

Data Center Power Terminology

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Table of Contents

Table of Contents	2
Introduction.....	3
Power Disturbances and IT Equipment	4
Uninterruptible Power Supply	4
Standby Generators	4
Voltage.....	5
Wattage	5
A UPS Combined With a Standby Generator.....	5
References.....	6



Introduction

A temporary loss of power is at best a nuisance for any business – at worst it could spell disaster. There are a number of mitigation strategies available ranging from off-site data storage to full hot-site data replication.

There are innumerable situations that can interrupt power delivery – weather, accidents, an overloaded power grid or other calamity – each of which has the potential to cripple businesses that are dependent on technology.

For a recent client engagement Interphase investigated and recommended technologies to mitigate the risk of power outages on an IT data center. This paper briefly describes power disturbances and how they affect IT equipment, and the use of standby generators and UPS devices to reduce the impact of power failures.



Power Disturbances and IT Equipment

Power disturbances can have severe repercussions for business computer systems – particularly server systems. The problem is especially difficult in locations where outages and power fluctuations occur frequently. According to Carl Walker, a project Manager for Eaton Electrical, “public utilities are not required to provide computer-grade power – and they don’t. IT equipment is damaged by subtle anomalies that users never see, such as sags, surges, spikes, brownouts, line noise, frequency variation, switching transients and harmonic distortion.”

While Mr. Walker may appear to be over-emphasizing the horrors of public utility power, he makes a good point –the power company cannot be counted on to supply consistent, clean power to computer equipment 100% of the time – we need to take what the power company provides and modify it for our own use.

Another consideration is that a loss of power will also affect the environmental controls of the computer room. A small room housing several servers can very quickly overheat which can have a much greater affect on the life of the hardware that the power loss itself. Any solution will need to include a method for dissipating the heat generated by the equipment.

Uninterruptible Power Supply

An uninterruptible power supply (UPS) is a device which maintains a continuous supply of electric power to connected equipment by supplying power from a separate source – typically a battery - when utility power is not available. A UPS is inserted between the source of power (commercial utility power) and the load it is protecting. When a power failure or abnormality occurs, the UPS will effectively switch from utility power to its own power source almost instantaneously.

UPS devices are available in different configurations and capacities. Most are sized to provide enough runtime for IT systems to shut down gracefully in the event of a power outage or to compensate for the time it takes for a backup generator to start up and begin supplying line power. Also, most contain power conditioning circuitry that provides a constant output voltage when the supply voltage spikes or sags.

UPS can be configured for extended runtime if necessary due to environmental issues that prevent the installation of a generator.

Standby Generators

A standby generator is another way for a business to mitigate a power loss to a data center. Most simply, a generator is a fuel burning motor (Diesel, propane, natural gas or a combination of the above) coupled to a generator head that turns the motor’s rotation into electricity. Standby



generators are installed permanently as an emergency power source. They are hardwired into the building's electrical system and often get fuel from municipal gas or propane lines.

A generator is measured in terms of the power (Watts) and Volts it delivers. Wattage is analogous to the volume delivered while voltage corresponds to the pressure with which that volume is delivered.

Buyerzone.com provides the following explanation:

Voltage

In the U.S., standard household current is single phase, 120 volts. Most houses have 120/240v service, meaning they have two 120v circuits. The two are combined to provide 240v for power-hungry appliances such as electric ranges, central air conditioning, and water pumps. Many small businesses use this 120/240v service.

However, larger businesses often have different power needs. Often, they use three-phase power, which is better for running heavy-duty motors than the residential-standard single-phase service. In the U.S., three-phase power usually produces 120/208 volts or 277/480 volts. Power generators are available for all common voltages - make sure you know what voltages your business is using now and you'll be able to find a match.

Wattage

Unlike voltage requirements, which are set based on your existing circuits and electric service, wattage requirements increase with each additional appliance or piece of equipment you want the power generator to power. Choosing the right wattage is critical...

The smallest generators produce around 800 watts, while large industrial generators can produce 500,000 watts (500 kilowatts, or kW) or more. Typical sizes are around 15 to 100 kW for small businesses.

When a power loss is detected, an automatic transfer switch starts the generator and allows it to supply electricity to the protected circuits in the office. When power is restored, the switch disconnects the generator and returns to a normal configuration.

A UPS Combined With a Standby Generator

A generator alone is insufficient to prevent computer systems from going down in the event of power loss. The start-up cycle of a generator can take between 30 and 60 seconds, therefore a UPS is still required to protect systems and prevent downtime.

A normal UPS configuration provides 10 to 20 minutes of runtime which should certainly be more than enough for a generator to start up. Once the generator has started and the transfer



switch begins providing power to the UPS, the UPS “thinks” that normal line power has been restored and returns to normal operations.

“Generators most commonly provide two to three days of power, or they can be built-to-order to last longer, according to Eric Johnston, chief executive officer of Americas Generators, a global supplier of generators based in Miami, Fla. Johnston says generators range in price from \$10,000 to more than \$500,000 to backup a large data center. Businesses also should plan for significant installation costs -- installing a generator can add 50 percent to more than 100 percent to the cost of the equipment.” (Gartner, 2007)

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