



Keep the Lights On:

How to Institute an Emergency Power Generation Plan for Your Facility in Twelve Steps

By Eric Plebuch & Daniel Williams

To be blind is not miserable; not to be able to bear blindness, that is miserable.

-John Milton

Knowledge is power.

- Sir Francis Bacon

Blackouts cost America around \$80 billion annually, according to a study conducted by researchers at Lawrence Berkeley National Laboratory¹. By building a contingency plan that includes rental generators and a complete support package for them, you can react quickly and prevent losing revenue when your business loses power². Rental equipment can keep your operations going at the level you deem necessary for as long as it takes for the utility to restore power.

This paper will describe a detailed, twelve-step plan you can implement to plan your business's emergency response. Contingency planning is not difficult. All it takes is a little time, modest expense, and a commitment to follow a few proven steps toward sound emergency preparation. Here is a basic guide to the planning process.

¹ Longley, Robert. "Power Interruptions Cost Nation \$80 Billion Annually: Berkeley Lab study focuses on state of U.S. power grid." *About.com: US Government Info*. The New York Times Company, Feb. 2005. Web. 27 July 2009.

² See International Facility Management Association (IFMA)'s *August 14 Blackout Survey*: the two "smartest things businesses] did to prepare or recover" from the most widespread electrical blackout in history (at the time) were "having a good plan in place" and "preventive maintenance and testing the plan".

Emergency Power Generation: Blackout Insurance When You Need It

Businesses insure themselves against all kinds of risks: fire, theft, vandalism, vehicle accidents, workplace injuries, liability, and more. Nevertheless, many companies fail to adequately insure themselves against the risk of interrupted electric power after an emergency, such as a storm or flood, despite alarming statistics attesting to the gravity of these events³:

- A company that experiences a computer outage lasting more than 10 days will never fully recover financially. 50 percent will be out of business within five years.
- An estimated 25 percent of businesses do not reopen following a major disaster.
- 70 percent of small firms that experience a major data loss go out of business within a year.
- Of those businesses that experience a disaster and have no emergency plan, 43 percent never reopen; of those that do reopen, only 29 percent are still operating two years later.

Modern businesses cannot operate without electricity. A thorough, well-planned and practiced contingency plan can determine if a business thrives or fails after a disaster: in the struggle to deal with consequences of utility failure after it occurs, it might take days to get an unprepared business back online—time its prepared competitors will put to use. According to Joe Eto of the U.S. Department of Energy's Office of Electric Transmission and Distribution, "for many commercial and industrial customers, it is the length of the downtime resulting from a loss of power that determines the cost of interruption, not necessarily the length of interruption itself⁴."

Although utility power is typically reliable, outages occur. Lightning strikes, strong winds, floods, and other disasters can disable utility lines feeding businesses miles away. Manufacturing plants, hospitals, schools, emergency shelters, and other crucial or highly sensitive operations must plan to provide electric power as soon after an interruption in service as possible—other businesses' needs are nearly as pressing. However, with a generator and a sound plan, power outages are easily managed.

Your Emergency Power Plan in Twelve Steps

Just as your emergency power needs are dictated by the specific demands of your business, the placement and installation of your emergency power equipment is determined by the particulars of your location. More than simply providing a list of model numbers and kilowatt ratings, your emergency power rental provider should work with you to determine your organization's needs when selecting and installing your generator(s). When an emergency occurs, these decisions should be made and your staff prepared for the arrival of the equipment you selected—accept no less.

STEP 1. Choose a Connection

There are several ways to connect a back-up generator to your facility's power supply, and the connection you choose should be appropriate to your organization's needs. Consider the importance of a quick response and the skill level of the personnel who will perform the connection: do you have certified staff onsite to assist your rental provider's personnel in installing your generator? How quickly will you need power in an emergency?

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An automatic transfer switch (ATS), a permanent connection that monitors your supply of utility power and activates your generator during an interruption, is the fastest and most convenient means of connecting back-up power to your facility, but it may be

more than you need—an ATS is also the most expensive switching option, and requires a permanent, onsite generator⁵. A quick-connect (and a manual transfer switch to disconnect your facility from utility power and reconnect it when the outage ends) may be more appropriate—you can patch a rented generator into your facility's lines with relative ease. This set-up requires a modest investment and can save you valuable hours of operating time during an emergency.

³ *Impact on U.S. Small Business of Natural & Man-Made Disasters: A compilation of public and private sector intelligence.* Hewlett-Packard Development Company, L.P., 2007. Print.

