

A guide to pre-crisis planning

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Executive summary

This white paper provides information on how to plan for and recover from events involving electrical system outages. Although there is no one-size-fits-all solution, this document outlines the most critical aspects of disaster planning and recovery to help organizations across many industries lessen the impact of electrical system failure.

Specific systems within a facility respond differently to power losses. After a disaster, power should be restored to the most critical services first, but the definition of “critical” changes depending on the duration of the outage. Attempting to sort out priorities such as these during the chaos that follows an event can make the decision-making process more difficult, underlining the importance of thorough and robust recovery planning.

Eaton recommends this document be used as a guide for a planning session prior to an actual emergency. With established emergency procedures, the consequences of the loss of electrical power can be minimized if a disaster occurs. Following these steps can also help train employees so they know what to do in an emergency and make emergency preparedness part of the culture of an organization. Overall, a proper pre-crisis plan should also allow your organization to identify the following:

- The steps needed to create a successful recovery
- How to prioritize the recovery of services
- What is required to recover these services, including facilities, IT, financial and resources
- What to expect in the event of a disaster



Powering Business Worldwide

59%

Fortune 500 companies that experience a minimum of 1.6 hours of downtime per week

Assuming an average staff of 10,000 employees who are paid an average of \$56 per hour (including benefits), the downtime loss in labor alone for a Fortune 500 firm would ring up at \$896,000 per week—or more than \$46 million annually.

Dunn & Bradstreet

The importance of pre-crisis planning

Downtime carries an enormous price tag, so it is critical to minimize interruption to your operations. However, electrical emergencies are often inevitable due to the unexpected nature of blackouts, equipment failures, hurricanes, lightning, floods, high winds and other natural disasters.

Every business depends on electricity, and ensuring its reliability is vital. When the power is out, the costs to a business can be immense, with losses in productivity, sales and even inventory. The price tag varies not only by industry, but also by the scale of business operations. For a medium-sized business, the exact hourly cost may be lower, yet the impact on the business can be proportionally much larger. Nailing down the cost of each hour of downtime varies widely and is based on a number of factors, such as the nature of the business, the size of the company and the criticality of its IT systems related to revenue generation. For instance, a global financial services organization may lose millions of dollars for every hour of downtime, whereas a small firm might lose only a margin of productivity.

Additionally, if you haven't planned in advance for a large-scale or regional crisis, it will be more difficult to retain the help you need to start the recovery process in the middle of the crisis—resulting in even more downtime while competing for available resources and paying top dollar for them.

With pre-established emergency procedures, the consequences of the loss of electrical power can be minimized if a disaster occurs. Pre-crisis planning also provides the opportunity to identify internal problems that could cause risk in the future, including overloaded or malfunctioning equipment, storage blocking equipment access and/or escape routes, missing breaker racking or lifting tools, missing drawings and more.



Power interruptions

Among the leading global causes of business continuity insurance losses

Based on a study of nearly 2,000 business insurance claims from 68 countries between 2010 and 2014, the report estimated the average large business property claim at a staggering \$2.4 million, with blackouts ranked among the top 10 causes of such losses.

Allianz Global Corporate & Specialty

How to develop a pre-crisis response program

1. Obtain a qualified first-response service provider

The first step is to identify and secure trained and experienced personnel for the equipment at your facility. To do so, you will need to research the service providers' capabilities. Ensure they have toured your facility and identified critical areas. Recognize that for widespread disasters like hurricanes, both your employees and those working at your support organizations may be affected, so it is critical that the provider you select can source manpower and materials outside of your surrounding area if necessary.

Additionally, if your organization includes a regional, national or global footprint, make sure the service provider is supported by an adequate network of first responders, equipment vendors and service technicians capable of quality and timely recovery no matter the location.

Once a qualified first-response service provider is identified, putting in place a contract with rates, fees and retainers before the crisis puts your company in the best position for negotiation. Your company should set caps and requirements in the contract to ensure there are supporting documents of services being provided. It is also important to ensure that all insurance and training requirements are stipulated, and the vendor and employees comply with all the required trainings before any crisis occurs.

2. Perform pre-crisis audits

A pre-crisis risk mitigation audit will help your organization estimate the potential impact of credible disaster scenarios and identify ways of minimizing vulnerability in the event of a disaster.

This typically includes a critical load audit to help identify which loads require backup power. Identifying consequences of potential natural and man-made threats will enable you to evaluate all physical surroundings and the potential financial impacts resulting from loss of equipment or regional infrastructure resources. You should also outline the consequences of electricity losses for varying durations and use this data to develop a contingency plan to deal with each consequence. In addition, conduct a safety audit and establish procedures to ensure injury-free remediation in compliance with Sarbanes-Oxley and OSHA requirements.

Once risks are identified, outline the consequences of loss of electricity (computer failure, loss of access, contamination, trapped persons, chemical release, etc.) with varying durations of outage. Have a contingency plan to deal with each consequence (e.g., manual key entry backup to electronic locks).

