### FRUIT

Canned fruit  
Dried fruit  
Fresh fruit

#### SNACKS

Cereals  
Cookies  
Crackers  
Dried fruits and nuts  
Swedish hardtack

#### CANNED VEGETABLES

All kinds

#### BEVERAGES

Bottled water  
Canned and bottled fruit juices  
Canned and bottled vegetable juices  
Canned milk  
Coffee and tea  
Non-refrigerated milk  
Powdered milk  
Soda and seltzer

by 20 inches. Long-distance hikers use even smaller stoves that consist of a fuel container attached to a simple burner. These are inexpensive and easy to store, but limit you to one pot at a time. **All of these stoves should be used in a well-ventilated space because they consume oxygen.** The safest place to use them is outdoors, and they should never be used in a tight, enclosed room. Remember, you will need an ample supply of fuel on hand.

Sterno stoves or canned-heat burners can be used safely indoors. Pry off the cover and touch the contents with a lighted match. Extinguish the flame by sliding the cover on top of the flame. Once the can has cooled, the cover can be secured.

**Charcoal grills and hibachi stoves must be used outside the house.** The fuel gives off carbon monoxide, which can be fatal in a closed room. Because this gas is colorless and odorless, you may not be aware that you are inhaling it. Therefore, use charcoal for outdoor cooking only — never for heating. Three or four briquettes in a small (8" x 8") hibachi or charcoal grill will generate enough heat to cook a simple meal. And charcoal briquettes store well.

Don't forget your outdoor gas grill. Even if the weather is freezing, your gas grill can be used for cooking outside in an outage. It can even heat water for bathing. If you have warning of an outage, make sure you have enough fuel to cook several meals.

## Drinking Water Safety and Storage

Water is your body's most critical need. You can probably live two to four weeks without food, but you can only live a few days without water. At the very minimum, each person needs 2 quarts of water per day. If possible, store a gallon per person per day, and to be safe, store a two-week supply. Half of the supply will be for drinking and food preparation, the other half for dishwashing, teeth cleaning, and handwashing. Remember to count juice from stored canned goods as part of your water supply.

If you receive pump-driven water from your own well, water will be an immediate necessity in the event of a power failure. Drilled wells depend on a submersible pump, and if the power fails, you will have no water. Dug (or shallow) wells depend on a pump, too, but in an outage, you may be able to remove the well cover and dip water from a shallow well using a bucket and rope. If you do this, make sure to sterilize the water and, after the power is restored,

sterilize the well. And make sure you replace and secure the well cover after every use.

Also check with your town fire or water district. In prolonged outages, the town may offer emergency water supplies to residents.

City water is usually pumped to storage towers, then gravity-fed to homes. In addition, water departments may have backup generators for their pumps. In either case, you may have water for quite some time. But check with your municipal water authority so you know what to expect in a power failure.

If you wait until the disaster, you may discover that your water service has been interrupted or contaminated (as in an earthquake or flood) no matter what your supply. So to be safe, store a supply of drinking water. Plastic is a better container than glass because it is lightweight and shatterproof, but do not use plastic containers previously used for foodstuffs, chemicals, or commercial drinks for long-term water storage. Containers will need tight-fitting lids to prevent evaporation. Store your water supply in a dark place; sunlight has an adverse effect on plastics. Properly stored water should have a shelf life of a few years. To be safe, rotate your water supply every month for purity and taste.

For longer-term storage, water should be sterilized or disinfected. To sterilize, fill glass canning jars with water, leaving 1" of headroom at the top. Place a sterilized lid on each jar and process in a boiling water bath — 20 minutes for quarts.

To disinfect, treat each gallon of water (stored in plastic or glass containers) with 16 drops (or ¼ teaspoon) of liquid chlorine bleach, which will kill or inhibit the growth of microorganisms. Sterilized or disinfected water should be safe for many years.

Water from sinks, showers, water lines, toilet tanks, and hot-water tanks is potable (fit to drink). However, water used from hot-water tanks for emergency drinking water should be free of

sediment and rust. Drain the tank every month until the water is clear to ensure 40–60 gallons of potable water.

Keep in mind that in a power outage, electric hot-water tanks will no longer be under pressure. Before water can be drawn, the system will need to be vented.

Usually this can be accomplished by opening a faucet in the hot-water line. Then drain off just what you need from the tank each time. If you have not maintained a sediment-free tank, filter the water before drinking or cooking with it.

Use water drained from a heating system or from waterbeds only for toilet flushing and hand washing — never for drinking. Swimming pool water is not potable, but water from refrigerator ice cube trays is.

## Let There Be Lights

Light will be an immediate need, so always keep a flashlight handy. It is a good idea to have more than one flashlight, perhaps even one for every member of the family, kept in each bedroom (the power always seems to go off at night), and a large four-battery flashlight for the kitchen or living room. Have spare batteries and bulbs (in the middle of a prolonged outage, they will vanish quickly from store shelves), and check them every three months to be sure they are still good.

Rechargeable, long-life flashlights are available, as are rechargeable batteries. Rechargeable batteries have a shorter life than conventional batteries, something to be aware of in a prolonged outage. Rechargeable flashlights plug into household current to keep the batteries at full charge; whenever there is a power failure, it serves as a flashlight.

Although candles may be romantic, they are also dangerous. Candles can be tipped over or allowed to burn so low that they become a fire hazard. In addition, too many candles are required to provide just minimal lighting. Never leave candles unattended.

• BRIGHT IDEA •

In the warning time before an outage, **store as much water as possible.** Fill your washing machine, sinks, bathtub, and any clean containers. Buckets, dishpans, empty soda bottles, barrels, large cookpots, plastic storage bins, and even sturdy plastic bags can be used to hold water for a few days.

If the outage is weather related, you may have access to unlimited water supplies (snow in the North and rain in the South). Use this water for sanitation, or purify for drinking.