⁴ Longley, Robert. "Power Interruptions Cost Nation \$80 Billion Annually: Berkeley Lab study focuses on state of U.S. power grid." *About.com: US Government Info.* The New York Times Company, Feb. 2005. Web. 27 July 2009.

⁵ For more information on ATS and standby generator systems, see Dembski, Darren, and Sarah F. Escalante. *Averting Common Causes of Generator Failure: Understanding How to Properly Maintain Your Standby Power System.* Tech. San Leandro: Peterson Power Systems, 2009. Print.



If you do not require an immediate response, and you have a licensed electrician onsite, you might also consider connecting your emergency generator to your facility's power supply using a copper bus bar or patching directly into your facility's circuit breakers. These connections take more time than the options above, but are acceptable for applications that do not require an immediate response. However, untrained personnel should **absolutely not** interact with this equipment—ask your rental provider for more information about these connections.

STEP 2. Choose a Location

After choosing the means by which you will connect your generator, you should determine its optimal placement at your facility. How close to the connection point will you place the generator? For various reasons, the closest point outside the building may not be the most appropriate—you need to park your generator on a paved, level surface and ensure that a weatherhead, access door, or other opening is available to pass cables into the building. If the installation requires you to run cables in trafficked areas of your facility, you may need cable ramps to let vehicles drive over them without damaging their insulation, and to keep people from stepping or tripping on them.

Expect your rental supplier to provide you with the necessary cables and ramps. If you plan to run multiple generators in parallel, order enough cable to reach all machines from the connection point, and for connections between them. You should tell your rental supplier the proper route to take through your facility before they arrive—give them space to travel through your facility, install the generator, and run the appropriate cables.

STEP 3. Plan for Exhaust and Emissions

All diesel engines produce exhaust, but by planning ahead you can keep it out of your building. Do not park your generator near your building's air intakes or under covered areas or overhangs where fumes can collect.

Know the direction of prevailing winds and, if possible, place the unit downwind from your building. If necessary, your rental provider can add a stack to your generator to direct its exhaust away from your facility.

You should also determine if you will need an air emissions permit to operate your generator. Regulations vary from state to state and between local jurisdictions, but in California, for example, mobile diesel equipment must be certified under the state's Portable Equipment Registration Program (PERP). Your rental supplier should provide generator sets that are PERP certified, if necessary. Consult with your supplier and with city, county, and state regulators to find out definitively what air permits you need, and have them ready in advance to avoid costly fines.

STEP 4. Determine Your Noise Abatement Needs

Generator noise can be a nuisance. Do you plan to operate your generator in a noise-sensitive environment? While most quality rental generators are enclosed in sound-attenuated housings, noise can still be an issue—check your city or county ordinances, as noise regulations vary from place to place. You may face restrictions on running your generator at night.

Public perceptions of noise also vary. If you operate in a residential neighborhood or near a nursing home, hospital, or call center, you should take their needs into account in placing your generator: try parking it on the opposite side of your building, surrounding it (if practical) with sound-damping materials like foam padding or hay bales, or building plywood walls to deflect sound. Your own work environment is important, too: keep generator away from areas where the sound might distract employees, even if it means a longer cable run.

STEP 5. Plan to Provide Service Access

Service access is an additional point to consider in situating your generator: all generators need periodic maintenance and regular fueling. Make sure your provider's service personnel and trucks have easy access to your unit

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to check its oil, fluids and filters, and to make adjustments and repairs. You should position your generator in such a way that service trucks will not block driveways or otherwise hinder traffic flow, and **you should always position the unit to leave room for technicians to fully open its service doors!**

You should also consider if anyone other than generator technicians will need access to where you plan to place your generator. Does the unit impede access to other parts of your facility? Essential services, like trash pickup, shipping and receiving, mail or parcel delivery, or fire and rescue services need access to your facility at varying times throughout the day: make sure your generator isn't in the way.

STEP 6. Prepare to Refuel

You should plan your generator's fuel needs in advance—people often overlook this aspect of emergency response planning. While most generator sets include tanks that hold a 24-hour fuel supply, a larger units' supply may last as little as eight hours. Auxiliary tanks can significantly extend your unit's fueling interval and your rental supplier should be able to provide turnkey fueling service, but you must determine your fuel needs, supplier, and means of delivery before an outage occurs—you have no way of knowing how long an outage will last.

Examine your unit's on-board fuel capacity—how long will a full tank power your facility? Is one tank sufficient for your needs, or will you need auxiliary tanks? Have you planned an access route for fuel delivery vehicles and met your local spill containment requirements? What time do you prefer to have fuel delivered? Talk to your rental provider about your individual fuel needs, and **secure credit from your preferred fuel supplier before an outage occurs**—don't compromise your carefully-planned backup power program by running out of fuel!

