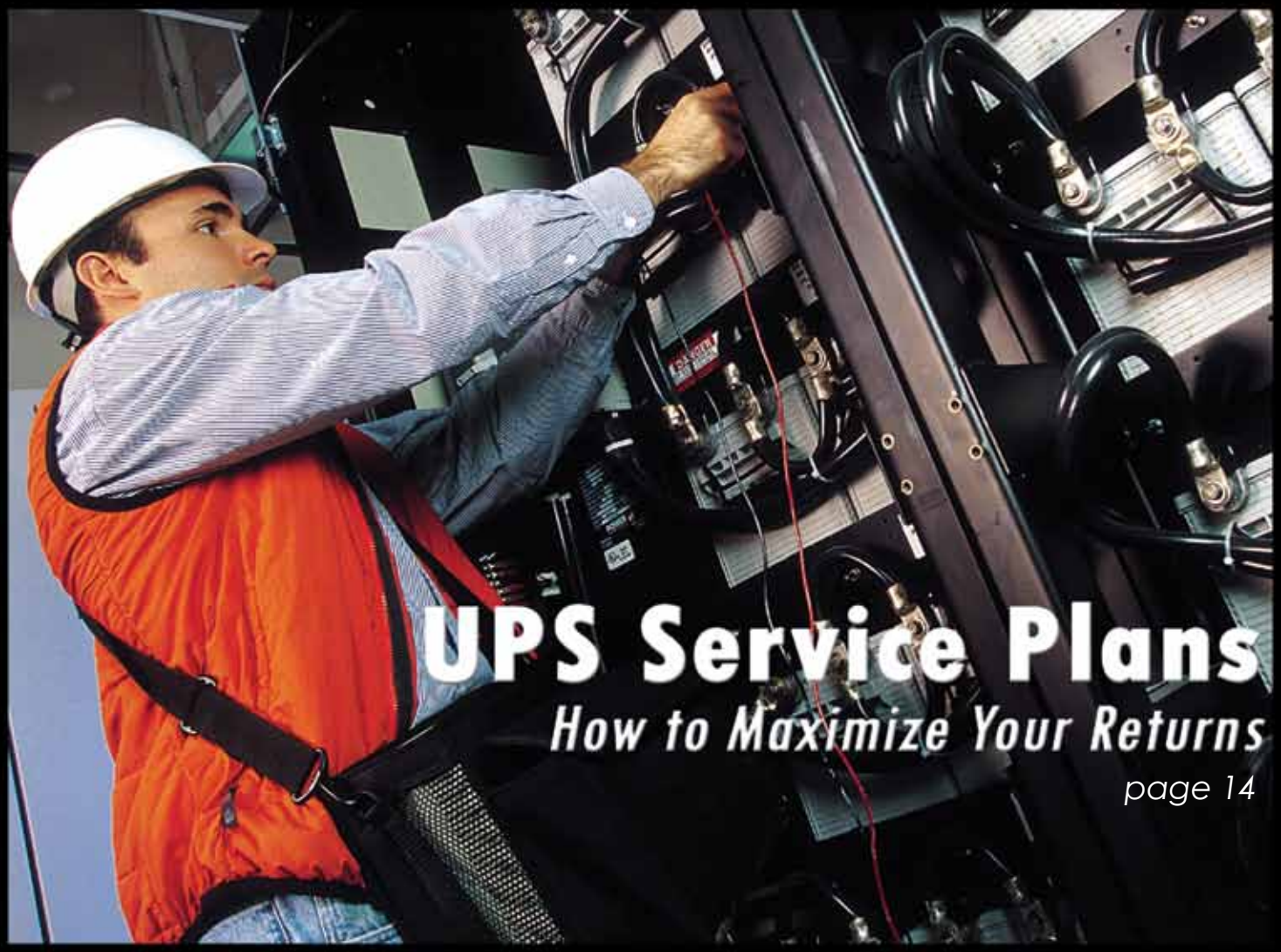
BATTERY POWER

Solutions for OEM Design Engineers, Integrators & Specifiers of Power Management Products

September/October 2010 www.BatteryPowerOnline.com Volume 14, Issue 5



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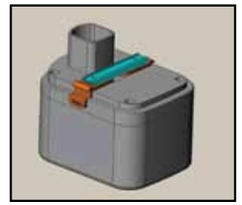

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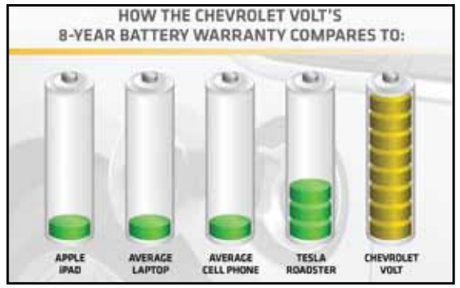
Chevrolet Volt Provides a Standard Eight-Year, 100,000-Mile Battery Warranty

The Chevrolet Volt electric vehicle with extended range will provide customers with an standard, eight-year/100,000-mile warranty on its advanced, lithium-ion battery. It is the automotive industry's longest, most comprehensive battery warranty for an electric vehicle, and is transferable at no cost to other vehicle owners.

The Volt's comprehensive battery warranty covers all 161 battery components, 95 percent of which are designed and engineered by GM, in addition to the thermal management system, charging system and electric drive components.



The Volt has a range of about 340 miles and is powered with electricity at all times. For up to the first 40 miles, the Volt is powered solely by electricity stored in its 16-kWh lithium-ion battery, using no fuel and producing no emissions. When the Volt's lithium-ion battery runs low, an engine/generator seamlessly operates to extend the driving range another 300 miles on a full tank of fuel.

The Volt's battery management system continuously monitors the battery real-time for optimum operations. More than 500 diagnostics run at 10 times per second, keeping track of the Volt's battery pack; 85 percent of the diagnostics ensure the battery pack is operating safely, while the remaining 15 percent keep track of battery performance and life.

GM engineers have completed more than 1 million miles and 4 million hours of validation testing of Volt battery packs since 2007, as well as each pack's nine modules and 288 cells. GM's Brownstown Township plant, which began building prototype batteries in January, soon will begin regular battery production.

Falcon Electric Unveils First Lightweight Lithium-Polymer Battery Pack for Mobile Military Applications

Falcon Electric, Inc. has unveiled a new lightweight power conversion system and ultra-light lithium-ion polymer battery pack. Falcon's ED LIB series 5 kVA UPS includes a lithium-polymer battery system, which is the first Department of Transportation-certified battery for use on-board Mobile Armored Vehicles, High-Mobility Multipurpose Wheeled Vehicles and other mobile applications.

Falcon's power conversion system converts the three-phase, 400 Hz power provided by an auxillary power unit (APU) in the vehicle and converts this raw alternate power to a clean, regulated 120 VAC/60 Hz source for critical computer and communications gear on board. Currently, hundreds of the new rackmount ED-LIB series 5 kVA models are in use by the US Army in Iraq and Afghanistan.

Due to its light weight and small size, the ED-LIB is well suited for powering sensitive computer-based equipment from generator-based APU sources typically incorporated into single and dual-pallet shelters, as well as tactical, hospital or laboratory shelters. Furthermore, to accommodate mobile applications the ED-LIB is designed to meet the shock and vibration requirements of RTCA/DO160, Zone A and the Munson Road Test.

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GE Introduces Smart Grid-Compatible Electric Vehicle Charger

GE has introduced the GE WattStation, an electric vehicle (EV) charger. Designed to help accelerate the adoption of plug-in electric vehicles, GE WattStation significantly decreases time needed for vehicle charging and, using smart grid technology, allows utility companies to manage the impact of electric vehicles on the local and regional grids.