## Two Ways to Purity Water

- Boil the water for 5 minutes. For every 1,000 feet above sea level, boil 1 additional minute.
- Add 1 halazone tablet to each quart of water. Let it stand for a half hour. If the water is murky, double the number of tablets and the amount of time you let it stand. Halazone tablets are available at camping stores and pharmacies.

Consider buying candle lanterns, popular with campers. They consist of a long-burning candle inside a metal-and-glass lantern and often come with hooks and handles for hanging and carrying. They are much less dangerous than are bare candles, and provide a steadier light, as the flame is protected by the glass chimney.

Kerosene lamps yield better light than either flashlights or candles, although they are potentially hazardous. Kerosene is highly flammable; it should be kept in a special can and stored outside, if possible, until needed. For maximum light, the wicks should be trimmed and the chimneys cleaned. On a quart of fuel, a kerosene lamp will burn 10 to 12 hours.

Aladdin-brand kerosene lanterns have incandescent mantles that increase the light output from the wick, but the flame must be adjusted carefully to avoid charring. These lanterns are relatively expensive, but produce the equivalent amount of light of a 75-watt bulb. When not in use, they should be taken apart and the fuel emptied into bottles for storage, because kerosene evaporates quickly when exposed to air.

Single-mantle and double-mantle propane lanterns are another option. A disposable propane gas cylinder attaches to the burner. The single-mantle lantern provides light equivalent to a 100-watt bulb and burns for 10 to 14 hours, while the double-mantle lantern provides light equivalent to a 200-watt bulb with a burning time of 5 to 7 hours. Use these in a properly ventilated room.

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Many companies sell inexpensive flashlights that recharge in the cigarette lighter of your car. These are handy during a power failure because they don't need batteries and, if the outage is a long one, you can run the engine of the vehicle to recharge them.

## Keeping Warm

Heat will be one of your major concerns if you live in the North and the outage occurs, as they often do, in winter. The first thing to do is to dress warmly.

**Clothing.** Clothing insulates the body, but it does not necessarily follow that the more you wear, the warmer you will be. Generally, each sweater increases the body temperature by 3.7 degrees, but it is the warm air between the layers of clothing that insulates the body. Waffle weaves, fishnet, quilted, bonded, and pile fabrics and

sweaters create air spaces and should be worn close to your skin. Very tight layers leave fewer air spaces, so make sure you have comfortably large outer layers. Outdoor sports companies sell a vast array of cold-weather clothing, from silk underwear to fleece jackets and hats. In an emergency, even newspapers can be used as an insulating layer.

Long johns add leg warmth. If you don't have long johns, try tights, pajama bottoms, or leggings. Lined slippers, slipper socks, down-filled and fiber-filled booties, even plastic bags help insulate your feet. Mittens are warmer than gloves — or you can use socks. Because your body loses a great deal of heat from your head, you should wear a hat, especially when sleeping.

Bed is the warmest place in the house. Several lightweight blankets are better than one very heavy blanket. Beds can be further warmed with hot water bottles or bricks warmed by a wood or coal fire, then wrapped in towels. And of course there is body warmth. Children and elderly people get cold more quickly and should sleep with others during a cold-weather outage. If the outage is a prolonged one, plan on having the family sleep together in one or two beds relocated to the warmest room. You will all lose less body heat this way.

**Other Heat Sources.** If your home depends on electricity for heat, you may want to think about auxiliary heating systems. Fireplaces will slow any temperature drop and at close range provide some comfort, but they may pull more warm air from the house than they provide. To increase efficiency, a fireplace can be fitted with heat-circulating metal inserts or with hollow tube grates.

Portable space heaters that use oil or gas are also available. Propane catalytic heaters are another option. They have a wick that draws fuel from a tank. The heater is relatively cool and is safe, clean, and efficient. These space heaters are especially beneficial when placed near vulnerable water pipes.

Use any space heaters with care. Every year, hundreds of house fires are caused by space heaters placed too close to flammable materials, being tipped over, or being used improperly. Before buying one, check

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**In a long, cold outage, pile whatever you can onto the beds to keep warm.** Use spare sleeping bags, tents, drapes, furniture slipcovers, large towels, and extra coats to keep warm.

If you have pet dogs or cats, let them sleep with you; they will help keep all of you warm.

that it is UL-approved, has a thermostat to prevent overheating, and has a grille to protect the combustion chamber. And never store flammable fuels in the vicinity of a space heater.

Wood-burning, coal-burning, or combination wood- and coal stoves may be the best backup systems, but they involve a substantial investment. If you do not intend the appliance for permanent use, buy a stove that is practical for emergency use only. Follow the manufacturer's installation and venting instructions. And make sure your chimney is kept clean. If you have a wood- or coal stove you use rarely, remember to keep a good supply of fuel on hand; in an outage, supplies may run low or may be unable to reach your home with a fresh supply.

## ***Fire Precautions***

Discuss with all family members the location of fire extinguishers, and their uses. Check smoke detector batteries regularly and make sure children know what they sound like. Also make sure everyone knows the locations of flashlights, first-aid kits, and emergency exits. If you have children, conduct fire drills every few months, so they understand and remember what to do in case of fire. If you live in an isolated area, prearrange a distress signal to tell your neighbor you need help if phone wires are down. Lights, flags, bells, whistles, automobile horns, and battery-operated horns all will work.

## ***Contact with the Outside World***

A battery-operated radio will keep you informed about the severity of the blackout, as local radio stations are usually a primary source for disaster instructions. But if you have a medical or other emergency, you need to think about how to contact help, because phone lines may not be functional.

A battery-operated or car-based CB radio may be helpful, as police routinely monitor certain citizen's bands. Unless you have a cellular phone, this may be the only way to contact emergency services for people in rural areas trapped by storm damage.

Consider the purchase of a cellular phone. A battery-powered cell phone will still work in a power outage and you can use it to

contact authorities. But keep in mind that you will have to pay monthly fees to keep a cell phone active.

