

Rolling Blackouts: The Need for Surge Protection When the Lights Come Back On

Conversation about power quality usually centers on two areas: what the electrical system produces as it operates, and what is required to keep the loads up and running. With "rolling blackouts," there is now a third topic of discussion: how to protect the electrical system from external and internal power surges after a blackout occurs.

Blackouts: What they can mean to your electrical distribution system: *The financial impact of downtime ranges from \$14,500 to \$6.5 million per hour, depending on the industry.¹*

When an electric utility company is unable to provide enough power to meet its customers' demands, it will methodically turn off power to blocks of customers for a period of time. This power allocation helps ensure customers have electrical service, even if it is interrupted for a little while, rather than no power at all for extended periods of time. These power allocation events are known as "blackouts" or planned outages, and unfortunately, will be a part of the business landscape for at least the near term. (The term "rolling blackout" was coined recently by the media to describe increasingly frequent, regional power outages managed by electric utility companies.) As a result, power blackouts will create significant burdens to customers, ranging from personal inconvenience to lost production time, spoiled production materials and irrevocable revenue losses.

A blackout starts a series of related electrical events that can significantly damage or degrade electrical and electronic equipment. When the utility company reapplies power to its systems after a blackout, harmful power fluctuations, including power surges, are created. Power surges assault circuit boards, control logic power boards and other components in electrical and electronic devices, causing them to malfunction or fail.

What are power surges and where do they come from? A power surge, also called a spike or transient, is a short-duration electrical disturbance with high levels of voltage and current. Depending on their source and magnitude, surges can cause immediate, catastrophic damage or the continuous degradation (latent damage) of electronic systems and components. Surges can come from sources inside and outside a building. Even under normal power conditions, surges are generated within a facility by the on/off cycling of electrical loads, such as air conditioners and compressors. These types of surges continuously assault electronic components causing them to malfunction or fail.

Today, rolling blackouts present another source of harmful surges. Surges can be created when a disconnected electrical load is reconnected. For example, when the utility recovers from an outage and power is reintroduced to a building, a very fast high-voltage pulse is induced. This high-voltage pulse is due to the sudden change in current flow in the electrical distribution system. As a result, these changes in the system (disconnecting and reconnecting of loads) can create surges.

Here's an analogy: Imagine having something rolling around in the trunk of your car. Every time your car accelerates, the object rolls to the back of the trunk. Every time you slow down, the object rolls to the front of the trunk. Each time a change in the car's velocity takes place, the object reacts to the change. The faster you start or stop, the harder the object "hammers" the wall of the trunk.

Like the changing velocity of the car, the changing current in the power system results in voltage surges that "hammer" the loads. The more intense the change in current in a distribution power system, the more significant the voltage surges can be. Another concern occurs when the system is re-energized. The same phenomena observed at the individual building level occurs on a large scale across the whole power grid as adjacent communities are systematically switched on and off. Surges generated by switching these large blocks of loads propagate far and wide. If that isn't bad enough: A blackout is not a one-time event; *it will happen again as power companies strive to manage customer demands within their limited-capacity systems*. Keep in mind that the above scenario will likely happen with *every* blackout. If the first blackout doesn't create too much havoc, be patient; there will be more to come.

What can be done to protect against blackout aftermath: The device that is used to safeguard against surges is called a surge protection device or SPD. SPDs reduce voltage surges to an acceptable level that can be tolerated by sensitive loads connected to the system.

How does an SPD protect the load after a blackout? SPDs are designed to "catch" a surge, then conduct the harmful levels of current away from the devices it is protecting. When building loads are re-energized and the utility reapplies power to the distribution system, spikes will be generated. SPDs sense the spikes as they enter the building electrical system and shunt them away before the surge can damage the building loads. In this way, loads are protected from the excessive voltage and current from a surge, so they are not damaged by them.

What type of SPD works best? Because so many different types of electrical systems exist, it would be impractical to choose a product based on a one-size-fits-all approach. The good news is that assistance is immediately available to help you properly apply surge protection. Talking with an Applications Engineer about your specific protection needs can help determine the appropriate type and size SPD product that will best fit your system requirements. By talking with the factory engineers, you can make an informed decision about product offerings and identify the approach that provides the greatest value to you.

Rolling blackouts will have a significant impact on the productiveness of businesses in the future. With effective SPDs properly applied and installed throughout a facility, blackout aftermath surges will not effect the expensive equipment in your facility. Without proper surge protection, damaged equipment and downtime due to surges create a self-inflicted "blackout" that business and industry simply cannot afford.

¹*GartnerGroup and Contingency Planning Research Inc. study.*