



# Preparing for electrical power interruptions

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A blackout is a prolonged loss of power. A blackout can result in lost or corrupted data, failures of process control equipment, and loss of products or services. A brownout is a significant voltage reduction which may result in similar problems. Both of these conditions can be considered power quality issues. A power interruption can happen for any number of reasons and at any time of the day or year. Planning for this disruptive event is key. What can you do to prepare for a power interruption?

## Know your system

The first step is to become thoroughly familiar with the electrical system in your facility. Some electrical systems can be complex; that is why it is important to have updated electrical system documentation available, including one-line diagrams. An effective one-line diagram will clearly show how the main components of the electrical system are connected, including redundant equipment and available spares. Details on equipment ratings are typically shown, and it is helpful to identify each major component with a unique name. In addition to showing the equipment identifier on the drawing, a permanent label should be mounted on the equipment. This greatly reduces the possibility of switching the wrong piece of equipment during an outage.

## Critical loads

Once the design of the system is well-documented and understood, it is important to identify critical loads that will require power in the event of a power outage. Typically, standby generation may not be necessary for all facility loads.

Decisions need to be made in selecting the equipment that is essential during an outage. Once identified, these loads should be clearly marked on the one-line diagrams as being "critical loads."

Depending on the importance of the critical loads and the possibility of being without power for an extended period of time, you may consider installing an uninterruptible power supply (UPS) and a permanent standby generator and automatic transfer switch to power certain equipment. The running and starting loads will be needed by the vendor for properly sizing the generator. The kilowatt and voltage ratings of each generator needed should be readily available prior to an outage to expedite your response.

If portable generators are the best alternative for your facility but purchasing a standby unit is impractical, you may want to arrange a rental agreement with a dependable local vendor. Be sure to consider such things as how many generators are stocked, how they are delivered, what is the guaranteed response time, and what service is included if a generator has problems. When an outage occurs, others will be looking for the same rental generators.

You need to plan how each generator will be connected during the outage. Is it practical to install manual transfer switches near the critical panels ahead of time so they are available to easily transfer the load to the generators? Are spare cables, properly sized for the load, stored with the generators to ensure the hook-up can be done quickly? Has

the rotation of three-phase circuits been predetermined and labeled to ensure proper connection of the generator to the critical loads? Are formal written procedures prepared explaining how to connect each generator to the emergency loads? Is the plan in accordance with all national, state, and local electrical codes? Are staff or contractors adequately trained to do this work?

Once the critical circuits and their corresponding generator ratings are known, develop testing procedures to ensure that the generators can carry the critical loads. The installed standby generators should be tested quarterly under actual load conditions. If this is not practical, each generator should be started and run for 45 minutes each month. Make sure that generator testing meets all requirements for state and federal emissions regulations. Make sure that each generator fuel tank is full and that procedures are known for refueling during the course of the outage. Test the fuel for the presence of water and replace fuel that is more than 1 year old.

If your facility has computer loads or communications systems that utilize a UPS to ride through short-term outages, you should develop procedures for having an orderly shutdown. Typically, a UPS will provide power for only a short period of time (15 to 60 minutes) to allow for backing up of system and data files before shutting down. Preparing for an outage now and practicing emergency procedures will enable a smooth transition during an extended outage.



## Surge protection

A common cause of damage to equipment from a power interruption is from the electrical surges that occur before, during and after a power interruption. Installing a surge protection device (SPD) on the incoming electrical service of a building helps to prevent damages caused by external surges. Further protection is achieved when SPDs are installed on distribution panels supplying critical or sensitive loads and when installed locally at the equipment point-of-use. This layering of SPDs throughout a facility is known as a "Zone of Protection" approach and is the most effective way of protecting a facility from electrical surges.

## Loss of telephone service

Telephone service interruptions affecting a significant geographical area usually do not result in property damage. However, if interruption of communications would affect your business adversely, alternative communications should be considered.

## Power outage preparation checklist

- 1 Prepare well-written, easily understood procedures that can be followed without confusion to facilitate a quick response when an outage occurs.
- 2 Ensure that accurate electrical systems documentation is kept in a known location.
- 3 Include a list of required standby generators, the critical load to be connected, and the step-by-step procedures for how to connect each portable generator.
- 4 Provide procedures for disconnecting or turning off all loads. This includes the loads that are not running when the power is out.
- 5 Include steps for reenergizing loads after normal power is restored. This helps to reduce electrical equipment surge damages.

**Careful planning is the key to successfully reducing risk to your business caused by a power interruption. Take steps today to protect your business from the adverse effects of power interruptions.**