## ***Transportation***

During an outage, you may have to travel for medical help or for supplies. During a prolonged outage you may need a way to leave your home for an emergency shelter. If you have warning of a storm, fill the car with gasoline and park it where you will have the best access to traveled roads. Protect the car from blowing snow, and make sure it is parked clear of trees, branches, phone poles, and other things that could damage it or block access to it. Store blankets, a shovel, flashlight, jumper cables, flares, and a bag of sand in the car, and be sure the snow tires are on. Take food and water in case you become stranded on the road. If you are stranded in a car in a storm, stay in the car and run the engine occasionally for warmth, leaving a window open a crack and making sure the tailpipe is clear of obstructions.

### **First-Aid Kits**

A first-aid kit and manual are essential, especially in any emergency when medical help may be difficult to summon. Also have a reserve of any medication that is needed on a regular basis. If you wear glasses or contact lenses, store a spare pair where you will find it in an emergency.

#### ***First-Aid Supply Checklist***

- |   |  |
|---|--|
| <input type="checkbox"/> Adhesive strips  | <input type="checkbox"/> Ethyl alcohol, hydrogen peroxide, or other disinfectant |
| <input type="checkbox"/> Adhesive tape  | <input type="checkbox"/> First-aid book  |
| <input type="checkbox"/> Antibiotic ointment  | <input type="checkbox"/> Gauze bandages (2- and 4-inch)                          |
| <input type="checkbox"/> Antiseptic wipes   | <input type="checkbox"/> Gauze pads  |
| <input type="checkbox"/> Aspirin, ibuprofen, acetaminophen, or other over-the-counter analgesic | <input type="checkbox"/> Hydrocortisone cream                                    |
| <input type="checkbox"/> Burn ointment  | <input type="checkbox"/> Oral thermometer  |
| <input type="checkbox"/> Decongestant tablets   | <input type="checkbox"/> Prescription medications                                |
| <input type="checkbox"/> Children's pain reliever   | <input type="checkbox"/> Safety pins   |
| <input type="checkbox"/> Elastic bandage  | <input type="checkbox"/> Scissors  |
|   | <input type="checkbox"/> Tourniquets   |

If you live in a flood-prone area, plan to evacuate before the water rises high enough to strand you in the house. Remember that flooded rivers are swift and dangerous, and often full of fast-moving downed trees and other hazardous debris. If you are trapped, contact emergency authorities. The best plan is to park a car on high ground with a good route to safety, and to evacuate before the water rises too high.

If you have to travel on foot, dress warmly. Skis or snowshoes are useful in winter, a bicycle in summer. No matter what the season, in an outage due to weather or natural disaster, be prepared to encounter obstacles. If you must leave your home, take water, a first-aid kit, an emergency blanket, and food. And watch for fallen power lines. You may have to detour to avoid them.

## Steps to Take during a Blackout

Being prepared is only part of the response to a blackout. Once the power is gone, there are steps you must take to ensure the safety of your family and your house.

Many power outages are caused by fallen power lines. Never touch or even get close to a downed wire. If a wire is down near your house, immediately call the power company — if you still have phone service. If it is a threat to passersby, you can place warning lights, flares, or other obstacles well away from the wire. But if it is sparking, smoking, or moving at all, keep away entirely and try to get word to the power company.

### Protect Your Heating System

There are things you need to do to ensure that your heating system is not damaged during an outage or when the power goes back on.

#### **Step 1. Check your heating system to see if it is still working.**

**Gas Systems.** The main gas burner must be operating if you are going to have heat in the house. If the burner has a manual control, this will be easy. Look for a button or switch on the gas line feeding the burner that allows for manual operation. If there is no such control, there is no way of getting gas to the main burner.

Whatever you do, do not try to light the burner with a match. A great deal of gas is fed into the main burner, and it may flare when

ignited. To use the control, press or turn it until the main burner lights. The initial flame is provided by the pilot.

If there is an interruption in the gas supply, the gas company should be immediately on hand to turn off the gas to your house. However, you may be able to do this yourself. Just shut off the main gas-control valve to your home. The valve will be located near the meter and may be inside or outside your house. If you suspect a problem and cannot shut off the gas, get in touch with the fire department and gas company and leave the house immediately. Gas is poisonous to breathe and extremely explosive. If you do manage to shut off the gas to your house, open all windows and doors to ensure that any residual gas escapes. Don't light any matches, or even turn on or off electric lights in the presence of free gas. Tiny sparks in the light switch resulting from the action of the switch could set off an explosion.

**Hot-water Systems.** Open the flow valve on the water feed line and shut off the pump motor. This allows heated water to be gravity-fed through the system. There will not be as much heat as when the pump is operating, but there will be some.

**Hot-air Systems.** A hot-air system can provide heat (by gravity) even though the furnace will have to operate without the blower. Remove the filter(s) and shut off the blower motor. Some warm air will rise through the registers, which is better than nothing.

**Coal Furnaces.** Stoker-fed coal furnaces can be fed with a shovel. If the fire has to be restarted, fill the furnace with paper and kindling just as you would to start a fire. Then hand-feed the coal. Regulate the fire by opening or closing the manual air damper.

There may be a buildup of pressure and temperature inside any furnace operated manually. If there is a throttle on the gas line that permits you to raise and lower the flame, as with a kitchen range, lower the flame for 10 minutes every half hour or so to allow the furnace to cool. If there is no throttle, shut it off with the manual control for 10 minutes every half hour. Once electricity is restored, make sure the manual controls are turned off, then return the system to normal automatic operation.

#### **Step 2. Conserve your heat.**

If you still have an operable furnace, conserve heat in case fuel deliveries are delayed. If your heating system is not operable, and you are planning to heat with a small stove, a space heater, or a fireplace (none of them is too efficient), conservation of heat is even more critical.



Choose a living space in which you can wait out the power failure. An inside room loses heat the most slowly. Outside rooms with lots of windows lose heat more quickly. Isolate your chosen room as completely as possible from the rest of the unheated house, but do not cut it off from the basement. The earth usually stays around 50°F, which means the basement should provide some warmth. If the furnace is still warm or giving off heat, move into the basement while preparing another area of the house.