Combining functionality with consumer friendly form, the GE WattStation on average decreases electric vehicle charging time from 12 to 18 hours to four to eight hours compared to standard charging "level 1", assuming a full-cycle charge for a 24 kWh battery. GE WattStation will be commercially available globally in 2011. GE will unveil a specialized home version of the charger later this year.

Underwriters Laboratories Introduces Safety Requirements for Battery Separators, Aiming to Further Battery Safety and Integrity

Underwriters Laboratories (UL) has announced the establishment of revised requirements addressing the safety of lithium batteries. The requirements, issued in December 2009 as UL Subject 2591, are designed specifically for separators, the porous film that keeps the anode and cathode components of batteries apart while still allowing ions to flow between them.

Evaluation to Subject 2591 will assist separator manufacturers and manufacturers of lithium batteries who use separators, to control critical separator parameters in order to reduce the potential for product failure and enhance consumer confidence in their products.

"The importance of battery integrity and safety has grown as the capabilities and demands we place upon our portable electronic devices increase," said Carlos Correia, vice president, UL High-Tech Division. "UL has worked closely with members of the battery and IT industry to introduce separator requirements focused on reliability and, first and foremost, safety."

UL now offers testing and certification services pursuant to the new requirements. UL also provides manufacturers with the technical information and guidance they need to maintain compliance with the requirements.

Angstron Materials and K2 Energy Solutions to Develop Hybrid Nanomaterial for Lithium Ion Batteries

Angstron Materials, Inc., has teamed with K2 Energy Solutions to participate in a Department of Energy (DOE) research project for the development of hybrid nano graphene platelet-based high-capacity anodes for Lithium-ion (Li-ion) batteries. The team will commercialize its new anode technology, which has the capability to capture the high charge capacity allowed with silicon over extended charge/discharge life, using a network of highly conductive yet inexpensive nanoscale graphite filaments.

Angstron and K2 will conduct the project over three phases with initial activity focused on demonstrating the commercial and technical viability of new high-energy anode materials. This will include delivering data on anodes capable of initial specific capacities of 650 mAh/g and achieving ~50 full charge/discharge cycles in small laboratory scale cells (50 to 100 mAh) at the 1C rate with less than 20 percent capacity fade. Phase II will target development of process technology for cost-effective production of the optimized Si-coated NGP/CNF blends.

As the project moves forward, 18650 or larger format cells will be assembled with the anode material, cycled and examined to evaluate any failure modes under cycling and calendar aging as well as demonstrate cells that show practical and useful cycle life. Upon completion the team will introduce a new nano material platform technology for Li-ion battery anodes. A prototype Li-ion battery (with a lithium iron phosphate cathode) for vehicle applications will be constructed and tested.

Connector from ITT Interconnect Solutions Provides Electric Vehicle Charging Solution

ITT Interconnect Solutions has achieved an electric vehicle industry first with its new high efficiency J1772 connector. Based on HEP spring contact technology, the EVC series connectors represent the industry's first UL-rated, J1772 Level II 75 amp four hour or less full charging solution. Charging options include 75 A/240 V, 30 A/240 V, 15 A/240 V, and 15 A/120 V. Designed specifically for electric vehicle charging applications, the J1772 is capable of performing Level I and II charging from a low-end of 15 A/120 V to a high-end range of 75 A/240 V.

The inlet connector includes finger-tip protection on the power and ground pin contacts and also features an enhanced cable management system using ITT's VEAM CIR series backshells. By using a cable with a greater degree of flexibility, ease-of-use is assured on retractable design charging units.

The J1772 Level I and II electric vehicle charging robust coupler and inlet connectors are suitable for electric passenger vehicles, home charging units, public infrastructure charging units, roadside assistance trucks, electric fleet vehicles and electric motorcycles.

Improved Measurement and Analysis Yields Cost-Effective Standby Battery Monitoring

Loic Moreau, Business Segment Manager
LEM

The infrastructure that underpins contemporary society must operate with very high reliability. In contrast to the advanced technology deployed in data storage centers, Internet server farms and communications central offices, most of them rely for near-100 percent "up-time", or system-availability, on a very mature technology; the lead-acid battery. It is standard practice to provide such critical nodes, and many other essential services, with back-up power. The first layer of that back-up is usually an inverter that draws on banks of valve-regulated lead-acid (VRLA) cells, or the closely-related sealed gel-cell types.

This venerable technology continues in widespread use for a variety of reasons including that the cells are economical, and offer excellent reliability. Excellent, but not perfect. VRLA cells do have a finite life, a design life of 12 years is common, and in normal use in critical-system standby power they are routinely replaced on timed basis. Failures can, and do, still occur.

In a typical standby supply the cells do exactly as the name implies, they are held at full charge awaiting failure of the primary supply. This is achieved by maintaining a small, continuous "float" charge. If the float charge current is below a certain limit, the gases produce by electrolysis within the cell will recombine. In this condition, cells can be vulnerable to damage if the float-charge voltage is even a little higher than the standard value of 2.27 V per cell. A small overvoltage will cause the electrolyte to produce more gas than the recombination chemistry can cope with, and this will escape through the valve. Excessive cell temperatures, even with correct charging voltage, will also lead to loss of electrolyte.

Other failure modes include early sulphation, poor connection between the posts and the grids, poor connection between the grids and the plates, stratification of electrolyte and accelerated grid corrosion. An infrequent, but catastrophic, mode of failure is thermal runaway, which is peculiar to VRLA and Gel batteries and can result in fire or explosion. The only way to detect its onset is to monitor the internal cell temperature.

It is recognized that simply monitoring the cell voltage gives very little information about declining capacity of a lead-acid cell. A failing cell will frequently present nominal voltage until it is called on to deliver significant current, when it will exhibit severely reduced capacity with premature collapse of its terminal voltage. Establishing battery condition by measuring electrolyte specific gravity is not possible with the sealed VRLA or gel construction; conventionally, the only way to verify capacity has been to discharge the complete battery under controlled conditions, requiring it to be taken out of service. Deep discharge also reduces the life of lead-acid cells. In an installation that regularly discharge-tests its batteries, and in which the primary power supply has high reliability, the test regime will be the dominant factor in determining battery service life.

Newer, non-intrusive electronic methods of continuous monitoring can detect impending failures in individual cells, saving cost while maintaining full system availability. Early versions of such systems typically measured parameters such as cell or monobloc (the battery-industry term for multiple cells in a single case) voltage, despite the known limitations, plus charge/discharge current and ambient temperature. Some systems attempt, with varying degrees of success, to measure or infer the cells' internal resistances.

LEM's Sentinel system pioneered the transition from reliance on simple analogue measurements of basic parameters, and is now in its third generation. It uses a combination of analogue and digital techniques implemented in a single, custom-designed, SoC (system on chip) integrated circuit. This device, deployed in a module that measures terminal voltage, internal cell temperature and internal impedance, is a key element in the design of a system that can deliver accurate measurements within a budget that is affordable for the majority of standby system configurations.

Cell temperatures, and/or internal resistance values, that increase in an exponential manner (Figure 1) are indicative of impending failure, and a data logging system that monitors trends in the data over time will, potentially, identify an impending failure. Each Sentinel III module has an external temperature measurement probe or patch, that is applied directly to the case of the cell or battery, to give the most accurate possible tracking of cell temperature.

