

## Choosing a UPS Service Plan

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### Executive Summary

Eaton, a global leader in power quality, distribution and control, recommends the inclusion of a service plan in order to maximize the performance and reliability of an uninterruptible power system (UPS). This white paper examines the four primary options available for maintenance and service of UPS products and outlines the differences and specific advantages among these alternatives.

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### Introduction

The old adage of, “If it ain’t broke, don’t fix it” may be feasible in some circumstances, but applying it to the maintenance of a UPS can have devastating consequences. Because a company relies on a UPS to deliver continuous power without any disruption to its business, proper service is a critical component to ensuring optimal performance from a UPS while minimizing the risks of downtime. The National Survey on Data Center Outages reported the average cost of downtime was \$1.7 million per year.

Research indicates that regular preventive maintenance—which affords the opportunity to detect and repair potential problems before they become significant and costly issues—is crucial in order to achieve maximum performance from your equipment. In fact, studies show that routine preventive maintenance appreciably reduces the likelihood that a UPS will succumb to downtime. The 2007 Study of Root Causes of Load Losses compiled by Eaton revealed that customers without preventive maintenance visits were almost *four times more likely* to experience a UPS failure than those who complete the recommended two preventive maintenance visits per year. Figure 1 shows the typical parts and maintenance required for an Eaton 3-phase UPS to achieve a 20 year lifespan.

	Year																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<b>Preventive maintenance (PM)</b>																				
UPS PM /with infrared scan	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Battery PM	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Thermography (infrared scan)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
<b>Replacement parts</b>																				
Air filter	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Static switch fan				◆					◆					◆					◆	
Fan				◆					◆					◆					◆	
ISBM interface PCB									◆										◆	
UPM interface PCB									◆										◆	
ISBM control board									◆										◆	
UPM control board									◆										◆	
Static switch board										◆										
Power module									◆										◆	
ISBM power supply PCB									◆										◆	
UPM power supply PCB									◆										◆	
Mini CSB PCB									◆										◆	
Display assembly									◆										◆	
Battery (VRLA)			—	—			—	—			—	—			—	—			—	
Battery (wet cell)															◆					
AC capacitor				—	—				—	—				—	—				—	
DC capacitor (9390/9395)																			◆	
DC capacitor 9315				—	—				—	—				—	—				—	
Spare parts kits available																				
<b>Additional services and upgrades</b>																				
<ul style="list-style-type: none"> <li>• kVA upgrade: Increase the power capacity of your UPS</li> <li>• Cellwatch battery monitoring: Daily battery monitoring increases overall system reliability</li> <li>• eNotify Remote Monitoring: 24x7 real-time monitoring of your UPS and battery systems by trained Eaton personnel</li> <li>• Energy Saver System (ESS): Reduce your utility bill by maximizing the efficiency of your UPS to 99% without sacrificing reliability (9390 and 9395 UPS models)</li> <li>• Firmware upgrade: Available as part of a UPS standard contract</li> </ul>																				

◆ Parts inspected and replaced as necessary under standard services contracts. Please contact your sales representative for details about your coverage.  
 — Parts are inspected, but replacement is not covered under standard services contracts. Eaton recommends replacement of these parts within time intervals indicated by a solid blue line.

Figure 1: An illustration of typical UPS maintenance requirements

## What type of service is best for you?

Selecting a service provider for your UPS can be a complex decision. Some customers simply purchase a service contract or extended warranty from the UPS manufacturer, while others prefer to contract with an independent service provider. A handful of companies employ internal engineers who are capable of maintaining all or certain parts of the power equipment. Still others choose to engage in UPS service only when something goes wrong. All of these options have advantages and disadvantages, with no one choice being the best solution for every organization.

## Common questions for choosing a service provider and plan

1. If my UPS fails to provide reliable backup power, what is the cost of downtime to my organization?
2. How critical is continuous power to my application? Is it simply an inconvenience or do I lose customer sales, destroy products or shut down a network of critical servers?
3. How long can I wait to obtain an emergency repair on my UPS? A week, a day or an hour?
4. How many trained field technicians for my specific UPS model are within 100 miles of my site, and do they carry the correct parts?
5. Do I have budget or cost constraints for UPS service?
6. How much scheduled preventive service do I need and what can I afford?
7. What level of service is recommended by the manufacturer?
8. Have I budgeted for battery, capacitor or other unplanned part replacement costs?
9. Do I have competent electrical staff resources to do some or all necessary maintenance?
10. What is my risk tolerance for a UPS failure, and what happens to me personally if this UPS fails?

