Top UPS design considerations

The following factors outline the key design considerations to take into account when analyzing your needs.

1. Power environment: single- and three-phase

Understanding your existing power infrastructure is a crucial step in the qualification and sales process. While you may focus on larger, three-phase power systems, the majority of IT managers are dealing primarily with single-phase equipment, often at the rack level.

Many existing computer rooms and small to mid-sized data centers have single-phase loads at the rack level. Ground-up designs are increasingly moving three-phase power to the point of utilization to gain efficiencies and reduce costs, creating great opportunity for three-phase solutions in new construction.

2. Installation environment

It's imperative to understand how a prospective UPS will be deployed. Since most environments support several different solutions, you may need to evaluate these options.

3. Power load

The VA or watt rating of your power loads is one of the most important factors in identifying the right UPS. After identifying the power environment (if the UPS needs to be single- or three-phase), the size of the UPS further narrows the selection. In single-phase deployments especially, it often makes sense to select a UPS that exceeds current power requirements but offers greater runtimes and allows for future growth.

4. Availability

This is where you need to determine your true runtime requirements. While runtime may seem like a simple thing to quantify, understanding the facts behind the numbers help contribute to the development of end-to-end solutions.

Generally, the amount of runtime required can significantly affect the solution cost, but many Eaton solutions are actually more cost-effective in extended runtime applications.

5. Scalability

It's always important to consider your future expansion needs when evaluating solutions. Eaton's scalable UPS solutions provide a competitive advantage by offering a cost-effective way to increase capacity. Virtually all Eaton® UPSs with a 6 kVA or greater power rating offer some form of scalability, either through a simple firmware upgrade, the addition of modular hardware components or the paralleling of multiple UPSs.

For cost-conscious or budget-constrained customers, a UPS with inherent scalability often proves to be the best value in the long run, allowing you to increase capacity without purchasing additional hardware. A simple kVA upgrade is all that's needed to enable a UPS with inherent scalability to operate at full capacity.

You may want to service the UPS yourself. If that's the case, look for a unit that allows you to add capacity with power and/or battery modules.

While modular solutions—including multiple, paralleled systems—are often a more affordable option initially, they can be a more expensive solution over the long term due to added hardware and installation costs. Depending on your needs, a larger, centralized, non-modular system with inherent scalability might ultimately be the most cost-effective solution.

6. Power distribution

It is important for you to consider how power will be delivered to your critical equipment. In some cases, you may simply plug loads directly into the UPS. In others, you may need large PDUs to distribute power. You may also incorporate rack-based power strips or ePDU units into your design.

7. Manageability

While a UPS protects the attached load during a power outage, power management software is required to ensure that all work-in-progress is saved and that sensitive electronic equipment is gracefully shut down if the power outage exceeds the battery runtime of the UPS. Without software, the UPS simply runs until its batteries are depleted and then drops the load. In addition to this basic functionality of UPS software, you should consider the following monitoring and manageability capabilities:

- Power event notifications, including e-mails, pop-up alerts and text messages to pre-designated recipients
- Logging of power events
- Advanced capabilities in virtual environments, including integration into VMware's ESXi and vSphere and Microsoft's Hyper-V
- Dedicated battery monitoring and advanced service notifications
- Remote monitoring by service personnel from the UPS manufacturer.

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Other UPS design considerations

The following design guidelines should be reviewed and followed prior to ordering the appropriate UPS solution.

1. Check to see if there's an adequate electrical supply near the UPS.

Compare UPS fuse ratings (amps) and breaker types and whether any electrical work may be needed (i.e., cabling to the UPS terminal block input).

2. Find out the dimensions of the UPS and include any battery cabinets.

Make sure your installation site has enough space available.

3. Ensure the UPS can be placed in its final position.

Will the UPS components fit through doors? Are there any stairs? Please consult Eaton's website for detailed UPS dimensions and specifications: **www.eaton.com/power-quality.**

4. Verify that the floor is strong enough to support the UPS and battery cabinets.

The UPS and its battery cabinets can be heavy, so make sure the site has the proper floor loading capacity.

5. Confirm that the UPS will have adequate ventilation.

Eaton UPS models use internal fans to cool them. You shouldn't install the UPS in a sealed container or small, sealed room.

6. Always be sure which wall receptacle is required to plug in the UPS.

Only UPSs with power ratings up to 1500 VA plug into a standard 15-amp wall outlet. All others require a larger receptacle, which must be installed by an electrician. Things go more smoothly if you aren't waiting for this to be done after all of the equipment has arrived. Most small and rackmounted computers run on normal 120 volt, 15-amp electrical service. Some computers have power cords that require a higher voltage of 208V or 240V, in which case you'll need a 3000 VA or larger UPS.

7. Hardwired connections.

Hardwired outputs are generally useful if you want the UPS output to be distributed via electrical panels. Using an electrical distribution panel allows for flexibility with receptacles types. If there's no other UPS that fits your receptacle and power requirements, you may need to hardwire it. Hardwired UPS models typically require the use of a certified electrician to wire them to the electrical distribution panel, which could be a more costly option.

8. Installing small UPS models behind larger UPS models.

If you're installing a smaller UPS behind a larger UPS, you must consider the total potential power of the smaller UPS as well as other loads that will be powered by the larger UPS. For example, if you're plugging a 1500 VA UPS into a 10,000 VA UPS, you must consider the load of the smaller UPS rather than just the load that's plugged into it. In addition, the larger UPS must be at least five times larger than the smaller UPS. This design guideline must be followed due to charging capacity that may be required by the smaller UPS; any anomalies associated with the building power, and to avoid overheating or potential over loading of the larger UPS which may result in failure of the all UPS models in the string.

9. Using a UPS and a generator together.

A UPS provides backup power and actively conditions and regulates voltage. Similarly, an auxillary generator provides backup power, but typically takes 10-15 seconds to start up, depending on its type. For long-term backup servers and IT equipment, this isn't an optimal situation, so during that downtime the UPS kicks in. Basically, the UPS bridges the power gap between loss of power and generator coming online.

When choosing your UPS solution, it's important to keep power ratings in mind; you cannot size a generator in a 1:1 match to the UPS and expect successful results. There are two reasons for this: first, UPSs aren't 100% efficient and second, generators need to account for step loads. In addition, very small generators don't often provide enough kinetic energy to provide a smooth transition. As a rule of thumb, for 20 kVA and above, auxiliary generators should be sized 1.5 times the size of the output rating of the UPS in kW, while for 20 kVA and below, they should be two times larger. It's also important to note that gas-powered generators should be sized a bit larger.

10. Building codes.

Verify that the final UPS solution meets local building codes.

8. Operation and maintenance

While you may value the ability to service your own equipment, the vast majority of IT and facility management professionals prefer the peace of mind that comes with full factory support through on-site service or an advanced UPS exchange agreement. To make an informed decision on service support, you must accurately assess your own technical and service capabilities. You should also look at the various UPS product designs to gauge how easy it is to swap out battery and power modules.

9. Budget

Although the latest performance features of a UPS may fit nicely with what you are looking for, budget constraints may force you to make trade-off decisions. Be prepared to prioritize your needs for redundancy, scalability, efficiency, software management, modularity and serviceability.

Eaton
Electrical Sector
1000 Eaton Boulevard
Cleveland, OH 44122 USA
Eaton.com

Powerquality.eaton.com

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