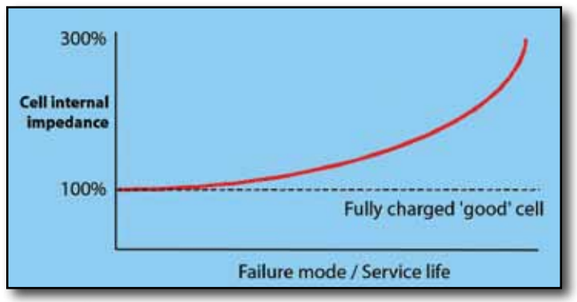

Figure 1. Cell internal impedance is not necessarily a good indicator of impending failure. The exponential shape of the curve means that early-stage failure is hard to detect, but the later decline in performance is rapid.

An established technique makes an assessment of internal resistance while the cell is in service and on-charge. Exact implementations vary, but typically, a small AC voltage is superimposed on the DC of the float charge, measuring the AC

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voltage and current yields the internal resistance. The method has limitations, partly to do with the very shape of the exponential curve. A cell that is about to fail can be well along the path to failure before the data logger identifies the trend. Conversely, by the time the problem is spotted, the cell may only be a short time from complete failure.

LEM, in association with academic partners, has implemented a much more sophisticated algorithm that detects deteriorating cell performance at a much earlier stage. The result is an extremely dependable test method, which penetrates well into the cell's energy layer, to ensure the highest possible degree of reliability. It is based on the so-called Randles equivalent circuit, which represents an electrochemical cell as a network of electrical elements, each of which is related to a physical aspect of the cell's construction. (See Figure 2)

Figure 3 shows the progression of the parameters over the life of a cell. The same characteristics are also demonstrated during a discharge, or loss of capacity. All of the resistance aspects of the equivalent circuit follow a similar curve; they do not change greatly during the early stages of failure, or of capacity loss. If resistance is used as the main indicator of the state of health of a cell, it will not give any significant indication until the capacity loss is greater than 25 to 30 percent. Since the industry standard is to replace batteries that fall below 80 percent of specified performance, it is clear that possible failure must be identified far earlier.

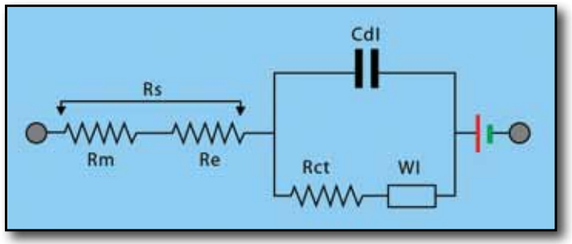

Figure 2. The Randles equivalent circuit for an electrochemical cell. Each element of the Randles circuit models a physical process and/or a failure mode of an electrochemical cell. **Rm** is the Metallic Resistance and represents the resistance of the metal and the jointing between components. **Re** is the electrolyte resistance: electrolyte loss can be one of the main causes of premature failure. **Cdl** is the double layer capacitance, a function of the effective plate area and the dielectric strength of the electrolyte. **Rct** is the transfer (Faradaic) resistance which arises due to limitations in the rates of chemical reaction kinetics at the plate/electrolyte interface. **Wi**, the Warburg impedance, is representative of a diffusional mass transport process. It is a low frequency component, not present during discharge. After separating out these equivalent circuit components, each of which represents some performance-limiting factor, the cell's energy source is shown as a pure electrical generation element, that can be removed during the testing process.

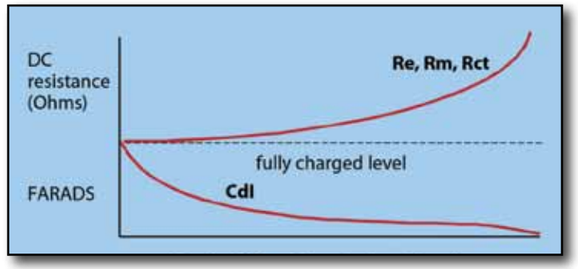

Figure 3. Randles parameter progression over the cell lifetime or discharge. The various resistance parameters show the same shape of curve while the double-layer capacitance, in contrast, exhibits an early detectable change.

There is, however, one parameter in the Randles equivalent circuit that does change in the early stages of cell failure (except purely metallic corrosion, which will be revealed by an increase in the parameter Rm), and that is Cdl, the double layer capacitance. Its behavior is indicated in the lower curve in Figure 3; again, the shape of the curve is similar for a healthy cell during normal discharge, or a failing cell that is supposedly fully charged.

The Monitoring Technique

A detailed description of the technique is beyond the scope of this article, but it can be summarized as follows.

The test signal is applied on a cell-by-cell basis, with no requirement to drive high currents through complete blocs or batteries, and no disturbance of DC connections to external systems. The original algorithms were developed using a bipolar test signal, but unipolar signals proved to be more reliable. However, unipolar signals experienced DC drift during the test. Simply removing this trend does not preserve the characteristics of the data set necessary for correct parametric estimation. By rearranging the varying frequency signal pulses that comprise the test signal, in a frequency sweep, the cell voltage response can be made to follow a predetermined curve.

Once the underlying drift curve becomes uniform, firmware algorithms can be designed to model the drift and remove it, resulting in a mean zero voltage data set suitable for direct input to the Sentinel algorithms. This method can reduce drift errors to less than 0.1 percent without causing significant distortion of the data set. Algorithms can then be applied to the measured waveforms, and the equivalent circuit parameters can then be derived with a high degree of accuracy.

Much of the measurement functionality and algorithmic processing has been integrated into a single integrated circuit (system-on-chip, or SoC). Sentinel modules can measure at an individual cell level, or at monobloc level (2 V to 12 V). Up to 250 measurement points, implemented in modular form, can report via a proprietary data bus to a battery data logger, the S-Box. In a large battery installation, several such streams of data can be combined and made available to a variety of local or remote upstream supervisory systems via standard buses or an Internet connection, using a Web server that is integrated in the S-Box.

Having had the measurement SoC determine every cell's real condition, detecting impending failures is not the only benefit that a sophisticated monitoring architecture can provide; several other features and services can be programed.

For example, the cells of a battery often have differing

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internal impedances. Over time, this can cause problems. The SoC intelligent control system allows such cells to be quickly detected, and a system, known as terminal voltage optimization, can divert the float current around the cell that cannot tolerate further charging.

Active Charge Management for Extended Life: The float current in VRLA cells is higher than that of flooded types, for the same terminal voltage. This can accelerate positive plate corrosion and reduce the useful life of the cell by up to 30 percent. Removing the float charge for a proportion of service life can reduce this effect. A useful side effect of life cycling is its ability to reduce the possibility of thermal runaway.

A cell-mounted module can also provide a lifetime log of terminal voltage and temperature to help manufacturers and users.

Exhaustive Discharge Protection: It is normal in charger/UPS systems, and even battery monitors, to preserve the battery by terminating a discharge based on the average cell voltage. However, weaker cells can be of a much lower terminal voltage than the battery average and may be exhaustively discharged well before the battery has reached its termination voltage. This can damage these cells permanently. A highly accurate, dynamic 'Time To Run' algorithm has been developed to give warning if any individual cell is approaching exhaustion.

Monitoring of standby battery parameters must be as comprehensive as possible, to produce results that most accurately represent the state of the battery. This is not only a technological issue, but an economic one. Avoiding in-service cell failures is essential, but prematurely replacing cells that are not approaching end-of-life is expensive. In addition to voltage, impedance and discharge performance per cell, LEM monitors internal cell temperature as standard. It is also developing a fluxgate-technology float-charge transducer capable of better than 10 mA resolution, with little or no temperature drift and virtually no remanence after a high current discharge, that will further improve measurement fidelity. Advances such as these can change the role of the battery monitor from being an expensive addition, to that of a cost-effective integral life management system.