Regardless of the exact course of action you implement, an effective preventive maintenance plan saves time and money by minimizing business interruption and the costs of downtime, as well as enhancing your overall return on investment by extending the lifespan of your critical power equipment.

## Option 1: UPS manufacturer's internal service organization

Engaging in a service contract with the manufacturer of your UPS affords a number of benefits. To begin with, customers receive the extensive knowledge, capabilities and expertise of factory-trained field technicians who receive ongoing and in-depth training on the manufacturer's specific UPS products. As a result, technicians are armed with the most up-to-date and comprehensive information pertaining to the functionality of the UPS, as well as access to the latest firmware and upgrade kits to maintain the highest level of performance from the UPS. Furthermore, the advanced troubleshooting capabilities of technicians translate to a reduced mean time to repair. When performing service on a UPS, the day-to-day familiarity and knowledge that comes from being brand-specific cannot be underscored enough.

In addition to offering a deep support infrastructure of design engineers, technical support personnel and other experts to back up its field technicians, UPS manufacturers generally possess the greatest number of field personnel and back office resources. Furthermore, manufacturers most often have in place risk mitigation programs that are frequently overlooked by customers, such as appropriate safety programs and proper levels of insurance.

Another significant advantage to manufacturer-provided service is that technicians have spare parts readily available either from a stocked van or from a central location, ensuring that UPS problems are quickly resolved, most often on the initial service call. Furthermore, many service plans include discounts on part kits and product upgrades, which can significantly reduce the overall cost of maintenance.

To meet the varied needs of customers, UPS manufacturers offer a wide variety of service plans, including standard warranty, extended warranty, preventive maintenance, numerous service contract levels, and time and material (T&M) billing. Many also feature value-added support such as remote monitoring. Even more, most manufacturers offer service contracts that include options such as 7x24 coverage, with response times ranging from two to eight hours or next-day response—an especially appealing benefit for customers in mission-critical environments.

While the price of service may be slightly higher from a manufacturer compared to an independent service provider, the advantages that only a UPS manufacturer can offer may outweigh any additional costs.

## Option 2: Independent service provider

An independent service provider is a third-party organization that often offers a range of services for UPSs or power quality equipment, such as professional maintenance, consulting, start-up, installation and emergency service. Although independent service providers are frequently priced lower than a UPS manufacturer, they also generally have fewer resources available and may not be comprehensively trained on your particular UPS model.

While an independent service provider's field technicians have usually received training on either a specific UPS product or brand, and may or may not be certified by a UPS manufacturer, it is virtually impossible to fully train a technician on every UPS model from every manufacturer. Furthermore, because UPS products are continually being updated and changed, if a technician has not been recently trained by the manufacturer, he or she may not have the knowledge to adequately service the UPS.

When it comes to having access to repair parts, some technicians may carry the appropriate parts with them or have them available from a central location. However, it is difficult to carry a local supply of adequate parts for all brands. Generally, independent service providers will access a UPS manufacturer's deep support infrastructure of design engineers, technical support and experts to back up their own field team, as the depth of their own resources can be limited. Insurance and safety records may or may not be maintained at an acceptable level.

While independent service providers generally do not deliver a factory warranty unless contracted by a manufacturer, they do offer preventive service, a variety of service contract levels, and T&M billing. Some may offer value-added support such as remote monitoring.

#### UPS service comparison chart: UPS Manufacturer vs. Independent Service Provider

	UPS Manufacturer	Independent Provider
Number of factory-trained techs within 100 miles for the specific UPS models		
New OEM (not refurbished or used) parts for the specific UPS model stocked on van with field tech		
Percentage of week spent working on specific UPS make or model		
Has 7x24 backup logistics center with specific new OEM parts		
Has 7x24 call center for emergency support		
Has 7x24 technical support available for specific UPS make and model		
Provides electronic field reporting and site history		
Has defined escalation process and senior techs on call 7x24		
Has access to OEM's technical field service bulletins (FSB)		
Maintains an OSHA incident rate of <1.0		
Has OSHA compliant safety program and documents for inspection		
Complies with NFPA 70.E for arc flash work practices		
Measures every site visit for customer satisfaction and improvement using quality of service surveys		
Employs direct field technical support (product experts) employees to back up the field technicians		
Offers 7x24 remote monitoring and diagnostics		
Has liability insurance and financial stability		
Has access to factory and product design engineers		
Has latest firmware and upgrade kits to maintain performance		
Can manage and extend the product life cycle for maximum cost effectiveness		

Can offer local, national or global support contracts		
Can provide professional engineering, turnkey and support services		
Supports a wide variety of infrastructure products under a single contract		
Has 40+ years of proven expertise in delivering power quality services		

### Option 3: Self-maintenance

If an organization has an internal resource that possesses sufficient electrical and safety skills, it may make economic sense to perform self-maintenance on a UPS. The most important aspect of self-maintenance is to have an efficient plan in place, in which routine scheduled maintenance is performed and common wear items such as batteries and capacitors are proactively addressed.