STEP 7. Provide Airflow

Mobile diesel generator sets need a steady supply of “breathing” air for combustion, and they are also typically air-cooled. Leave space around your unit to allow unre-

stricted airflow, and keep it away from sources of heated air, such as discharges from air compressors or other equipment, as “inhaling” hot air can overheat your generator. If you use multiple units in parallel, space them at least six feet apart (or as much as twelve feet apart for 500 kW or larger containerized units). Inadequate spacing may prevent your generators from cooling.

STEP 8. Determine Your Voltage Needs

Do you need to power equipment that operates at different voltages? For example, does your facility need 120/208V “house power” in addition to 480V power for process equipment or air conditioning? Without the necessary transformers, a single generator set can cover only one voltage. You should also determine if your facility has special high-voltage requirements—rental generator companies typically do not provide equipment beyond 600V. Arrange for any high-voltage equipment and the special cabling and connections they require in advance with your rental provider and an electrician.

STEP 9. Secure Your Site

Like all high-voltage electrical equipment, your emergency generator poses risks of injury and liability, and you should allow only qualified personnel access to it. You should consider security fencing around your unit(s), but remember that service technicians and fuelers may need access at any time, day or night.

Consider your facility's security risks carefully.

You face a number of questions in determining your security needs as they pertain to service visits: How do visitors access your facility—do they check in with a guard at a gate, call the front desk to be buzzed in, or use a card-key? Will someone need to escort them to your generator? Will the generator doors be kept locked, and if so, who provides the locks? Who has access to the keys? Who will provide the security fencing? How long will it take before the site can be secured? Resolve these questions before installing your generator(s), and remember that sites open to the public are also at risk of vandalism. Consider your facility's security risks carefully.

STEP 10. Obtain the Necessary Operating Permits

Many jurisdictions require an operating permit to use a temporary generator. You may not need it for emergency power, but if there are permit rules and restrictions, you should secure them in advance. Check with your city and county governments—building code or building inspection departments are a good place to start.

STEP 11. Identify Your Key Contacts

With your generator in place, you'll need to prepare a list of key contacts to reach in an emergency: these are the personnel who will be responsible for carrying out your plan. Make sure your team members have easy access to the list, and update it as necessary. Include each person's job function, name, office phone number, home number, cell phone number, and e-mail. Include at least one alternate for each function.

Your facility's in-house operations/maintenance staff should be trained to respond to an interruption in utility power. They are your business's first line of defense against power outages, and should be able to quickly connect your backup power module, or to contact an electrician to make the connection, as appropriate. You should identify in advance a key contact responsible for managing your facility's computers, security, and data recovery procedures, as well, since these areas of outage management pose special threats and require a more comprehensive response than other systems. Identify a member of your company's staff to coordinate your complete response to an outage—he or she should be aware of **ALL** of your emergency-response procedures, equipment, and contacts and should be empowered to make decisions on your company's behalf as they pertain to your facility's utilities: this person may or may not be the employee designated to activate and monitor your generator.

When you've chosen the appropriate emergency equipment and your personnel know their roles, try your plan under pressure.

When an outage occurs, you should contact a representative of your electric utility when you have the opportunity; they may be able to tell you when they expect their services to resume. You should also get in touch with your contact at the rental equipment dealership that provided your generator—they may have advice and operating instructions specific to the scenario. Finally, get in touch with your fuel supplier—arrange for delivery in advance, and make sure they are able to meet your specific demands (delivery times, etc.). Naturally, you should have these contacts established *before* a power outage—and make them available to personnel at your facility.

STEP 12. Test Drive Your Plan

Many organizations work hard to create a contingency plan, but never test it—when their power fails, it's as if they never made a plan at all. When you've chosen the appropriate emergency equipment and your personnel know their roles, try your plan under pressure. And don't do just one dry run, do two: one planned, and one a surprise. These exercises will help ensure that each person at your organization fully understands what he or she will do in an actual power outage, and they will help you estimate how long it will actually take from the time the power fails until your emergency power supply is online.

In a planned dry run, you and your team schedule delivery of your chosen rental generator set and walk through your procedures, step by step. Some rental suppliers will deliver units on a planned basis at no cost except for transportation. Discuss these charges as part of contingency planning.

A surprise run-through will provide you a decisive test of your contingency plan. The facility manager or other person in charge announces it without warning. Your supplier is expected to deliver as agreed; your team is expected to respond and perform as if to an actual emergency: the unit is delivered, connected, started, and run. Expect to pay your supplier the full rental rate for this service.

