VERTIV WHITE PAPER

Single-Phase UPS Lifecycle Management: Protecting IT Availability

Executive Summary

With an uninterruptible power supply (UPS), you have made a significant investment in power protection for your operations, so it doesn't make sense to risk that investment on batteries that may not work when needed most. Your system availability depends on a working battery.

UPS batteries are built to provide several years of service, operating reliably even through repeated charging and occasional use while supporting critical loads. But like any battery, they have a defined lifecycle. The key challenge is to know when your batteries are nearing the end of their life expectancy and to be able to replace them before you get into a situation — such as a complete power outage — where they fail to protect the load.

Single-phase UPS units are used by many mission-critical applications, including servers, critical nodes, network workstations, large network peripherals, network routers, bridges and hubs, as well as Voice over Internet Protocol (VoIP), safety/security, and point-of-sale (POS) systems.

These smaller UPS systems, ranging in capacity from 500 VA up to 20,000 VA, are usually overseen by IT/network managers and administrators within organizations having edge or remote computing locations. These types of installations are common for education, banking, healthcare, retail, industrial, and/or government organizations.

When it comes to small or remote IT edge installations, out of sight is certainly not out of mind, especially with their vital role in meeting business and customer demands. This is why a dedicated battery lifecycle management program is so important. The right battery management program must include battery maintenance to ensure that batteries are operating at peak performance. It should also alert IT personnel when a battery is nearing time for replacement.

In addition to keeping an eye on battery health, a management program should enable oversight of the UPS itself. As a small UPS gets older, usually after being in service for more than five years, it may be more cost-efficient to consider a total replacement of the unit as opposed to just making another battery replacement. Much like an aging PC or server, the older a UPS system, the greater the risk of unanticipated failure due to problems with internal system components and the more the UPS will lack in terms of technological innovations and performance enhancements.

In this white paper, we will highlight the critical role of the battery within single-phase UPS systems and discuss the options for ensuring power and business continuity, especially as IT networks increase in size and complexity and/or become more dispersed.

Battery Basics

Batteries store electricity that flows to devices when needed. Ranging from full to partial, a battery may have different capacities as the stored energy supply diminishes. As batteries age, they have a depleted ability to carry capacity. This aging is caused by exposure to high temperature and general use of the battery.

Essentially, your battery lifespan begins decreasing as soon as you begin using the UPS system. Life expectancy on valve-regulated lead-acid (VRLA) batteries is generally from 3 to 5 years, depending on the temperature and cleanliness of the environment where it is located, as well the number of discharge and recharge cycles. Average UPS system life is 7 to 10 years or when you're up to your third battery replacement.

Many IT users have an aging population of UPS systems that either need new batteries or a complete system replacement. They may also have limited internal resources to remove, install, maintain and service batteries and UPS equipment. This process is especially challenging when UPS systems are located in remote or unmanned sites that are difficult to access and manage.

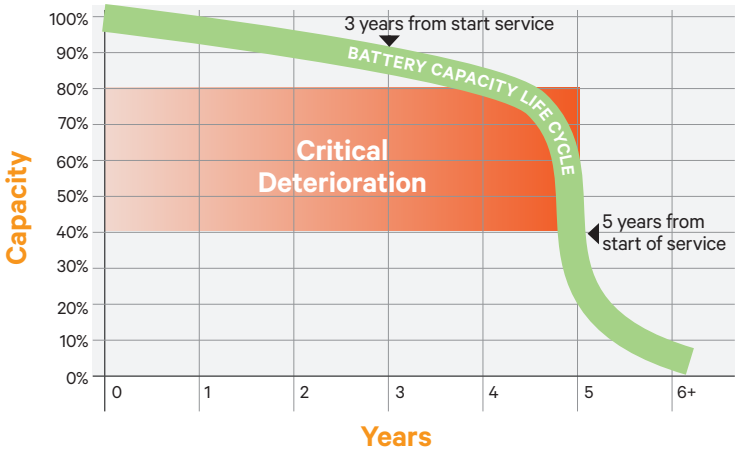
The Challenges to Long Battery Life

Your UPS system and battery should be installed in a temperature-controlled environment if possible. The location should also be out of direct sunlight and free of excessive dust and other airborne particles. Ventilation openings on the UPS should be free of any blockage.

