



Power Outages and Emergency Backup Generators White Paper

A guide to Selecting, Choosing, Purchasing and Installing the appropriate Generator for Emergency Power Backup

Why have a generator for your business?

Power outages are becoming more frequent and are lasting longer. There are two major reasons for this trend. First, severe weather patterns such as thunderstorms, hurricanes, flood and ice storms have increased dramatically over the past few years and are expected to continue at current or even greater levels for the foreseeable future.

In addition, the demand for electricity is increasing at an unprecedented rate and power companies are not able to replace aging transmission networks and build new plants fast enough to keep pace with the growing need.

A generator is a must-have for most enterprise, industrial, and institutional settings. When incoming utility power fails, the UPS detects the condition and switches to battery backup power to keep supplying power to protected loads. Meanwhile, the auxiliary generator starts up, and within 10 to 15 seconds the UPS will begin to receive its power from the generator. In a well-engineered site, integrating a proportionately sized generator, the protected equipment will never be affected.

What size to buy?

The right size generator is a function of many inter-dependent factors, even some that might seem obscure. In fact, so many factors must be taken into account that it's almost impossible to create a standard formula. The good news is that Eaton specialists can recommend the optimum generator for your needs, based on your answers to these questions:

Weighing the Factors

Application and Usage

Which generator will best support my existing UPSs?

Smaller UPSs (50 to 100 kVA) are usually clustered with other equipment to share a much larger auxiliary generator, say, 500-750 kVA. In this case, the generator is probably integrated with the building's electrical system and also supports air conditioning, backup lighting, and other systems.

With larger UPSs and mission-critical environments, the generator will probably be dedicated to only one UPS.

Wattage & Other Requirements

What size is the load that you need to power?

If the generator is shared among many components, you'll need to calculate total power consumption requirements for all loads that will remain up during an outage—as well as those that are dormant until there is an outage, such as emergency lighting systems. If you'll be selectively shedding loads during outages (powering down nonessential equipment), your power consumption during an outage might actually be far less than for day-to-day operations. In addition, you'll need to account for the efficiency losses that are a natural aspect of UPS operation, as well as the diverse operating characteristics of other equipment being powered by the generator—large motors, HVAC systems, etc.

How much of the UPS's rated capacity are you using?

The input characteristics of a UPS can change significantly depending on how much of its rated load it is carrying. A generator might not properly regulate its output voltage when serving a lightly loaded UPS. Is your UPS carrying loads at 80 to 90 percent of its rating, or closer to 15 to 20 percent of its rating? Eaton has designed intelligent input filters that can modify input characteristics to mitigate this effect, but it still must be taken into consideration.

Do you want UPS batteries to be recharged during or after the outage?

Although the generator may promptly step in to provide substitute power, the UPS batteries would still be partially discharged from carrying the load during the transition period. If you want to recharge the batteries while running on generator power, that drain must be factored into the generator size.

Are you considering a diesel, gasoline, or natural gas generator?

With carburetor and manifold or fuel injected? These variances make a difference in how the generator responds to step loads (building up gradually to full operation), and how much power can be generated. Diesel generators, which usually feature fuel injection engines, emit more power than comparable gasoline or natural gas generators. So if you were leaning toward (or already have) gasoline or natural gas, the generator would be sized somewhat larger to compensate.

Do you need a small generator to cover one small UPS?

If you need backup power for a UPS rated at 150 kVA or less, you might want to oversize the generator by as much as 200 percent, because very small generators often don't produce enough kinetic energy to provide smooth operation.

Typically, the generator must be oversized to some degree with respect to the output sizing of the UPS, to cover all these contingencies and considerations. You can't size a generator in a 1:1 match to the UPS and expect efficient results. As a general rule of thumb, auxiliary generators will be sized at about 1.3 to 1.5 times the output rating of the UPS in kW— somewhat higher for gasoline or gas powered generators. Eaton will be glad to help you select the most appropriate generator for your specific application.

Generator Safety

- Use the appropriate sized power cords recommended by the manufacturer to carry the electrical load.
- Never run cords underneath rugs or carpets where heat could build up or a damaged cord could go unnoticed.
- Never connect generators to another power source such as power lines. The back feed of electricity can be fatal.
- To avoid the risk of carbon monoxide poisoning, never run a generator in an enclosed space.

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