A surprise event is highly effective at exposing your plan's weaknesses and in finding out how your supplier will actually perform. After both dry runs, assess what

went wrong. Should the generator be parked in a different place? Do you need a different fuel supplier or electrical contractor? Were there any access issues? Communication problems? Was all the right equipment delivered? Discuss what should be done differently, and adjust your plan accordingly. Remember: “the litmus test for any business/service continuity plan is that it works when executed. To ensure your plans work, exercise them. Make certain that the logistics, procedures and tactical strategies you developed are sound.”⁶

Resource Typing

Resource typing is categorizing, by capability, the resources requested, deployed, and used in incidents. Measurable standards identifying resource capabilities and performance levels serve as the basis for categories. Resource users at various governmental agencies use these standards to identify and inventory resources, which may be divided into subcategories to define more precisely the capabilities needed to meet specific requirements.

Resource typing is designed to enhance emergency readiness and response at all levels and is part of the National Incident Management System. A comprehensive and integrated system for resource typing allows jurisdictions to augment their existing resources during an incident, and assists jurisdictions in effectively identifying, locating, requesting, ordering, and tracking outside resources.

Appendix A: Generator Set Features Checklist

- Sound attenuation.** Ask for ratings below 75 db (A) at full load. (Ratings as low as 70-72 db (A) are available.)
- Auto start-stop.** For units backing up permanent standby generators: Starts a rental unit if the standby generator fails.
- Vertical radiator and exhaust discharge.** Directs discharges up and away from buildings and people.
- Electronic governor.** For critical loads that cannot tolerate frequency fluctuation.
- Charging alternator.** Charges batteries when the unit is operating.
- Site gauges.** Simplifies checking of fuel and critical fluid levels.
- Security features.** Lockable doors, interior oil/water drains, and hidden exterior fuel drains to help prevent tampering.
- Distribution panel labeling.** Helps operators safely identify output voltages.
- Output bus bars.** Allows one generator set to run several loads.
- Fuel priming pump.** Enables easier starts after transport.

⁶ Moore, Pat. “Business continuity planning: a strategic facility management function.” Emergency Preparedness FMJ Article. International Facility Management Association (IFMA), 2000. Web. 27 July 2009. <http://www.ifma.org/tools/ep/fmj/bc_moore.cfm>.

Easy identification of these resources hastens the response to the requesting jurisdiction. Resource typing is also important for businesses that are part of critical infrastructure that may need to request resources from their local jurisdiction or the state. Additional information on Resource Typing can be found on-line:

- Resource List: <https://www.rkb.us/nims.cfm>
- Generators: <https://www.rkb.us/download.cfm?id=1268>

A Final Word

A highly-qualified rental equipment supplier is your essential ally during an electric power emergency. Choose a supplier with a full inventory of the generating equipment you will need during a power outage. A reputable supplier will have experience in your specific industry and will be glad to answer questions about emergency power and support your contingency planning process. In addition, a rental supplier should be qualified in more than one utility profession—your building has power, compressed air, water, and HVAC needs. Can your rental supplier accommodate them in an emergency? Choose carefully.

For more information on choosing a rental equipment provider, see *Contingency Planning for Disrupted Electric Power: The Case for Partnering with a Strong Rental Power Supplier* by George Schalk, available online at www.petersonpower.com.



Appendix B: Generator Set Ancillary Equipment Checklist

- | | | |
|---|---------------------------------------|--|
| <input type="checkbox"/> Cable | <input type="checkbox"/> Fuses | <input type="checkbox"/> Quad boxes |
| <input type="checkbox"/> Cable ramps | <input type="checkbox"/> Outlets | <input type="checkbox"/> Load banks |
| <input type="checkbox"/> Transformers | <input type="checkbox"/> Spider boxes | <input type="checkbox"/> Distribution panels |
| <input type="checkbox"/> Circuit breakers | <input type="checkbox"/> Switchgear | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Bus bars | <input type="checkbox"/> Controls | <input type="checkbox"/> Other _____ |

Appendix C: Dry Run Performance Checklists

Planned Exercise

- Rental supplier met expectations
- Electrical contractor met expectations
- Fuel supplier met expectations
- Staff performed effectively
- Overall results satisfactory
- What, if anything, should be done differently?

Surprise Exercise

- Rental supplier met expectations
- Electrical contractor met expectations
- Fuel supplier met expectations
- Staff performed effectively
- Overall results satisfactory
- What, if anything, should be done differently?

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