When there is a power failure, or other power anomalies that are outside of normal operation, battery power will be called upon to properly power the protected equipment. When adequate power is restored to the UPS, the battery will automatically be recharged in preparation for the next outage.

A VRLA battery's chemistry is such that it can only handle a finite number of discharge and recharge cycles (generally up to 300 full discharges) before it fails and must be replaced. In addition, the depth to which the battery is depleted during each discharge event will also affect its lifecycle.

Typical VRLA Battery Capacity over Time



Low Maintenance Isn't No Maintenance

While most of the batteries used in single-phase UPS systems are considered maintenance-free, it is still necessary to monitor and maintain them.

The maintenance-free description is referring to the fact that these batteries do not require electrolyte fluid replenishment. Every 3 to 6 months, a periodic maintenance inspection of the UPS and battery should be performed to accurately determine the state of battery health.

Accumulated dust, dirt, or debris should be removed to avoid any short circuits or ground fault conditions. The UPS battery should be inspected for any leaking or swelling, and if these conditions exist, it should be replaced and recycled properly.

As defined by the Institute of Electrical and Electronics Engineers (IEEE), the end of life for a VRLA battery is when it can no longer supply 80 percent of its rated capacity. This loss in capacity is due to the deterioration of internal battery components.

The degradation process speeds up as the battery nears end-of-life and must be replaced. Even though a battery at this point may still be able to provide adequate runtime, the internal deterioration of the battery will increase the likelihood of sudden failure.

Battery Recommendations

Ideally, your UPS should be in a space that is cool and dry with proper ventilation. If possible, the temperature where the UPS is located should not exceed 77 degrees Fahrenheit (25 degrees Celsius). Excessive heat has a detrimental impact on overall battery life. It is important to remember that for approximately every 18 degrees Fahrenheit (10 degrees Celsius) above the ambient temperature of 77 degrees Fahrenheit (25 degrees Celsius), the life of the battery will be reduced by 50 percent. This is why keeping batteries at a proper operating temperature is so critical to UPS performance.

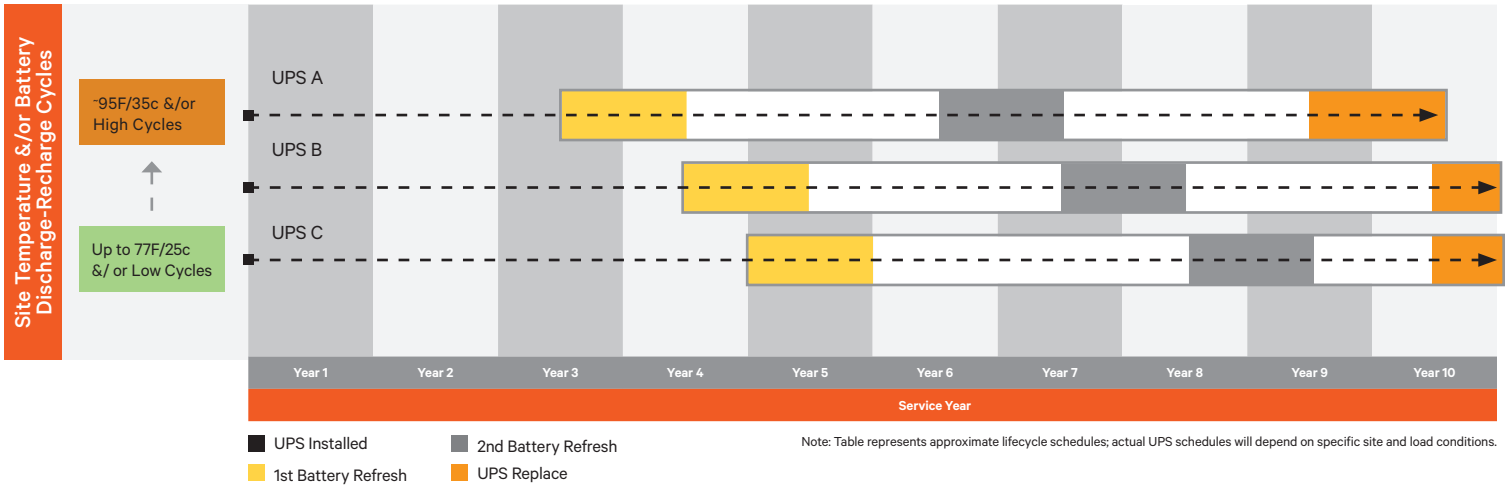
Since the operating life of a VRLA UPS battery is generally from 3 to 5 years, performing preventive maintenance, such as runtime tests on the UPS, once or twice a year should be sufficient to determine your battery's capabilities to support the connected load. Many newer UPS systems also include automatic self-diagnostic and testing features that can aid in ensuring that the UPS is operating properly.