Close all doors to your chosen living room; stuff newspapers or sheets between the door and the frame. Roll up a throw rug, towels, newspapers, or blankets and push them against doors to prevent drafts. Plan openings and closings of doors (especially of exterior doors) to prevent excessive heat loss. Hang blankets, bedding, drapes, or shower curtains over the windows and secure them to the window jambs with masking tape to prevent as much movement of cold air as possible.

If your power failure extends over a long period, leave south-facing windows exposed on sunny days so that they will let in the much needed warmth. But cover the windows at night, or you may lose as much heat as was gained during the day. In a hot climate, do the reverse. Open windows at night to cool your living area, but close them and cover windows during the heat of the day to help keep the living area as cool as possible.

You will be more comfortable in a tightly closed room with no heat source whatsoever than in a room that is properly ventilated for a space heater — at least until the house temperature drops below 50°F. Likewise, until the house temperature drops below 50°F, you will lose more heat through the chimney with a roaring fire in the fireplace than you will gain. If, however, you have an airtight, wood-burning or coal-burning stove that is properly installed and requires no ventilation, you can fire it up at any time.

### **Step 3. Start your alternative heat source, if necessary.**

No matter how careful you are with your heat, if the power failure extends over a long enough period, your interior house temperature will drop below 50°F in winter. This is the time to start up your alternative heat source.

Fireplaces can burn firewood, wood chips, scrap lumber, corn cobs, magazines, and twigs. Ideally, burn dry wood that has seasoned one to two years, but if there is an emergency, such patience may be impossible. Both ash and sumac burn well even when wet and green.

### **Fireplace fires can be dangerous; never leave a fire untended.**

If the heat is essential, take turns watching the fire, or make a cover of sheet metal to block off the fireplace at night. Glass doors are ideal fireplace covers, but in an emergency, you may have to improvise. Spark screens are helpful but in no way foolproof, nor do they prevent a downdraft in the chimney from pushing noxious gases out into the room. Move all flammable materials like rugs, furniture, and curtains out of range of flying sparks. Do not burn trash or briquettes indoors; both give off highly toxic gases.

Space heaters can also be dangerous. Asphyxiation is possible from insufficient oxygen and an excess of poisonous gas. Be sure to provide cross ventilation. For safety, open a window on each side of the heater and have a person awake at all times. If you begin to feel drowsy, there is inadequate ventilation. To prevent plumbing and heating systems from freezing, set up the space heater in the basement near water pipes and in the area of the boiler (if you have a hot-water system).

## **Water Concerns**

During an outage, there are three main concerns with respect to water. You need to have enough to meet all your drinking and eating requirements. You need to prevent your pipes from freezing because they may cause a great deal of damage when they thaw. And you need additional water for sanitation purposes.

Once you have stockpiled sufficient water to meet your drinking requirements, the safety of your water pipes is your next concern. Frozen pipes can be costly and messy. If the power goes out for an extended period and the outside temperatures are below freezing, the pipes, regardless of how well they are insulated, may freeze. **Take the following steps to prevent frozen pipes.**

- Set the faucets on the first floor at the rate of a fast drip. Water enters a house at above freezing temperatures; if kept moving, the water will not have a chance to freeze.
- Open the hot water faucets every three or four hours and let the hot water run for 5 minutes. You can do this only if you have a gas or solar hot-water heater. Opening the faucets periodically will warm the hot-water pipes and prevent them from freezing. The cold-water faucets, however, should be kept open and allowed to drip continuously.

- Oil or propane space heaters should be kept operating in the basement near the boiler or in the area of the pipes. Be sure to leave a window opened an inch to adequately vent the heater.
- For plumbing systems in danger of freezing, the pipes may have to be drained. When water freezes, it expands; this expansion will crack the pipes. When the water thaws, the pipes will begin leaking; and if the main supply valve has not been closed, water will gush out of the crack(s), flood your basement, cause thousands of dollars of damage, and create a terrible mess.

## Sanitation

You will think longingly of the old-style outdoor privy if the outage lasts very long and your water is in short supply.

To conserve water, disconnect the lift chain or the trip lever from the lift wires of the toilet to prevent accidental flushing. Put used toilet paper in a covered container, and flush the toilet only to prevent clogging.

If you have a severe shortage of water and no snow to melt for toilet use, line the toilet bowl with a plastic bag to collect waste materials. Metal containers with tight-fitting lids can be adapted for the

## Draining Your Pipes

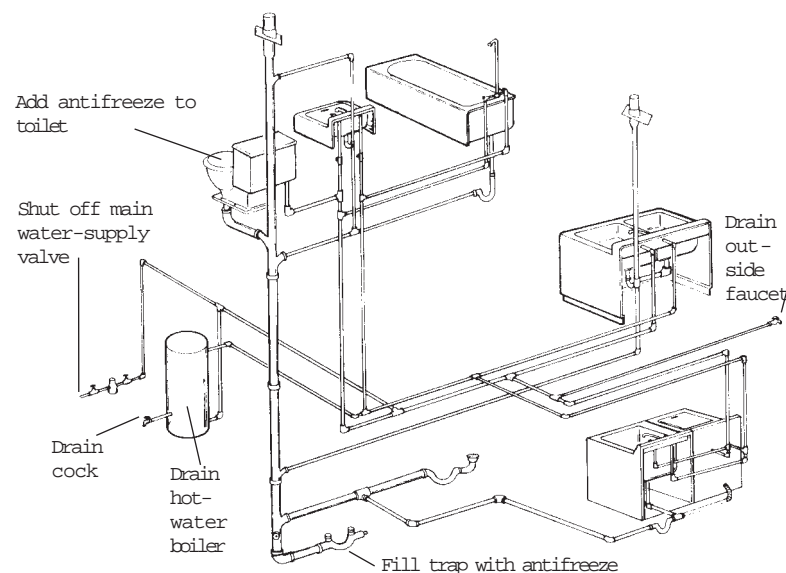
Before draining your system, turn off the hot-water-tank heat source. Then close the water supply to the heater and close the main shut-off valve — usually a blue handle located near your water meter in the basement. Turn the handle clockwise to shut off water to the house.