First responder training enables a skilled person to understand the operation, safety, environmental concerns and basics of preventive maintenance on a specific UPS. This person must also understand the various alarm conditions and responses required for specific events, as well as the steps to start and stop a UPS correctly in various applications.

A spare parts kit obtained from the UPS manufacturer can supplement those who choose to self-maintain their UPS equipment. However, it is important that an organization also has access to a professional service provider for more critical repairs, upgrades or routine maintenance that may be required to supplement a self-maintenance resource.

#### Questions to ask when considering self-maintenance

Before opting to perform self-maintenance on a UPS, consider the following questions:

1. Is there an internal resource within your company that possesses basic UPS knowledge and electrical skills? If so, does this individual have time that can be designated to UPS maintenance?
2. Has your organization developed a specific plan for self-maintenance, including a schedule for replacing common wear and tear items?
3. Has a spare parts kit been purchased from the UPS manufacturer?
4. Has an external service resource been identified for more critical repairs?

### Option 4: Time & Material

Paying as you go is a common UPS maintenance approach that can be appropriate in certain situations, primarily for very old UPS models where no service contract is available. However, this tactic does not make good economical sense for complex, multi-module or redundant UPS configurations.

Available at any time to all customers, T&M is typically charged per hour of labor, often with a minimum number of hours required. Charges are also generally more for after-hours and weekends, compared to normal business hours. Response time for T&M is typically "best effort" with no guarantee of arrival, as customers with existing service agreements are always given priority over T&M customers.

Another downside to T&M is that replacement parts are usually very expensive. For example, the average board for a common three-phase 80 kVA UPS costs more than \$5,600, while power modules that integrate several components exceed \$10,000 each, with larger models containing several pairs of modules.

The uncertainty of response time during an emergency and financial exposure to unplanned repairs may make T&M less attractive to more mission-critical organizations. On the other hand, T&M may be appropriate for a self-maintainer, in situations where a UPS is not fully utilized, or where preventive

maintenance is being performed by a manufacturer or independent provider and the insurance portion of a service contract (parts and labor coverage and emergency response) is deemed unnecessary by either self-insuring or other reasons.

### **Questions to ask when considering T&M**

If you are considering the pay-as-you-go approach, it is important to first consider the following questions:

1. Is there a service plan available for your particular UPS?
2. How complex is your organization's UPS?
3. Is your UPS utilized regularly or occasionally?
4. Is your UPS supporting mission-critical applications?
5. In the event of a UPS failure, can your organization afford an uncertain amount of downtime until a technician is able to schedule a service call?
6. Does your company have sufficient funds allocated for T&M service, parts and repairs?

### **Conclusion**

Although UPS technology has improved significantly over the past 20 years, routine maintenance of these complex devices is critical for organizations wishing to avoid the potentially devastating and extremely costly consequences of downtime. Whether you choose to engage in a regular preventive maintenance contract with a UPS manufacturer, rely on an independent service provider, perform routine maintenance in-house, or call upon professional expertise only when needed, there are specific benefits to each option, as well as disadvantages of which you should be aware. Regardless of the process you choose, some form of UPS maintenance is necessary in order to minimize business interruption and the costs of downtime, as well as enhance your return on investment and maximize the life of your UPS.

### **About Eaton**

Eaton is a diversified power management company providing energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power. With 2012 sales of \$16.3 billion, Eaton is a global technology leader in electrical products, systems and services for power quality, distribution and control, power transmission, lighting and wiring products; hydraulics components, systems and services for industrial and mobile equipment; aerospace fuel, hydraulics and pneumatic systems for commercial and military use; and truck and automotive drivetrain and powertrain systems for performance, fuel economy and safety. Eaton acquired Cooper Industries plc in 2012. Eaton has approximately 103,000 employees and sells products to customers in more than 175 countries. For more information, visit [www.eaton.com](http://www.eaton.com).

### **About the author**

Arthur Mulligan is a Raleigh-based product manager for Eaton's US power quality service organization and is celebrating his 14<sup>th</sup> year with Eaton. He brings a varied background of marketing, advertising and sales experience in telecom, software and professional services. Prior accomplishments include expanding Eaton's remote monitoring services (eNotify), developing a new online services configurator and redesigning service offerings between bundled packages and an a la carte (Flex) menu-based approach to drive customer value. Mulligan has a B.A. in Economics and Management from Albion College.