Loic Moreau is Business Segment manager, New Business for LEM, responsible for driving the strategic approach marketing within the company. He also created and manages the new Energy & Automation Division, which develops transducers that integrate additional electronics to offer added value and increased functionality such as the Sentinel for monitoring standby batteries and Wi-LEM for wireless local energy monitoring.

Contact LEM at www.lem.com.

UPS Service Plans: How to Maximize Your Returns

Art Mulligan, UPS Product Line Manager
Eaton Corp.

Painfully aware of the devastating impact that downtime can have on their bottom lines, most businesses appreciate the wisdom of deploying first-rate uninterruptible power supplies (UPS). Yet they often invest far more time and energy in deciding which UPS to buy than in selecting an accompanying service plan.

In reality, however, both considerations are vitally important. With proper servicing, a well-made UPS can operate safely and reliably for as long as 20 years. Without proper servicing, even the best UPS is significantly more likely to fail when the business can least afford it. Protecting mission-critical IT systems from costly outages, then, involves choosing not just appropriate UPS hardware but also an appropriate UPS service plan from a service provider that delivers real value rather than just a low price.

The Basics of Selecting UPS Service

The consequences of UPS failure can be expensive. The average annual downtime for the US utility grid was eight hours and 45 minutes as of 2009, according to the Electric Power Research Institute. Should a UPS fail during a power outage, the average cost of the resulting downtime can range from approximately $330,000 an hour for companies in the media industry to a staggering $6,450,000 an hour for financial brokerage firms, according to the Fibre Channel Industry Association.

A quality UPS service plan can help a business avoid equipment failures and resolve those that do occur quickly. However, in today's economy, no organization can afford to purchase either less or more UPS support than it requires. Thus, UPS buyers should carefully consider their needs and options before selecting a service plan. To begin that process, there are six basic questions.

What kind of service provider should you work with? Generally speaking, there are two kinds of service providers to choose from:

Manufacturers: These are the companies that design and build UPSs.

Independent Service Providers: These are third-party companies that service UPSs.

Third-party service providers sometimes charge less than manufacturers, but that doesn't necessarily mean they provide greater value. As a rule, the company that designed and assembled a UPS will have the deepest understanding of how it operates, the most qualified technicians and the fastest access to factory parts.

What type of UPS service do you need? Most service providers offer three basic service options:

Depot Exchange Repair or Replace: When a problem occurs, the business manager contacts the UPS service provider and ships the UPS to a repair facility. After it arrives, the repair shop sends either the repaired unit or a refurbished unit in return.

Advance Swap Depot Exchange: After a problem is reported, the UPS service provider ships a refurbished replacement unit immediately. When it arrives, the original UPS is returned to a repair facility in exchange.

On-Site Repair: After reporting a problem, a factory-trained field technician comes to the site to diagnose and repair it.

Here are a few guidelines to keep in mind when deciding among these options:

- In general, a depot exchange plan is the most cost-effective choice for organizations that use UPS products rated below 1,000 VA.
- If a UPS is rated above 1,000 VA and is either hardwired to the data center's electrical infrastructure or too heavy to ship, an on-site repair plan is usually the sole practical option.
- Companies with UPS equipment that is rated above 1,000 VA, light enough to be shipped and not hardwired should choose either an advance swap depot exchange plan or an on-site repair offering. On-site repair is often the quickest way to resolve technical issues, but can also be the most expensive.

Should you buy a support agreement, extended warranty or pay as you go? Support agreements, or service contracts, usually combine parts and labor coverage for the UPS's electronics, batteries or both, as well as one or more annual preventive maintenance inspections. Plans can be tailored to meet most any need. Special features like remote monitoring, battery replacement insurance and spare part kits may also be added.

Basic or extended warranties are also available for many UPS products. A warranty commonly covers specified parts and labor, such as electronic components, for a fixed period of time, but does not include 24/7 coverage or guaranteed response times. Nor do warranties typically include preventive maintenance services, though often there is the option of adding them if desired. The more services a company adds to a warranty, the closer it comes to offering the protection of a full-fledged support agreement.

Time and Material (T&M) service is a pay-as-you-go approach in which the service provider conducts repairs as needed and then bills the company based on how much work the technician performed and how many parts were replaced. Though relying on T&M services is often less costly up front than buying a service agreement or warranty, it is often more expensive over the long term, depending on how many problems are experienced and how severe they are. Additionally, some organizations find T&M response times unacceptably long. When available field technicians are in short supply, customers with support agreements always take priority. As a result, T&M customers must sometimes wait as long as five days, based on their UPS model and location, before receiving assistance.

What should a service plan cover? When evaluating service plans, pay special attention to what is and isn't covered. Support agreements and warranties for large UPS models usually cover internal electronics only, with battery coverage available as an optional extra. A strong, comprehensive service plan should cover all of the following:

UPS Electronics Parts and Labor Coverage: This covers a UPS's basic electrical components, excluding the battery.

UPS Battery Parts and Labor Coverage: To prevent UPS failure, batteries should be replaced at least every five years. Batteries that are discharged frequently or used in a warm environment should be replaced more often.

Preventive Maintenance: Preventive maintenance visits allow field technicians to annually inspect, test, calibrate and upgrade UPS and/or battery components, ensuring factory-specified performance.

Remote Monitoring: Remote monitoring systems automatically send UPS performance data to expert technicians via the Internet, enabling them to proactively identify and address potential problems. They also send automatic alerts when a UPS fails, resulting in quicker response times.

How much service do you need and how fast do you want your service delivered? Most service providers offer two options with respect to when service is available:

7 Day, 24 Hour Coverage: A service technician will respond or deliver service at any hour of any day, including weekends and holidays.

5 Day, 8 Hour Coverage: Problems will be resolved only during standard business hours (8 a.m. to 5 p.m.), Monday through Friday.

A business manager can also choose how quickly the service provider responds to technical issues. Most providers offer two-hour, four-hour, eight-hour and next business day options. Note that two- and four-hour service plans are typically available only in markets in which the service provider has enough field technicians to meet its response time commitment 99.9 percent of the time.

How long should you plan for a UPS to last and how much should service cost? As a rule, large UPS products have a 15- to 20-year life span. Small UPS products can last 10 or more years, but are often replaced much sooner. However, routine preventive service can help extend a UPS's lifespan, as can replacing the unit's batteries, capacitors and other parts, or installing upgrade and modification kits.

As for price, the most basic warranty coverage usually costs five to 10 percent of the product purchase price, while a comprehensive, premium support agreement could exceed 35 percent of the original purchase price per year.

The Importance of Preventive Maintenance

Every UPS, no matter how well it is designed and manufactured, can fail for a wide range of reasons, including these:

Batteries: Studies show that up to 20 percent of UPS failures can be attributed to bad batteries. Lead acid batteries of the kind typically used in UPS products are sensitive to unusually high operating temperatures. In addition, every time a lead acid battery is discharged, it permanently reduces its capacity and shortens its operating life.

Fans: Though many UPS fans perform well for 10 years or more, anything from dried-out ball bearings to electrical and mechanical problems can incapacitate a fan far sooner than that, leading to dramatically increased risk of overheating.

DC Capacitors: A typical UPS contains a dozen or more electrolytic capacitors that smooth out and filter fluctuations in voltage. Like batteries, electrolytic capacitors degrade over time. When one fails, others must compensate for the additional workload, shortening their useful lives. In many cases, a capacitor failure will cause a UPS to switch to bypass mode, leaving it unable to protect downstream loads.