Also document and save the list of equipment installed (brand, model and serial number), one-line diagrams, device settings and software (both vendor provided and user custom) at your facility. All documentation should be consistently updated to reflect current facility or field conditions. Make sure new staff is trained on this procedure. Have clear responsibilities as to who is responsible to keep the data updated.

Extra copies of this information should be stored off-site to ensure it is accessible no matter the extent of damage incurred. Create a plan to store this information so it can be accessed in one or more safe locations. (Do not assume that cloud communications will be available in all disaster scenarios.)

Additionally, after evaluating assets, have discussions with your insurance provider to ensure all requirements are met prior to a disaster to make reimbursement and financial claim support as smooth as possible.

3. Consider adding local electrical power generation or temporary power sources for critical areas of operation

Permanent on-site local generation comes at the highest cost, but provides the highest level of assurance.

Local generation can help ensure systems are always functioning, but keep in mind that this increases your responsibility to ensure the system is functioning. A common solution is to contract out maintenance to a qualified engine dealer, typically the one from which the generator was purchased. Don't forget to contract with fuel providers for fuel delivery because normal fuel delivery will likely be affected after an event that strikes a wide area.

Alternatively, you can rely on a trusted supplier of rental backup power equipment, but make sure your facility contains provisions for temporary power hookup. This can only be done by trained, certified professionals. During times of emergency, tradespeople will be in high demand and short supply as the hard work of restoring power begins. Consider having provisions already installed to allow the possibility of simply plugging in a backup generator.

Renewable energy and on-site generation systems are designed to operate when utility grid power is available and automatically shut down when utility power is lost. Meet with your solar installation provider or a qualified engineering service provider to explore ways of configuring local alternative energy sources into an "island" or "microgrid" on an as-needed basis. This may involve adding protective devices or devices to automatically shed lower priority loads (because alternative energy is rarely sized to power an entire building's load).

Cost of downtime

Typical hourly cost of downtime by industry (in U.S. dollars)

- Brokerage service **6.48 million**
- Energy **2.8 million**
- Telecom **2.0 million**
- Manufacturing **1.6 million**
- Retail **1.1 million**
- Healthcare **636,000**
- Media **90,000**

Sources: Network Computing, the Metro Group and Contingency Planning Research.

4. Identify sources of equipment reclamation, life extension and/or replacement with full manufacturing capabilities

Sources for equipment reclamation must be certified for the equipment that is installed. Because many facilities are older and may include electrical equipment from a variety of electrical vendors, look for sources that have the certification or other demonstrated proficiency to repair, renovate and/or renew the electrical equipment installed at your facility.

For robust crisis response, make sure your contracted support organizations have expertise in staging support equipment, including generators, replacement electrical equipment and satellite communication networks.

When searching for a qualified first-response service provider, there are a few critical capabilities to look for, including:

- Proven results and performance
- Local support services with a national network and global capabilities
- Up-to-date certifications for procedures and facilities
- Adherence to original manufacturer standards and tolerances
- Familiarity with your business, industry and equipment

5. Develop a plan for survival and support accommodations for your in-house crisis response team

Depending on the severity of the disaster, food, water and sleeping accommodations may be in short supply; therefore, it is critical that your support teams can sustain themselves. If you have a radio communication system, make sure it will be operable following an electrical system failure. Typically, this involves supplying power to chargers as well as repeaters.

Qualified crisis-response service providers will most often provide access to satellite communication networks to help simplify communications. Contingency plans for accommodating response staff can also be arranged.



How to effectively respond during a crisis

1. **Monitor communications systems**
Depending on how widespread the disaster is, recognize that failure of communication systems may prevent you from contacting service providers. Consider arranging with those providers to check in with you in case of a wide area event.
2. **Execute your disaster recovery plan**
Mobilize disaster recovery teams, each with assigned tasks. Teams will include both internal personnel as well as external contractors.
3. **Prioritize tasks**
Use established team leaders and pre-crisis response plans to prioritize tasks. Consider outsourcing project management for specialty items such as electrical equipment repair/restoration.



4. **Maintain safety**
Remember that floodwaters conduct electricity. Entering a flooded building, especially rooms containing electrical equipment, is dangerous. Only trained personnel skilled in operating in this environment should enter such a facility. Electrical equipment exposed to water following a storm or a flood can be extremely hazardous if re-energized. This topic is covered in a separate NEMA® publication, "[Evaluating Water-Damaged Electrical Equipment](#)".
5. **Be thorough in your search for support**
Whether or not you have done any planning, don't panic once a disaster hits. In particular, choose electrical service providers carefully. Not all service providers are equal. While qualified service personnel may be in short supply following a wide area disaster, be thorough in your search to find support that is familiar with your equipment.
6. **Hire only qualified service providers**
Several manufacturers of electrical equipment have programs with certified electrical service providers. Review their recommendations by visiting manufacturers' websites. A listing of electrical equipment manufacturers is also available at www.nema.org.
7. **Learn from your experience**
During an emergency there are often distractions. Having someone responsible for documenting actions taken during the emergency will help you refine your future emergency response plans. Once you have recovered from a disaster, spend time to review what worked, what did not, what could have been done differently and what could have been prevented. Update your electrical diagrams, documentation and plans as equipment is upgraded, changed or repaired. Take the time to meet with operations to review and train personnel on any new or updated procedures resulting from your learning.