Additionally, the load of the equipment connected to your UPS should be managed. The closer the load is to the UPS rated capacity, the less runtime will be available in the event of an outage. In addition, heavy, repeated discharge cycles will tax the battery, and if sustained, will eventually contribute to deterioration of the service life. UPS monitoring systems and services should be considered to oversee and manage equipment loads.

Ensuring Maximum UPS Performance

Maintaining the health of a UPS system in a variety of locations may require more time or resources than an organization is able to allocate. While small UPS systems typically utilize user-replaceable, plug-and-play type batteries, maintenance requires manpower and management. This becomes especially challenging for locations without qualified staff and/or with larger quantities of units. This is where it makes sense to consider the battery service options available today. UPS and battery management services can be valuable in keeping systems operating at a peak performance level. This type of service offers various ways to handle the UPS and battery lifecycle maintenance program depending on user needs.

Small UPS Battery Managemnt Program - Lifecycle Examples



Note: Table represents approximate lifecycle schedules; actual UPS schedules will depend on specific site and load conditions.

UPS Restoration

In cases where there are qualified resources dedicated to maintaining the power in small or remote IT sites, there are do-it-yourself options in which users are shipped a factory-authorized UPS battery pack that they can install and start up.

UPS Refresh

A UPS refresh service eliminates the challenges IT professionals face in small or remote site management. This service level typically includes a new battery pack with installation, startup, and a UPS wellness checkup by a factory-authorized technician. The technician also removes the spent batteries and ensures proper recycling that is in accordance with all government and industry regulations. This service includes the management of any regulatory paperwork that may be required.

A refresh service can also include support via a service contract depending on the age of the UPS. This type of support can provide 24x7 emergency response with 100 percent coverage of travel, parts, and labor including a failed battery or UPS replacement. It can also include proactive emergency response enabled by continuous monitoring and data analysis by remote system engineers.

UPS Replacement with a New Unit

As a UPS system ages and is near the end of its usable life, typically within a range of 7 to 10 years, battery replacement is likely not the best solution. This is the time when you should consider full UPS replacement. And if IT resources are stretched, a combined, comprehensive installation and support plan should be included. Like refresh services, a factory-authorized service technician can handle the installation and set-up of a new UPS, as well as removal and recycling of the old unit. This level of offering may also include service support that features parts, labor and travel coverage, as well as proactive emergency response.

Conclusion

The need to manage the lifecycle of your UPS system and its batteries is essential to an effective power protection strategy. Whether it is do-it-yourself battery replacement or the use of a qualified technician to replace and manage batteries, there are comprehensive options for efficiently maintaining the health of your UPS in IT/edge locations.

A user-oriented, UPS and battery lifecycle maintenance program that maximizes uptime and simplifies replacement can be invaluable. Having factory-authorized technicians perform the work will allow you to augment your busy IT staff with a team of experts who can literally do the heavy lifting, ensuring continuous power for support of vital business applications.

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