Turn on all water faucets, including tub and shower faucets, and flush all toilets. Next, drain water from the lowest faucet, usually at the boiler or at a basement laundry washer. Save all this water if water is in short supply.

Dip water out of the toilet bowls and tanks with a sponge. Then add 8 ounces of antifreeze, kerosene, or alcohol to the toilet bowls to keep any remaining water from freezing. Run the dishwasher and washing machine a few minutes to pump out water already in the units. Also drain ice makers and humidifiers. Showers, sinks, and tubs have drainage traps; add kerosene or antifreeze (2 to 3 ounces) to prevent the trap water from freezing.

To drain the water heater, be sure the gas or electricity that heats the tank is turned off and that the valve between the water supply and the heater is closed. Reduce the amount of water to be taken out by opening the house hot-water faucets to remove water in the pipes. Also open the hot-water faucet in the lowest part of the system.

Let the remaining water in the tank cool. Then attach a hose to the drain cock near the bottom of the tank and run the hose to a floor drain to the outside. If you use a plastic garden hose, the hot water will weaken the plastic and may ruin the hose. Use a rubber hose instead. If necessary, the water can be removed by bucketfuls.



If you have a hot-water heating system, see the box on page 20 for instructions on draining that system.

You may not have to drain the entire system. Begin by draining all endangered pipes, including hot-water pipes to unheated spaces. Then protect all exposed pipes. This way you may avoid draining the entire system if the outage is neither severe nor prolonged.

If you have to abandon your house because of an outage, turn off the water and drain the pipes if there is any danger of freezing.

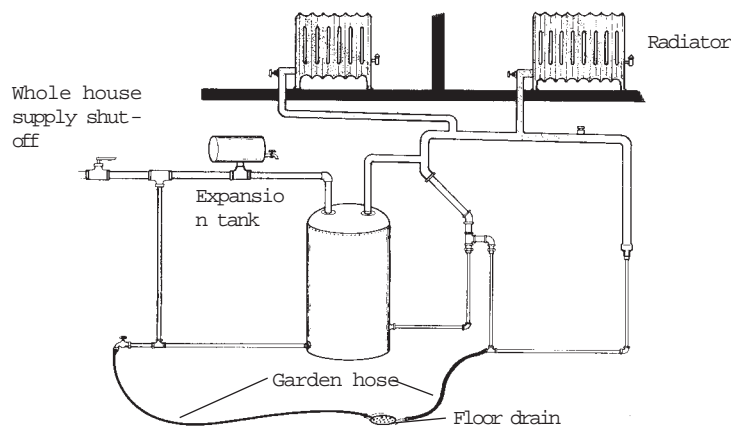
same purpose, or you can purchase a portable toilet. Store garbage and human waste outside in cans with tight-fitting lids.

## Draining Your Hot-Water Heating System

Hot-water heating systems circulate hot water, heated in a boiler, through pipes and radiator units. These will have to be drained. For a time after a power failure, the water will still circulate without being pumped, but cold weather and a prolonged outage may endanger these pipes, too.

To drain, attach a hose to the drain valve that is in the lowest part of the system, generally at the base of the boiler. Open and drain water from all radiator bleeder valves. The expansion tank for the hot-water system must also be drained.

There will still be water in some of the pipes. Look for a vertical shut-off valve to drain the water stored in the pipes between the water meter and the hot-water tank. Open this valve to drain the lowest part of the system. There is still a short section of pipe between the water meter and the vertical shutoff. With a hacksaw, saw this section of pipe in half. Bend the two parts of pipe to drain both sections. Once the power has been restored, solder these pipes together before the water is turned on.



## Appliances

Immediately disconnect all appliances that run continually on electricity, such as freezers, refrigerators, electric pumps of water systems, and furnace blowers on forced-air systems. Also disconnect air conditioners and ovens, which have high starting-wattage requirements. This is done to safeguard the appliances. When power is turned on after an outage, it is often initiated at half the usual voltage. The motors of appliances will work faster, trying to draw the missing voltage. If the half voltage continues for an extended period, the result can be a burned-up appliance motor. Also, power spikes and surges are common during lightning storms and when power is being restored. Vulnerable electronics like TVs, VCRs, and computers can suffer significant damage if not unplugged.

To keep informed of the status of electric power, leave a light turned on in a conspicuous area of the house. When the power comes on at half voltage, the lamp's bulb will glow dimly. Wait a half hour after the lightbulb glows normally before reconnecting your appliances.

### Protect the food in your refrigerator and freezer from spoiling.

- Keep the doors closed as much as possible.
- Insulate the freezer with blankets.

For longer outages:

- Move the food to a friend's refrigerator or freezer, *or*
- Place a 25- to 50-pound block of dry ice on a piece of cardboard in the freezer, *or*
- If outside temperatures remain consistently below 0°F for freezer foods, or below 40° for refrigerator foods, place the food outdoors, but out of the sun.

A full, well-insulated freezer will keep food frozen for two days if left unopened; a half-full freezer will keep food frozen for a day. Larger freezers will preserve food longer than will smaller units. Cover the freezer with blankets to keep in the cold.

Dry ice will hold the freezer at 0°F for 36 hours. **If you decide to use dry ice, remember to handle it very carefully.** Wear thick gloves; dry ice is solid carbon dioxide gas that melts at minus 109°F. It will damage bare skin instantly.

## Safety Tips

- Unplug all major appliances to prevent them from being damaged when the power is restored. Unplug all lights except one so that you will know when the power returns.
- Have emergency telephone numbers listed and kept in an accessible location, preferably next to the telephone.
- Make preparations and review plans with everyone living in your house. If infants or elderly people will be involved, make plans to take them to relatives or neighbors if they will be better cared for there. If you are friendly with neighbors, or have relatives living nearby, find out if they have such things as a portable generator or woodstove. Make emergency plans together.
- Check into community emergency food and fuel supplies, emergency shelters, and evacuation plans.
- Be sure your supplies of fuel and medication are out of the reach of children. Do not store them where they can contaminate food and water.
- Provide adequate venting for any alternative heating equipment. Asphyxiation is possible if there are excess poisonous gases and insufficient oxygen. Open windows to provide cross ventilation.
- Repair windows broken in the storm with heavyweight clear plastic and some tape, staples, or tacks.

