Portland General Electric

Facility Power Troubleshooting FAQ

With lighting, HVAC systems, computers, refrigeration, machinery and motors all putting demands on your facility's electrical system, it can be a challenge to maintain a reliable flow of power for smooth operations.

Sometimes, power problems happen externally, like when a storm knocks a tree onto a power line. But in many cases, the answer lies inside your facility. Your wiring and equipment, and how they interact, all play a role.

Questions & Answers

Q. One of the 200-amp circuit breakers that serve a compressor has tripped several times. An electrician was unable to find any overload problems with the circuit breaker and thought it was probably due to harmonics. What can be done to fix the problem?

Harmonics is a complex subject and when it causes circuit breakers to keep tripping, it's a nuisance. Harmonic currents are caused by certain types of equipment that draw current intermittently while running. Harmonic currents flow from the load, through the circuit breaker, and into PGE's system. If the circuit breaker is tripping because of harmonics, it may be defective, or you may require a different type of breaker that is not sensitive to harmonics.

Harmonics are sometimes blamed when a circuit breaker that is protecting a compressor trips. However, if a compressor is pulling more than 80 percent of its nameplate capacity for an extended period of time, it will, in fact, overload the breaker and trip. So a 200-amp circuit breaker should not have more than 160 amps per phase for any extended period of time.

Q. We have a small standby generator that supports our critical systems when we have a power outage. We also have small uninterruptible power supplies to support the loads until the generator starts. However, the UPS does not work correctly when the generator operates. Why not?

Not all UPS systems operate correctly when served by a generator.

PGE Business Services

For outages, repair or any power problems, contact your PGE representative or call the Business Services Team:

- Portland: 503-228-6322
- Salem: 503-399-7717
- Elsewhere: 800-822-1077

Top 10 most common facility concerns

Call your PGE representative or call the Business Services Team for help with any of the following:

1. Grounding sensitive machinery. Some equipment manufacturers specify that the power grounding system should not be used for sensitive machinery, such as computer numerical control machines. In fact, some CNC manufacturers designate the installation of a ground rod, separate from the power grounding electrode system, to serve as their ground reference. This violates the National Electric Code and under certain conditions can lead to injury and equipment damage.

2. Avoiding electrical noise. Arcing loads, such as welders and electronic lighting, can create electrical noise that affects TVs, radios and telecommunications equipment. Enhanced grounding and bonding can increase the

Facility Power Troubleshooting FAQ

You can adjust the sensitivity of some UPS units so they work correctly with a small generator. Or it may be necessary to install better controls on the generator before the two can work together. Some generators do not have quality voltage and frequency regulation, while others cause too much voltage distortion. Each of these problems can cause some UPS systems to cycle their battery until it is depleted. Be sure to carefully review the specifications of any UPS you want to operate with a generator to ensure they will work together.

Q. We recently lost some control cards in one of our machines that has surge protection. The repair technician told us the failure was due to surge damage. How can this be true?

Losing some control cards due to surge damage may indicate inadequate surge protection or improper installation. Another common cause of failure for control cards is inadequate or incorrect grounding of the control card system. Wiring errors can lead to failures even if you have surge protection. Contact your PGE representative or PGE Business Services (numbers on front).

Q. One of our large three-phase motors keeps tripping. An electrician told us the motor is not drawing the same amount of current on each phase and something must be wrong with the service from PGE. What can be done?

The PGE specification for voltage imbalance measured at your main service is 3 percent or less. Generally, we are below 2 percent. If the voltage is imbalanced it causes current imbalance in three-phase loads. And if there isn't an equal load on each phase, the voltage imbalance can increase at different locations within your facility. If you think the voltage imbalance is higher than it should be, contact your PGE representative or PGE Business Services.

Q. We have several variable frequency drives that frequently trip during the week. This usually occurs between 5 a.m. and 6 a.m. Do you know why this is occurring and what we can do to prevent it?

If a VFD trips early in the morning, it may be that it is sensitive to capacitor switching transients. PGE turns the capacitor banks on and immunity to electrical noise.

3. Correct installation of adjustable speed drives. If you install adjustable speed drives, it's likely you'll experience nuisance trips and increased harmonic distortion unless you install line reactors or isolation transformers at the same time.

4. Accommodating large motor loads. Starting a motor can require so much electricity that it reduces the voltage for all the other loads that share the same transformer. This can cause many problems, including control systems malfunctioning, high-intensity discharge lighting failures and dimming lights. You can reduce the motor load by using soft-start controllers and adjustable frequency drives.

5. Older adjustable speed drives. Older adjustable speed drives are often sensitive to minor power disturbances. Some newer drives feature stronger immunity capabilities. Call us for important steps in installing a new drive, like performance criteria to improve power quality.

6. Power factor correction You may create rather than diminish power quality problems when you combine power factor correction with harmonics-producing loads.

7. Using neutral conductors. Shared neutral conductors often lead to power quality problems.

Facility Power Troubleshooting FAQ

off at the substations to support our customer load requirements. Some brands of drives (15 HP and smaller) are sensitive to this one cycle disturbance; newer, larger drives are not as susceptible. The most cost-effective way to reduce this type of nuisance tripping is to install line reactors; contact your PGE representative or PGE Business Services for more information.

Q. Every time a fault occurs our variable frequency drives trip off line. What can be done to prevent this?

Most faults are single-phase events, and most VFDs can handle single-phase sags even when the voltage drops to almost zero. Unfortunately, the drive's control circuit may not be able to handle such an event; a minor voltage sag on the control circuit can cause shutdown. There are many ways to solve this problem, but the two most cost-effective solutions are: 1) support the control circuit with an uninterruptible power supply, and 2) replace "weak link" control components with components that are less sensitive to sags. This may involve replacing only a few "ice cube" relays. To find out more, contact your PGE representative or PGE Business Services.

Q. We added variable frequency drives to some of our motors. Now they seem to be failing much sooner than expected. Can you explain this?

Adding VFDs to your existing motors is a good way to reduce your energy usage and have better control of your motors. However, it can lead to early failure of motors that are not designed to operate from a VFD. An inverter-rated motor is one that is designed to operate correctly with a VFD. Motors that aren't can still be used with a drive, but additional mitigation steps are necessary to prevent early failure of the motor. To find out more, contact your PGE representative or PGE Business Services (numbers on page 1).

For example, if three branch circuits share one neutral conductor, the conductor could be overloaded. You can minimize problems by reducing load and using separate neutral conductors for each circuit.

8. Serving sensitive equipment.
Large facilities often use long branch circuits to serve sensitive equipment locations. But even with minor loads that cycle on and off, this can cause equipment to malfunction. To increase reliability, install a transformer near all sensitive equipment locations.

9. Increasing UPS reliability.
If you use a UPS system to protect critical loads from power disturbances, make sure the battery string is good. Install battery monitoring systems and provide proper maintenance.

10. Ensuring generator reliability
It's important to test your standby generator with building loads on a monthly basis to confirm that it is operating properly. By performing this type of regular testing, you can spot potential problems in advance and ensure that equipment will work at critical times. PGE's Dispatchable Standby Generator Program can improve your reliability, while covering most maintenance and fuel costs.