Transient Spikes: Sudden power surges can cause fatal damage to a UPS's filter/rectifier side.

A comprehensive preventive maintenance plan is the best defense against such problems. By ensuring that UPS equipment is thoroughly evaluated, cleaned, tested and calibrated on a regular

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Battery Power 2010

October 19-20 • Dallas, Texas

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Join hundreds of industry professionals and discover the latest developments and technologies in the battery industry. Battery Power 2010 is an international conference that will feature presentations on portable, stationary and automotive battery technology, as well as battery manufacturing, materials and research & development. Topics will include new battery designs, emerging technologies, battery materials, power management, charging and testing systems, battery health, as well as the latest market trends affecting the industry.

The conference is designed for OEM design engineers, system engineers, technical and management professionals involved in battery powered products and systems, battery manufacturing, battery technology research and development and power management technology.

Keynote Presentations

The Global Battery Market

In 2009, the global batteries market was estimated at $47.5 billion and is likely to reach $74 billion in 2015. This growth can be attributed to the high demand for rechargeable batteries that commands the majority of the global battery market. Factors influencing the growth include higher capacity, environmentally friendly, better lifecycle, reduced cost and weight among others. Applications include electric vehicles, military equipment, medical equipment, telecom and communication and mobile communication devices. Learn what lies ahead in the global battery market and what it means to battery manufacturers, suppliers and OEMs.

Vishal Sapru • Frost & Sullivan

How US Battery Manufacturers and Suppliers are Changing the Game: A Panel Discussion

US battery manufacturers and suppliers are not only shaping the battery industry and enabling emerging markets such as electric and hybrid vehicles, but they are also re-energizing the US economy with stimulus dollars as part of the Recovery Act. Hear from industry-leading companies on their new facility capabilities, R&D projects, goals and potential market/industry impacts.

Ann Marie Sastry • Sakti3 • Paul Cheeseman • Exide Technologies
Chris Wheaton • EnerG2 • John Battaglini • International Battery

Battery Projects and Developments in Government Labs

This panel discussion will feature the country's leading government labs actively involved in battery research and development. Hear new projects that they are working on and new technologies that are expected to impact the market.

Jeff Chamberlain • Argonne National Lab
Claus Daniel • Oak Ridge National Lab
Shriram Santhanagopalan • National Renewable Energy Lab

Who Needs to Attend

- OEM design engineers of battery-powered systems
- Developers and integrators of rechargeable battery systems
- System engineers of standby, backup and UPS systems
- System integrators, vendors, distributors
- Manufacturers of batteries and battery packs
- IC and chipset providers
- Manufacturers of charging, monitoring and testing equipment
- System engineers of electric vehicles
- Product managers seeking new applications and opportunities
- Charging and testing system component providers
- Specialized energy materials suppliers
- Battery component providers

Attend a Pre-Conference Workshop

Arrive early and attend one of the pre-conference workshops taking place on Monday, October 18th.

Li-Ion Battery Design will be presented by Robert Spotnitz with Battery Design LLC. This full day course surveys all aspects of Li-Ion battery design ranging from materials and processes, to cells to packs. How to design Li-Ion cells is discussed in detail with an emphasis on comparing different chemistries.

Battery Power Management: Safety, Charging, Fuel Gauging and Cell Balancing will be presented by Jinrong Qian with Texas Instruments. This workshop addresses the issues surrounding battery power management for safely charging the battery, smartly monitoring the battery for improving protection and accurately estimating battery remaining capacity.

Battery Power 2010 will be held at the Gaylord Texan. A special room rate of $179 is offered to Battery Power attendees. Use the code A-EMC10 to get the discounted room rate.

Portable, Consumer & Medical

Overcoming Battery Pack Design Issues • *Boston-Power*
Using Lithium Polymer Batteries in Commercial Devices • *Micro Power Electronics*
Li-Ion Myth-Buster • *Elithion*
Lithium Battery Transportation Regulations • *Nexergy, Inc.*
Changing Global Regulatory Requirements for Battery Powered Consumer Electronics • *TUV SUD America*
Your Product's Battery Failed – What Now? • *Exponent*
Embedded Energy for Pure Power Solutions • *Cymbet Corp.*
Notebook Battery Standardization Challenges • *Dell, Inc.*

Automotive, Hybrid & Electric Vehicle Applications

Battery Performance and Plug-In Hybrid Electric Vehicles and Other Electric Vehicle Adoption • *Navigant Consulting, Inc.*
Commercial Applications of Lithium Titanate Batteries for Mass Transit • *Altairnano*
Battery System Integration, Energy Management and Testing • *Ricardo, Inc.*

Charging, Testing & Monitoring

A Simple Topology for Solar-Charged Battery Systems • *Microchip Technology, Inc.*
New Advances in Li-Ion Battery Monitoring • *Cadex Electronics, Inc.*
High Efficiency and High Safety LiFePO4 Battery Charger System for Industrial and Medical Applications • *Texas Instruments, Inc.*
Energy Policy in a Battery Charger World • *Ecos*
The Evolution of Li-Ion Safety Testing Since the Laptop Battery Recalls of 2006 • *UL*

Stationary, Standby Power & Energy Storage

Ready for the Grid: How Battery Storage will Support Renewable Energy and the Smart Grid • *Electric Power Research Institute*
Designing Li-Ion Batteries into Your Application: The Critical Issues You Need to Know • *Nexergy*
Analyzing the Role of New Battery Technologies in Hybrid Power Systems with High Penetrations of Renewable Power • *HOMER Energy, LLC*
Datacenter Trends Creates Sweetspot for Entry of New Materials • *Dell, Inc.*
Design Advantages and Comparisons of Large Format Li-Ion Batteries • *International Battery*
Sodium Metal Halide Batteries for Stationary Applications • *General Electric*
High Temperature Li-Ion and Li-Thionlyl-Chloride Cells • *Saft Group SA*

Battery Manufacturing

The Cost of Safety, Designing for Safety and the Changing Li-Ion Battery Pack Regulatory Requirements • *Palladium Energy*
Safer Li-Ion Battery Design and Development Using Thermal Analysis and Adiabatic Calorimetry • *Netzsch Instruments*
Advancement of Ultrasonic Metal Weld Tooling for Battery Applications • *Edison Welding Institute*
Busbar Joining of Dissimilar Anode and Cathode Metals: The Role of Intermetallic Compounds • *Technical Materials, Inc.*
Deciphering Cell Variations in Battery Manufacturing • *Hawaii Natural Energy Institute*
Nanotechnology Manufacturing Techniques for More Efficient Li-Ion Batteries • *NETZSCH Fine Particle Technology*
Upscaling New Battery Technologies from Lab to Fab • *Coatema Coating Machinery GmbH*

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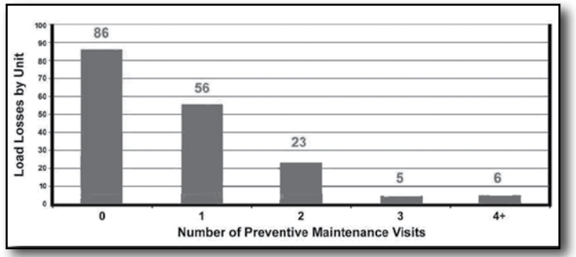

Companies that received the recommended two annual visits experience roughly one-fourth as many losses.

basis, preventive maintenance plans can significantly decrease the exposure to downtime. In fact, organizations that receive two preventive maintenance inspections a year, as recommended, experience approximately one-fourth as many UPS failures as those that don't, according to an analysis of Eaton services data on its own products.