### Emergency Evacuation Checklist

- Turn off power at the circuit-breaker box.
- Drain water pipes and heater.
- Pour antifreeze into all water traps.
- Store canned and bottled foods on inside walls to prevent freezing.
- Take pets, plants, and valuables with you.
- If possible, check your house daily.

## When Power Is Restored

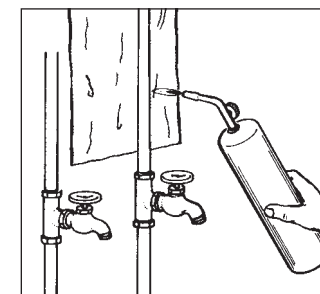
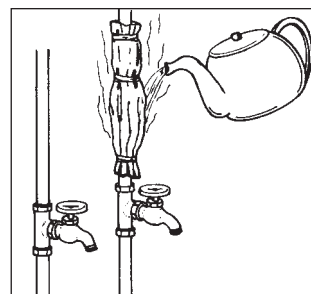
When power is restored, restart your heating system, thaw any frozen pipes, restore your appliances to working condition, and evaluate your food for spoilage. Keep in mind that power companies have priorities for power restoration. They work with local authorities to restore power first to critical areas and services

(hospitals, municipal water facilities, and police and fire stations). Then their priority is to restore power to the greatest number of customers first. So if you live in an outlying area or on a street of few

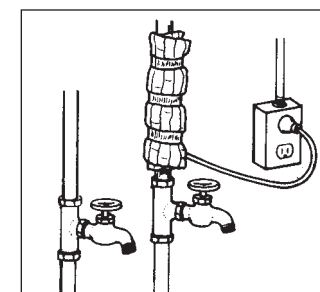
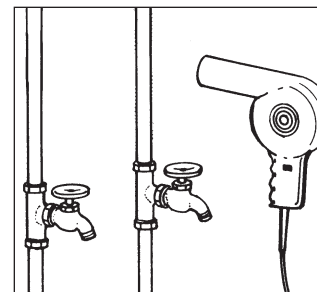
### To Thaw Frozen Pipes

Usually pipes do not freeze their entire length; they freeze at points where they are exposed to the cold, especially near sills, exterior walls, and uninsulated spaces. To locate the freeze-up, turn on the water faucets. Follow the frozen pipe back to a juncture. Then test water taps off this second pipe to determine whether the pipe has frozen farther downstream.

Once you have located the culprit section of pipe, you probably can pinpoint the location of the freeze-up by deciding where the pipe is the coldest. Open the affected faucets to allow for the expansion of the frozen water.



*Try to thaw pipes with hot water poured on rags wrapped around the pipe (left), or try a propane torch with safety shielding behind it.*



*You can also try to thaw frozen pipes with a hair dryer (left), or with an electric heating pad if you have an outlet nearby.*

houses, you may have to wait several days or even weeks for power to come back at your house.

## Turning the Heat Back On

**Gas.** The gas company has emergency crews to restore power as well as to reignite pilot lights. However, there are usually instructions for relighting the pilot on the front of most units. Follow the manufacturer's instructions.

**Hot-water System.** To refill a hot-water heating system, open the water-supply inlet to the boiler. Keep the venting valve open on the entire system, until you hear water filling the pipes and water drains from open hot-water faucets. Close the venting valves and then restart the water heater. Late in the day, vent all valves to release the trapped air.

**Electric.** Turn your thermostat way down; then, at half-hour intervals, raise the thermostat by two degrees. This helps to evenly spread the electric load of your community.

## Food

When the power is restored, refreeze partially thawed foods only if they contain ice crystals. The ice crystals show that the food has remained at 40°F or below. Food with no ice crystals left in it is said to be defrosted and generally should not be refrozen. Fruit can be refrozen but with a decrease in quality, and bread can be refrozen. Label it and use it first. Bacteria that cause spoilage are not destroyed by freezing; they are kept inactive only as long as the food remains at 0°F. Should the food thaw, the bacteria will start to grow, and food poisoning is possible. Therefore, examine all food for spoilage before refreezing.

# Generators

Generators are machines that change mechanical energy into electrical energy. They are essential to operations that depend on continuous electrical service, such as hospitals, broadcasting systems, chicken hatcheries, greenhouses, and farms with milking machines

and milk coolers. Generators can also provide dependable power to homeowners who face frequent or extended power outages and must keep their sump pumps, freezers, and furnaces operating.

A generator is not inexpensive, but it is the surest protection against the inconvenience and even serious losses that can accompany a power failure. Is it a justifiable investment for you? The answer depends on the history of outages in your area and how extensive the impact may be on you. It is quite possible that one interruption in service could cost you more than the price of a generator; in that case, the unit is well worth the expense. If you think you are vulnerable, consider buying when they are not so scarce.

## Types of Generators

If you have a farm tractor, you are probably familiar with the *tractor-driven generator* that has no engine of its own. Most homeowners, however, opt for a self-contained generator with a small engine run by gasoline, LP (bottled) gas, natural gas, or diesel fuel.

Typically a generator has two parts: an alternator that produces 12-volt alternating current and an engine similar to that of the average lawnmower. Both parts are protected within a frame or housing. Electric power is delivered through one or more 120-volt AC outlets.

The *portable generator* is a small mobile unit that can be taken to remote construction sites, boat docks, hunting camps, or anywhere power is needed away from electrical outlets. Its usefulness during a home power failure is limited. With the help of long extension cords, it can power lights and small appliances that normally plug into wall outlets. Portable generators cannot power water heaters, well pumps, or large appliances that require large start-up wattage or are hardwired, not plugged, into junction boxes.

