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How To Avoid Pitfalls During Power Outages

Prepare for what could happen, not what should happen

Power is the lifeblood of data centers, and anything that threatens the steady flow of electricity is a risk. Downtime, no matter what causes it, results in lost revenue and a tarnished reputation.

Data center operations require power 24/7, but it's not as simple as connecting to the power grid, turning on the servers and HVAC system, and walking away. Owners and operators must pay close attention to the electrical system. Understanding the power requirements — access from the utility, the load and how much power is needed to maintain the data center, and uninterruptible backup power supplies — is critical information for those building a new facility or retrofitting an existing one.

In the U.S., with a power grid that is generally reliable, outages do happen. Even the top-performing utilities can experience adverse events, like extreme weather, physical or cyber breaches at facilities, or fluctuations in performance caused by the transition from fossil fuel and nuclear-powered generators to renewable sources. Outages are usually unexpected but not always. Last year, in California, both Pacific Gas and Electric (serving approximately 5.4 million people) and Southern California Edison (serving approximately 15 million people) made decisions to selectively turn off

power to help reduce wildfires caused by their unshielded power lines. As this was typically executed on high wind days, some advanced notice was possible based on the forecast.

Given the risks associated with losing power for any data center, it's imperative to have the proper uninterruptible power equipment to handle the unique energy loads of each facility.

MAINTENANCE

With its minimum of mechanical parts and what feels like guaranteed service from the local utility, some owners and operators may be lulled into believing the power system runs on its own, and they only need to pay attention to the IT equipment. That couldn't be further from the truth. Data center power infrastructure needs proper maintenance, too, to ensure the system runs smoothly and to minimize or avoid the risk of downtime.

Manufacturers of electrical equipment, like breakers, transfer switches, distribution switchgears, batteries, fan motors, and UPSs, include maintenance schedules and recommendations when their products are delivered or installed. Whether your maintenance plan is implemented by the manufacturer as part of a service contract, a third party, or your own team, this equipment needs adjustment or maintenance annually at a minimum and more often for some types of equipment. And, since we're talking about mechanical and physical connections, it's not possible to work on these components when the system is energized. Even in cases where it is technically possible, working on electrical equipment with the power on violates Occupational Safety and Health Administration (OSHA) safety regulations.

REDUNDANCY

Data centers have to stay up and running while maintenance is taking place or when an outage occurs. The best way to keep your server online is to build redundancy into the facility as much as possible, based on the needs of the business. This serves to both minimize exposure to risk and make it possible to perform ongoing maintenance on the system. For some, redundancy means an N+1 system with a backup generator to kick in when the power from the grid fails. For others, it's 2N redundancy, a full and complete mirror of the data center — servers, IT equipment, and power and cooling infrastructure — that can act as a backup.

Redundancy

N = capacity to run the data center.

N+1 is an additional piece of equipment to support one component.

2N is two full systems, disconnected and independent from each other.

Older data centers especially, even those built just 20 years ago, may not be designed with enough redundancy. And, many data centers can't afford dual path (2N) redundancy or don't need to pay for that level of protection. All data centers, at the very least, need to integrate one backup generator into their systems and, ideally, a redundant UPS, generator, and transformer.

Without a duplicate system or generator, data centers must be shut off to conduct maintenance, and they're left with no recourse in the event of a power outage. It takes time to shut down a data center, and it is possible it may not restart if there are hardware or software issues, for example, or if you're dealing with a legacy system. Planned power outages like those in California are unusual, but that situation demonstrates the value of planning ahead. That includes getting vendors on-site or on call before and during outages.

Steps to plan for expected outage
- Get vendors on-site/on call in advance.
- Test the generator to ensure there is fuel and batteries and that it will start.

Steps during an outage
- Get vendor on-site or on call.
- Start the generator when the power goes off.
- Monitor the power loads and ensure maintenance of the generator.

ASSESSMENTS

Power system assessments are useful tools for all data center owners and operators to ensure a system can handle the load and outages without compromising service. Understanding the current state of power in your data center means identifying what is going right in terms of equipment and the ability to protect critical loads and uncovering gaps to determine what can be improved and where more investment is needed to fully safeguard the facility and data. This is an opportunity for data center owners and operators to think strategically about existing data center power issues and determine the next steps to ensure they have the service required to meet their business goals.

Power Assessment
1. Validate the existing system using available drawings, manuals, and maintenance records when possible.
2. Identify how it's designed to work, its capacity, and its failure points.
3. Confirm the existing maintenance schedule (who does what and how often?) and identify what you can learn from what you are not doing.
4. Develop recommendations for equipment, maintenance schedules, etc.

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Conducting a complete assessment requires the expertise of IT and data center specialists. Contractors and electricians not familiar with data centers may build or recommend a system that is not optimized for the load requirements (including cooling and power density needs) and maximum efficiency. Additionally, they might not include proper backup. This results in higher capital and operational costs and can potentially cripple data centers in the event of electrical outages, planned or unplanned. Any

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Any operator looking to address power issues needs to work with someone who has data center experience.

It is important to work with data center experts who recognize that the best power system for any data center is one that keeps it as simple as possible. With all the concerns about ensuring uptime, it’s also important not to overbuild the electrical system and redundancies. That’s why an assessment is a critical step before building a new system or making changes to an existing one.

Data center power systems are sophisticated and complex. The best systems require an understanding of power loads, business needs and uptime requirements, alternate paths of power, and where and when it’s possible to direct power from other areas to keep critical systems up and running.

The greatest value in an assessment by a trained expert is the ability to deploy an IT-data-driven response to ensure power uptime. Anything that threatens the supply of electricity to servers, storage devices, network equipment, and environmental controls puts data centers at risk. A complete assessment, and trained experts to implement the findings, secures your data center and helps you meet your business goals, no matter what is happening on the power grid outside your doors. ■