In addition, preventive maintenance can maximize a UPS's performance, as systematic inspections, testing and cleaning by trained technicians help keep a UPS's electronic and mechanical components functioning at peak potential.

The Top 10 Features of a Strong UPS Service Offering

In addition to preventive maintenance, an effective UPS service plan should also include these 10 elements:

Comprehensive Battery Services: The Valve Regulated Lead-Acid (VRLA) batteries used in most UPS products typically wear out after three to five years. Given that batteries are a UPS's most essential component, any well-structured UPS service offering should include a rigorous battery maintenance plan that includes regular inspection, cleaning and testing, as well as prompt replacement of defective batteries as needed.

A Large Team of Skilled Field Technicians: When evaluating service providers, make sure their technicians receive thorough, ongoing factory training and certification, not only in the latest UPS equipment but in legacy products as well. In addition, find out how many technicians they employ and where those people are stationed. A provider with a limited number of technicians, or none based near your data center, may have trouble responding promptly to service incidents.

Access to the Technician of Your Choice: Most service providers dispatch whoever is available when an issue arises. The best providers, though, let the business facility request a specific technician who is familiar with that specific environment and has earned the confidence of the business staff.

A Deep Pool of Escalation Resources: Field technicians are but one part of a complete support team. The service provider should also offer 24/7 telephone support, as well as senior engineers capable of assisting field technicians remotely or in person when they encounter a problem they can't solve alone.

A Proven Commitment to Safety: Like any complex electrical product, UPSs are potentially hazardous if mishandled. The service provider's field technicians should have the OSHA, IEEE and NFPA tools, arc flash training and personal protection equipment to protect themselves and the on-site employees from unsafe work conditions.

An Emphasis on Long-Term Solutions, Not Short-Term Fixes: If a component of your UPS keeps malfunctioning, does the service provider just replace it over and over again? A strong provider not only fixes the immediate problem, but figures out why it keeps happening.

Prompt Access to Parts: To maximize the technician's ability to resolve problems quickly, he or she should have a wide array of parts on hand for immediate use, or stock them locally. That can help prevent the need for multiple visits to repair a problem.

Remote Monitoring Services: Choosing a support plan that includes remote monitoring can help spot potential problems before they cause downtime, address problems that do occur more rapidly, and even extend the lifespan of UPS batteries.

Multi-Vendor Services: A typical data center power infrastructure includes a variety of products from multiple manufacturers. Working with a service provider capable of supporting all of those systems will help simplify vendor management, eliminate finger-pointing and keep critical maintenance issues from falling between the cracks.

Field Upgrades and Product Modifications: A well-designed UPS can adapt and grow over time to accommodate expanding power requirements. To take advantage of this capability, a service provider must be equipped to perform field upgrades and install product modifications. Upgrades increase the capacity and performance of a UPS.

Conclusion

No investment in UPS hardware is complete without an accompanying service plan. Trained service professionals can help minimize downtime by detecting and addressing problems before they have time to develop. They can also help a business swiftly recover from technical issues that couldn't be prevented. Selecting the right service offering is essential. Knowing which questions to ask and features to look for simplifies that process and increases the chance of success.

Art Mulligan is a UPS product line manager for Eaton Corp. where he develops offerings for power quality services.

Contact Eaton Corp. at www.eaton.com/upsservices.

Machine to Machine, the Future is Here

Dr. Kerry Lanza
Palladium Energy

I was recently reading about how machines are in charge; communicating with each other, thinking and influencing (maybe even controlling) people's lives. The image that it conjured was that of some futuristic society of robots having enslaved humans. This was not a science fiction novel I was reading, but a product fact sheet on a telematics device for your car to perform hands-free toll collection and navigation. The future is here; machine-to-machine (M2M) communication is happening, and it is "way cool."

M2M Technology

M2M refers to technologies that allow both wireless and wired systems to communicate with other devices. This is accomplished through the use of telemetry, which is a language machines use when communicating with each other. Such communication was originally accomplished by having a remote network of machines relay information back to a central hub for analysis, which would then be rerouted into a system such as a personal computer.

However, modern M2M communication has expanded beyond a one-to-one connection and changed into a system of networks that transmits data to portable personal electronics. The expansion of wireless networks across the world has made it far easier for M2M communication to take place and has lessened the amount of power and time necessary for information to be communicated between machines. M2M devices and compact battery power (such as lithium-ion and lithium polymer) are a perfect marriage and, to a certain extent, portable power has enabled M2M technology to proliferate. These networks also allow an assortment of new business opportunities, portable devices, battery applications, and connections between consumers and producers.

The origin of M2M communications is cloudy because of the many different possibilities of its inception. It probably began around the year 2000, maybe earlier, when cellular technology first began to learn to connect directly to other computer systems. An example of an early use is GM's OnStar system of communication for in-vehicle security and diagnostics. According to the independent wireless analyst firm Berg Insight, the number of cellular network connections worldwide used for M2M communication was 47.7 million in 2008. The company forecasts that the number of M2M connections will grow to 187 million in 2014, a compound annual growth rate of over 25 percent ("*Global Wireless M2M Market*", 2009).

Palladium Energy Continued on Page 20

M2M Applications

This growth is the result of the almost endless M2M applications. Some of the more obvious applications are satellite communication and telematics. Telematics is the integrated use of telecommunications and informatics, also known as ICT (Information and Communications Technology). More specifically, it is the science of sending, receiving and storing information via a satellite or other telecommunication devices. Telematics includes, but is not limited, to Global Positioning System (GPS) technology integrated with computers and mobile communications technology in automotive navigation systems. Most narrowly, the term has evolved to refer to the use of such systems within road vehicles for tracking, toll collection, navigation and security tracking devices. In a recent Frost and Sullivan research report, they found that in 2007 there were 1.4 million active satellite M2M units being used globally. By 2012, that number is expected to reach 22.6 million, most of them being installed in private vehicles ("*Satellite M2M Market Study*", 2010).

Wireless networks that are all interconnected can serve to improve production and efficiency in various areas including building cars and letting the automobile owners know when and why certain components need to be taken in for maintenance. Such information serves to streamline products that consumers buy and works to keep them all working at highest efficiency.

Another application is to use wireless technology to monitor systems such as Automatic Meter Reading (AMR) in the "smart grid", water supply and wastewater streams. This would allow both the owner of the meter and the utility to know use rates, efficiencies and improve billing accuracy. Traffic control is another dynamic area that can benefit from M2M communication. Properly located sensors and along with software can manipulate traffic lights to maximize traffic control.

Telemedicine offers another use. Heart patients can wear specialized monitors that gather information about the heart's operation and can deliver a shock to correct an errant rhythm (Crosby, 2009).

Businesses can greatly enhance productivity and efficiency by using M2M communications in supply chain management by tracking inventory and security. Companies can manage their fleets and track the use of assets in the field, follow freight as it moves across country and plot the most efficient routes, monitor fuel usage and even disable equipment if it is reported lost or stolen. Any business can benefit from M2M. Farmers can even monitor and keep track of their livestock that may be off grazing in some remote location. If you can imagine it, you can do it.

Batteries and M2M

For M2M to work, it requires a specific bundle of functional components: sensors, communication and power. So what are the battery use, design and application implications for M2M? The battery function for the majority of applications will be in a backup power mode. This may be a less glamorous application, but significant all the same. For many M2M uses, the device's most important function may be when there is a primary power loss, and without a reliable battery, the device would be rendered useless. As a result, the battery's reliability may be its most important feature.