The *stationary generator* is a larger unit for home emergency use only. It is permanently connected to the house circuitry and is installed outside the residence at the entry point of the power line. When commercial power fails, the homeowner starts the standby generator and throws a transfer switch to change the service box over to generator power. Through the transfer switch, emergency power is sent directly to the home wiring system. Appliances can then be used in the normal way (within the wattage limit of the generator). Some units will transfer this electrical load automatically.

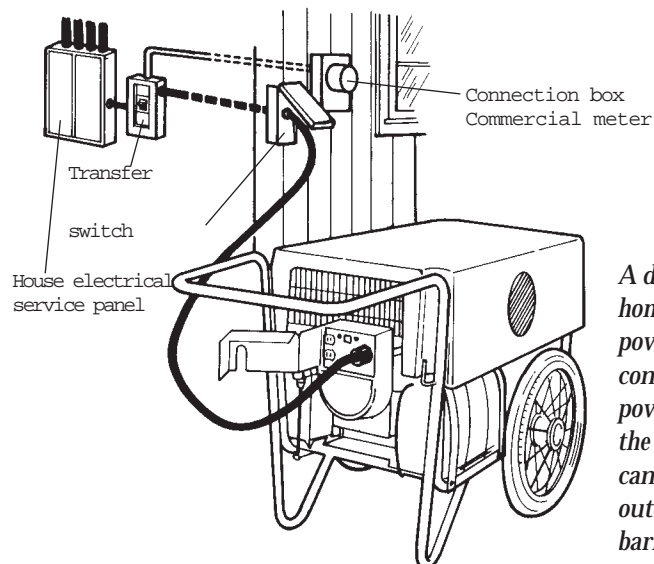
The *dual-purpose generator*, offered by a few manufacturers, is a mobile unit that can also be used in a power failure to take over the home's electrical load at the service box. When commercial service is interrupted, the generator is wheeled or carried to the outside wall of the home, plugged into a special receptacle, and operated like a stationary generator. When service is restored, the generator is disconnected and is available for recreation or handyman jobs.

Both the stationary and the dual-purpose generators require modifications to your house electrical system in advance of the emergency. These adjustments must be done by a licensed electrician. Remember to include the electrician's estimate when calculating the cost of the unit.

Installing a generator in your home may raise local regulatory issues. First check on local storage restrictions for flammable fuels; interconnection requirements if the generator will be connected to the house's electrical or natural-gas supply; and building permits if you will be constructing a pad or shed to protect the unit.

## What Size Do You Need?

Generators are available in many models, with engines that vary from 3.8 to 12 horsepower. What affects the homeowner is the gen-



*A dual-purpose, home emergency power generator connects to your power system at the service panel. It can be stored in an outdoor shed or barn until needed.*

erator's electric power output, expressed in watts or kilowatts (1 kilowatt = 1,000 watts). This can range from 1,750 to 5,000 watts. The size generator you need depends on how much power you require to keep your home functioning in an emergency. Remember, portable generators will operate only plug-in appliances. Such a unit may be sufficient if you have an alternative power source for heating and cooking needs. However, if your "survival appliances" include a stove, sump pump, furnace, and well pump, or if you intend to power your entire house, you will need a dual-purpose or stationary generator; both installations require professional wiring of a transfer switch at the electric service breaker box.

To determine your wattage requirement, decide when your use of electricity is higher — in winter or in summer. Then decide what tools and appliances you need to use at the same time should a power failure occur in that season. Obtain wattage requirements for each appliance from its nameplate. (The load may be given in amperes; just multiply amps times volts to get watts.)

Lightbulbs, radios, and small appliances, such as hand drills, use the same wattage to start as to run. A 100-watt lightbulb, for instance, always uses 100 watts. But electric motors that drive heavier equipment, such as air conditioners, water pumps, and refrigerators, require a surge of power to start. Start-up wattage may be three, five, or even nine times the wattage needed for operation.

In your calculations, it is not necessary to include start-up figures for all appliances. It is highly unlikely that they will all start up at the same time — and in any case, most generators are protected from overload by circuit breakers.

Take the start-up wattage for your largest power user and add the operating wattages for the other appliances you will need. (See table on page 28.) This will determine your generator size. Because a generator is a once-in-a-lifetime investment, include wattages for equipment you intend to buy later.

## More Buying Tips

Once you have decided the type and size you need, consider some further points before you invest in a generator:

- Look for a product made by a reputable manufacturer. Check the warranty before you buy, and find out whether there is an authorized service facility in your area.

- Generators are expensive. Unless there is reason to do otherwise, buy one that will handle only your “survival needs.” This will lower the initial cost.
- A generator is only as reliable as its engine. A cast-iron engine block will usually last longer than one made of alu-

### WATTAGES FOR HOUSEHOLD APPLIANCES

Wattages Shown Are Approximate

<b>Appliance</b>	<b>Starting Load</b>	<b>Operating Load</b>
Air conditioner (window)	3,000	900
Clothes dryer (gas)	900	300
Coffeemaker		800
Dehumidifier	900	300
Dishwasher (without electric drying element)	900	300
Fan (attic)	900	300
Fan (furnace)	750	250
Fan (window)	600	200
Freezer	900	300
Frying pan		1,200
Heater (space)		1,200
Lights	as indicated on bulb	
Microwave oven		500-1,500
Refrigerator/Freezer	1,000	330
Stove		
(each element)		1,000
(broiler)		1,400
(oven)		4,000
Sump pump	1,200	400
Television (b&w)		160
Television (color)		300
Toaster		1,100
Washing machine	1,100	375
Water heater		3,000
Water heater (quick recovery)		4,500
Water pump	1,100-1,500	350-500

minum. Also, be sure you can start the engine easily. Some units have electric starting, some have recoil, and some have an electric starter with a recoil backup.