Eaton's crisis and disaster response capabilities

Conclusion

In the aftermath of a crisis, it is essential for facilities to have a recovery plan in place as well as the support networks needed to ensure the facility can return to production in a rapid and safe manner. It is also important to recognize there is no one-size-fits-all template for disaster planning. However, by following the guidelines listed in this paper, organizations of all sizes can better prepare themselves to minimize the impact of electrical system failures.

With more than 100 years of expertise, Eaton employs world-class service professionals and project management experts and manufactures the innovative products needed to provide a complete, turnkey crisis response solution—with proven results and satisfied customers around the world.

Call on Eaton today to learn about how you can have your plan in place before a disaster happens.



Customer monitoring center



Power outage



Crisis response trailer

Crisis recovery plan

Failure prevention

- Pre-crisis risk mitigation audit to minimize vulnerability in the event of a disaster
- Predictive maintenance services
- Remote monitoring services
- First responder and operational training
- Spare parts in inventory for rapid response

Planning and execution

- Strategically located service engineers on call 24/7
- Immediate identification of experienced personnel who will support your needs
- Definition of the procedures needed for a comprehensive recovery plan
- The equipment needed to handle a variety of large or small project recoveries
- Contingency plans for living accommodations
- Significant refurbishment and repair capabilities in addition to a comprehensive portfolio of products
- Expertise in critical staging of support equipment, including generators, temporary and satellite communication networks
- Single point of contact to coordinate activities and mitigate project risks

Equipment restoration

- Rapid retrofit, reconditioning and/or replacement services
- Turnkey support from installation to startup and commissioning
- Retrofit additions to and replacement of competitors' equipment
- New product replacement



Eaton's significant refurbishment and repair capabilities

Dedicated project management

- System and component evaluations
- Temporary power systems and generators
- Coordination of rental equipment, including trucks, trailers, load banks, lifts
- Electrical components and complete assemblies, as required

Eaton service center locations



Crisis response case studies

Chemical manufacturing

A chemical manufacturing plant in Lake Charles, Louisiana, found themselves in dire circumstances as Hurricane Rita left the facility without power at a critical point in its production cycle. Without restoration of power, several million dollars of process materials and equipment were at risk and would result in a total loss within one week. This organization turned to Eaton for help. Within hours, Eaton's Electrical Services & Systems team was on-site assessing the situation. A recovery plan was developed and implemented immediately. Within four days, the Eaton team had critical power systems back online. The equipment was saved and shipping deadlines for client orders were met.



Chemical manufacturing plant

Gaylord Opryland Hotel and Conference Center

After two days of unrelenting rainfall in May 2010, the usually thriving Gaylord Opryland Hotel and Conference Center in Nashville was dark and deserted. The Cumberland River had rushed over its banks, leaving 12 feet of water in some areas of the world's largest non-casino hotel. Fifteen hundred guests were evacuated to a nearby high school, as the owner, Gaylord Entertainment, waited for the floodwaters to subside so that a damage assessment could begin.

The power supply to 2,881 hotel rooms and 600,000 square feet of meeting space was cut off. Resort management recognized Eaton as an immediate resource for disaster response. A team consisting of senior field engineers conducted a thorough assessment of the equipment as soon as they could navigate through the powerhouse structure.



The atrium underwater

One of Eaton's 32-foot Crisis Response trailers was dispatched to the stricken site to meet basic first-response needs. The mobile unit also served as a command center for performing extensive retrofit services on the electrical equipment that could be salvaged throughout the complex.

Making full use of its widespread service capabilities, Eaton played a major role in making Opryland fully operational by the July 1 deadline. Eaton's support in restoring the remaining areas kept the owner on track to re-open the famed complex before the end of 2010.

About Eaton

Eaton's electrical business is a global leader with expertise in power distribution and circuit protection; backup power protection; control and automation; lighting and security; structural solutions and wiring devices; solutions for harsh and hazardous environments; and engineering services. Eaton is positioned through its global solutions to answer today's most critical electrical power management challenges.

Eaton is a power management company with 2015 sales of \$20.9 billion. Eaton provides energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 97,000 employees and sells products to customers in more than 175 countries. For more information, visit Eaton.com.

About the author

Robert Kirsliis has more than 25 years of experience in the planning, maintenance and operations of data centers, power plants and other types of facilities. Serving as the data center and industrial marketing manager at Eaton for its Electrical Engineering Services & Systems division, he helps customers advance their businesses by delivering highly effective power management solutions. Kirsliis has a degree in electrical engineering from the Wentworth Institute of Boston, Massachusetts and has served on the board of directors of the Boston Chapter of 7x24 Exchange.

For more information:

Eaton.com/crisisresponse

24/7 emergency response hot-line:

1-800-498-2678

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