For M2M portability, size and weight do matter. Lithium-ion and lithium polymer batteries will have the edge here as lithium provides the best energy density ratio (more energy in less space) of the available battery chemistries. However, since many M2M operations are not in climate controlled conditions, designing for battery temperature tolerance, particularly high temperatures, will be an issue engineers must contend with. Nickel-based batteries have a higher temperature tolerance than a standard lithium battery, but some of the newer lithium chemistries such as Lithium Iron Phosphate and Lithium-Thionyl Chloride, could prove to be optimal.

If the Future is Here, What's Next?

Like with any new technology, innovation into unfamiliar territory is a part of the fast growth experience. M2M may drive OEMs to build devices so they can work with any manufacturer's brand. As a result, we may see the emergence of common design platforms that will facilitate communication across multiple devices. This interoperability across devices may seem futuristic, but consumers feel otherwise as they become "tech-savvy" and are expecting it.

M2M may be a transformational experience for many businesses, requiring new business methods and models as many approaches may coexist. But one thing is apparent, the telecommunications companies will play a major role in M2M as mobile operators are well positioned to provide support for networked devices by leveraging their capabilities without the need for substantial investment.

So, can we predict what will happen next? I believe the future will be whatever we can envision it to be. Besides, as Yogi Berra said, "The future ain't what it used to be."

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Dr. Kerry Lanza is strategic marketing manager at Palladium Energy. Palladium has expertise in lithium-based technologies for battery packs that power portable and backup applications across various verticals including medical, data capture, data storage and consumer electronics.

Contact Palladium Energy at www.palladiumenergy.com.

Stakeholder Analysis of the Recent Acquisition Moves In the World UPS Market

Anu Cherian, Industry Analyst, Energy & Power Systems
Frost & Sullivan

The world uninterruptible power supply (UPS) market is a highly mature market that has witnessed significant market consolidation in the past two decades. Companies such as Emerson acquired Liebert Corp. to strengthen its position as a global UPS manufacturer. Eaton acquired Powerware brand of Invensys to create a strong brand of Eaton Powerware UPS. Most recently, APC was acquired by Schneider Electric to become a global force in the UPS market. The composition of the tier one category of this market has become stronger each year, and the intensity of competition has decreased prices, as well as commoditized products at the lower power ranges.

The key end-user segments of the market are datacenter, industrial and healthcare, as well as niche markets such as military and government. The market for datacenters has witnessed a significant increase in the past decade as a result of the convergence of telecom and data communications and global business integration. Datacenters have been the key driver for growth of the backup power market, especially in North America, Europe and Asia Pacific.

This article provides a brief insight into the latest moves by Emerson Network Power to acquire Chloride Group PLC, a focused UPS manufacturer with a strong presence in Europe.

Emerson's Bid for Chloride: A Move Toward Greater Market Consolidation

Emerson Electric Co., which has been trying to acquire the UK-based Chloride Group PLC since 2008, has finally succeeded in obtaining Chloride's approval for its latest 375 pence per share offer, valuing Chloride at approximately $1.5 billion. Two of Emerson's previous offers were declined before this approval; one at 270 pence per share in 2008, which then valued Chloride at approximately $1.29 billion, and the other earlier this year at 275 pence per share, which valued Chloride at approximately $1.11 billion. The 275 pence per share offer by Emerson was also followed by a 325 pence per share offer by the power and automation giant, ABB, which valued Chloride at approximately $1.25 billion that has now been outbid by Emerson's latest offer.

Emerson has already acquired 49,998,079 shares of Chloride through open market purchases, which is almost 19 percent of Chloride's total issued share capital, and the acquisition of complete stake is expected soon.

Frost & Sullivan Continued on Page 22

Emerson manufactures UPS systems under its Network Power Business Segment that offers a wide range of power protection and precision cooling solutions. Emerson also has businesses in the process management, climate technologies, tools and appliances and industrial automation areas.

ABB is the largest builder of electricity grids. It is a supplier of components for transmission and distribution of electricity, and it also provides solutions for industrial automation.

ABB's Interests

ABB serves sectors such as power, oil and gas, pharmaceuticals, chemicals, pulp and paper; all huge markets for UPS systems. This acquisition could have helped ABB to bundle Chloride's UPS systems with its existing products. In addition, it helps them gain access to Chloride's existing markets for selling its own products. ABB could have leveraged its financial strength to grow the UPS business further and position itself as a total solution provider.

Benefits for Emerson

A complete stake in Chloride holds great potential for Emerson. Presently, Emerson and Chloride have the third- and fourth-largest market shares in the global UPS markets, in which APC - Schneider Electric and Eaton Corp. hold the first and second position, respectively. With the acquisition of Chloride, Emerson can surpass Eaton, to take the second position in this market.

Although Emerson manufactures UPS systems across all power ranges, its major strength lies in the high power and three-phase UPS segments, in which it holds large market shares. Chloride also holds a significant share in these segments.

Currently, Emerson has the largest market share in the above 200 kVA UPS systems and the second-largest market shares in the 20 kVA to 50 kVA and 50 kVA to 200 kVA segments. With this acquisition, Emerson can lead the entire high-power segment of the UPS markets. These power ranges together contribute to almost 40 percent of the overall UPS market revenues and are expected to grow at a faster rate compared to the lower power ranges.

Market Segment Benefits

Chloride's strong line-up of industrial UPS systems will strengthen Emerson's business in the industrial UPS markets. Industrial UPS markets are strong in the Middle East and North America among the regions worldwide. Industrial UPS markets are mainly driven by end-user segments such as oil & gas and power. In addition, industrial UPSs are different from commercial UPSs as they are rugged systems that are designed to handle shock, vibration and temperature variations, as well as moisture. Chloride's power conditioners have leveraged the quality of their product.

Geographic Benefits

Two of the geographical regions where Emerson is likely to benefit significantly are the following:

Europe: Chloride's strong position in the European UPS markets make this acquisition an opportunity for Emerson to strengthen its foothold in the European markets where its current position is relatively weak. Chloride is headquartered in Europe and its product line is geared to appease the European market as well as its industry.

Asia Pacific: Chloride's acquisition of Ascor Power Systems in Singapore, its 90 percent stake in DB Electronics in India and its joint venture manufacturing facility in Shenzhen, China, have helped it gain a strong hold in the Asia Pacific UPS markets. This acquisition will help Emerson strengthen its operations in this region. This is a region of significant interest for all companies globally.

Future Outlook

This acquisition carries the potential of creating a new UPS giant with an extremely strong brand and market position globally. It emphasizes the increasing consolidation in the highly fragmented UPS markets. Despite market maturity, individual regional players continue to grow in this market. This is an indication that tier one companies continue to place stock on regional manufacturers that show consistent growth, product innovation and target markets that are lucrative and strategic in their regions.

Contact Frost & Sullivan at www.frost.com.

C&D Technologies Introduces Two New Models to Address Global Telecommunications Market

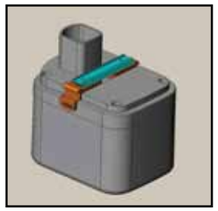
C&D Technologies, Inc. has released two new models to the C&D True Front Access series of batteries. The TEL12-105FNS and the TEL12-115FN expand the product family to six models designed to global standards.

The battery designs are aligned to a European footprint, specifically targeting the global telecommunication network infrastructure manufacturers, a portion of the market not previously addressed by C&D.

The C&D True Front Access batteries will access the strong growth of the global wireless telecommunications markets. These unique batteries will set a new standard of performance in the wireless and wireline industry, providing infrastructure power to the ever growing global voice and data networks. These new products utilize C&D's unique True Front Access technology, optimizing footprint, performance, reliability and ease of maintenance to provide a product that addresses the current and emerging needs of the market.