- Because overloading can burn out a generator, the unit should be protected by a circuit breaker. A voltage regulator, which prevents damage to appliances caused by variations in generator power, is another feature to look for; it's on most models.
- Find out approximately how long the unit will run on a tankful of gas and whether it is equipped with an auxiliary tank for extended use without refueling; most units hold 1 to 5 gallons of fuel and will run 2 to 5 hours on a tank.
- Fuel tanks for gasoline-operated units are usually relatively small, and if there is a heavy power drain, the generator will require frequent refilling. As local gas stations may be inoperative because of the power outage, consider a unit that runs on natural gas; the supply of natural gas will not be affected by the outage. The fuel is clean burning, requires no on-site storage tank, and exhaust emissions are minimal. But it will add to the initial cost. Generators can be modified to run on LP or bottled gas, as well. These units are more expensive than those that are gas-fired, but propane is a clean fuel, and maintenance and repair costs are lower.
- Determine whether items such as a battery and transfer switch are included in the purchase price.
- A cover is desirable to protect the unit from weather, dirt, and tampering. Some generators include additional safety features to prevent children from injuring themselves or damaging the machine.
- Portability may be important. If you will be using the generator for multiple tasks, know that it is mobile. The large-wattage units come with a handle and wheels, but smaller units don't — and can weigh a couple of hundred pounds.
- Some generators include the option to switch from 120-volt to 240-volt current, a necessity to run a submersible pump.
- Consider the operating noise of portable and dual-purpose units. Because you will be using them for other tasks, excessively noisy units may be annoying.

## Location

A generator must be used outdoors because of the exhaust fumes. The site should be dry, level, easy to reach, and within 10 feet of the transfer switch (usually installed next to the household service box). The unit can be placed under a porch or overhanging roof for shelter. Don't locate the generator near the sleeping area because of the fumes and noise.

You will also need a safe place to store the gasoline or other fuel — well away from the home, and in UL-approved cans or, preferably, in an underground tank.

## Installation

A home emergency power system must be installed in accordance with the National Electrical Code or local ordinances. You may also need the approval of the power company.

In the case of a stationary generator, the unit will be permanently connected to the service disconnect (main fuse or breaker

### The Automobile as Generator

The automobile is an emergency source of electrical energy. A 10-volt trouble light can be successfully plugged into the cigarette lighter, and with some modifications and an inverter, cars and trucks can deliver 110 volts of 20-amp AC current — enough to power lights and a few small appliances.

In 1998 Aura Systems began production of AuraGen, a 5kW generator that converts energy from a truck, sport-utility vehicle, or RV into electrical energy. The AuraGen is mounted under the hood with an outdoor receptacle mounted on the side of the vehicle for plugging in 120-volt or 240-volt appliances. When the vehicle is at idle or low speed, enough power is produced to run lights, a refrigerator, and the house heating system for a couple of days on a tankful of gas. This duration can be extended if the truck is turned on only intermittently or when house power is needed. The system is an investment, but produces "clean" and stable (without surges or oscillations) power that will run even the most sensitive electrical equipment. And it is as handy as your truck.

box) of the house. If the generator is a dual-purpose type, a receptacle must be installed (usually a weatherproof one located on the outside wall) so that the unit can be plugged in when needed.

Because most home emergency power systems are turned on manually, a transfer switch must also be installed so that you can transfer the load from commercial to generator power. The transfer switch should be an enclosed, double-pole, double-throw type with an ampere rating equal to that of the service entrance — in most cases, 100 or 200 amps. In one position, the switch connects the load to the commercial power line; in the other, it disconnects the load from the utility line and transfers it to the generator.

Improper connections to the house's electrical system can allow electrical current from the generator to backfeed into utility lines. This backfeed could electrocute utility lineworkers; it could also cause your generator to explode when the power is restored. Therefore, have only licensed personnel connect standby power to your electrical system.

## Operation

Become familiar with your generator before an emergency occurs. Study the owner's manual when you acquire the unit and run through a practice drill to be sure you know what to do in case of a power failure.

When power is interrupted, turn off all electrical equipment in your home. If the generator is a mobile type, move it into position outside the house. A dual-purpose unit must be connected to its receptacle.

Start the generator engine and bring it up to the proper speed, following instructions in the owner's manual to determine when it is ready for the load.

Throw the transfer switch to connect the generator, and add the load gradually, beginning with the largest motor. Never start the generator with an electrical load on the unit. Once the unit is operating at normal speed, add other appliances one at a time. If the generator has been sized to carry only part of the load, remember which appliances it can handle and be careful not to overload the system. It is advisable to list the appliances that can be used, in the order in which they should be turned on, and to post the list beside the transfer switch.



The greater the load, the more fuel is consumed, so — even if the generator will carry all your appliances — power should be used economically in an emergency. Keep your heat low at night. Consider using an electric blanket, which requires less current than does the motor on your furnace. Rotate the use of motor-driven appliances to avoid the possibility that one of them will start up and create a demand surge when the generator is already operating at full load.

When commercial power is restored, return the transfer switch to its normal position. Then shut down the generator. Generators with automatic transfer switches will sense a drop in the electrical load, start the generator, and automatically transfer the load to the generator. When power is restored, it will do the reverse and shut down the unit.

## Maintenance

Unless the home generator is properly maintained, it may be of no help when you need it. Let the engine run for an hour once a month to keep the unit in good condition. Follow the manufacturer's instructions for periodic changing of oil, fuel, and water. Prevent accumulation of dust and dirt on the generator; this can cause overheating when the unit is in use. A well-cared-for generator will provide dependable emergency power for many, years.

## Sources

Aura Systems, Inc.  
2335 Alaska Ave.  
El Segundo, CA 90245  
(800) 909-AURA  
www.aurasystems.com  
(*car generator*)

Cumberland General Store  
#1 Highway 68  
Crossville, TN 38555  
(800) 334-4640  
www.cumberlandgeneral.com  
(*lamps, kerosene, woodstoves*)

Lehman's  
P.O. Box 321  
Kidron, OH 44636  
(330) 857-5785  
www.lehmans.com  
(*nonelectrical supplies*)

R.E.I.  
Sumner, WA 98352  
(800) 426-4840  
www.rei.com  
(*sporting goods, warm clothing, camping supplies*)

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