Micro Power Builds Surgical Battery Packs for Hydrogen Peroxide Sterilization

Micro Power Electronics, Inc. has announced the capability to manufacture rechargeable lithium-ion battery packs that can be sterilized via hydrogen peroxide gas without performance degradation. These battery packs provide surgical instrument manufacturers with the maximum power for a cordless surgical device. The sterilization of rechargeable lithium-ion batteries with hydrogen peroxide gas enables hospitals to utilize a popular sterilization process while providing surgeons with the most power for their surgical tools.



Micro Power prototype battery developed to test sterilization with hydrogen peroxide gas.

Micro Power offers rechargeable lithium-ion battery packs capable of delivering up to 24 volts, 100 amps of current, 10 amp-hours of capacity, fuel gauging for state-of-charge indication and a serial communication bus for integration with surgical tools.

In the last two years, Micro Power performed extensive research and testing to overcome the electrical, environmental, mechanical and chemical challenges in producing these battery packs. Once the design guidelines were developed, Micro Power tested and evaluated lithium-ion batteries by repeatedly subjecting them to the sterilization process, and subsequently manufactured prototypes for verification of performance after sterilization. Since OEMs consider product safety and power delivery of utmost importance, safety and performance was proven with an array of tests including electrical, environmental and mechanical tests.

New Intimidator AGM Battery for Emergency and Severe Service Vehicles

East Penn Manufacturing has introduced a BCI Group 65 battery to be included in its Absorbed Glass Mat (AGM) Intimidator line. This group 65 Intimidator AGM battery is well suited for emergency, police and other severe service vehicles that need a specially designed battery that can handle abusive conditions while delivering superior reliability. It is also suited for passenger cars, light trucks and vans that undergo frequent stop and start conditions, such as city driving, or have many electronic devices needing tough battery power.

The Intimidator's tightly compressed structure and reinforced internal design safeguards against intense vibration while providing more starting power. Highly efficient recharging and additional power for accessories make this battery well suited for the daily needs of severe service vehicles. A completely sealed design virtually eliminates gas emissions and acid leakage for longer and safer operation. Its leakproof design enables installation next to sensitive electronic equipment.

New Staco UPS is Compact and Economical

Staco Energy Products Company has introduced the FLU-10S, a second generation to their FirstLine 10 kVA three-phase uninterruptible power supply (UPS). This true on-line, double-conversion UPS provides computer grade power quality at a price that is significantly below comparable kVA models. The FLU-10S has a standard battery run-time of more than nine minutes (with optional batteries for extended run times). Sophisticated power electronics technology provides reliable blackout protection and power conditioning. Front-end harmonic correction eliminates the need for additional filtering, lowering the cost of operation. Robust double-conversion technology protects the connected load from sags, swells, harmonics, noise and voltage imbalances without going to battery operation. This UL1778 listed UPS is well suited for a wide range of applications including broadcast, computer networks, medical, university, process industries, wastewater treatment, food/beverage and manufacturing plants.

FirstLine models are intended for applications with input voltage of 208, 220 and 480 VAC and a range of +10 /- 20 percent (166 to 229 VAC). Input frequency is 60 Hz +/-5 percent. Full load walk-in from 25 percent to 100 percent of rated load in 10 seconds. Inverter output distortion is ≤5 percent THD for non-linear loads and ≤2 percent THD for linear loads. Output voltage is regulated to +/-1 percent of nominal at full load.

60 Watt Chassis Mount Encapsulated AC/DC Power Supply

ConTech, a Division of Calex Mfg., has released the PC60 series of AC/DC switching power supplies. The PC60 series offers 60 watts of output power in an encapsulated case, making it well suited for ruggedized backplane applications. The optional Din-Rail mount and easily accessible terminal blocks gives it the versatility to be used as a power solution in a large assortment of applications.

The PC60 series offers output voltages that range from 5.1 VDC to 48 VDC, with efficiencies up to 84 percent. The series also has output over-voltage protection. The units are encapsulated with a thermally conductive potting compound in a plastic resin and fiberglass case that meets UL94V-0. The enclosed case has external terminal blocks for ease of connection and is chassis mountable. Adding optional accessory DIN-03 Base Plate easily converts the chassis mount case to a standard Din-Rail mount. The PC60 series is rated for 3,000 VAC isolation, is UL approved, and is RoHS compliant.

Summit Switch-Mode Battery Chargers with Programmable JEITA Support

Summit Microelectronics has expanded its third-generation programmable battery charger integrated circuit (IC) family for single-cell Li-Ion, Li-Polymer and Li-FePO4 powered systems. The SMB328A and SMB328B incorporate functionality that allows automatic matching between the AC/DC adaptor's current capability and the portable device's charging requirements. High-efficiency operation allows for higher, continuous charging current levels, thereby ensuring battery charging even during high system load conditions. Like all Summit's solutions, digital, non-volatile programmability provides design and system flexibility at no additional cost.

The SMB328A and SMB328B operate with an input range from +3.5 V to +6.2 V input and safely withstand continuous input over-voltage up to +20 V (non-operating), while protecting downstream circuitry.

Synchronous Boost Regulators Enable Less Than 0.7 Volt Operation With Any PIC Microcontroller

Microchip Technology, Inc. has announced the MCP1623 and MCP1624 (MCP1623/4) Synchronous Boost Regulators, which bring low-voltage support to any PIC microcontroller, providing a customizable solution for single-cell battery applications. Featuring a start-up voltage of 0.65 V and an operating voltage down to 0.35 V, the MCP1623/4 regulators reduce the number of batteries needed in a typical design, even enabling designs to be powered from a single alkaline, NiMh, NiCd or disposable lithium battery cell.

The MCP1623/4 Synchronous Boost Regulators extend battery life with up to 96 percent typical efficiency, shutdown current of less than one micro Ampere in all states and a true load-disconnect shutdown. The devices have an operating input voltage of 0.35 V to 5.5 V and an adjustable output voltage range of 2.0 V to 5.5 V. In reducing the number of batteries required, the MCP1623/4 regulators enable more environmentally friendly designs, with lower shipping and operating costs.

Fuel-Gauge ICs Estimate Li+ Battery State of Charge While Eliminating Discrete Components in Portable Applications

Maxim Integrated Products has introduced the MAX17040/MAX17041 and MAX17043/MAX17044 one- and two-cell fuel-gauge ICs. Using the company's ModelGauge algorithm, these fuel gauges accurately estimate the state of charge (SOC) of a Li+ battery without requiring current sensing. ModelGauge ICs eliminate the current-sense resistor and require very few external components, thus saving both space and cost.

ModelGauge ICs track the battery's relative SOC continuously over a widely varying charge/discharge usage profile. These ICs do not require current measurement and they estimate battery state using voltage measurement alone. Therefore, they do not need a current-sense resistor and the board layout remains quite simple. Since the ground remains uninterrupted, troublesome grounding issues are also eliminated.

Chroma's 8000 ATS is Turnkey for EV/PHEV Testing

Chroma has introduced versatility in Automated Test Systems by providing a full range hardware devices and software architecture for EV/PHEV related applications such as battery storage system, EVSE charger station, DC/DC converter unit and motor traction drivers. The power conversion areas of electric vehicles and charging stations are composed of several power electronic units. Chroma's Automated Test Systems test the power electronics during the development phase as well as the production phase.

The Chroma 8000 ATS is a standard test platform that resolves problems brought on by conventional self-designed systems for power electronics testing. Designed with an open architecture, the Chroma 8000 ATS includes a wide range of hardware choices such as AC/DC power supplies, electronic loads, power analyzers, oscilloscopes, digital multi-meters, as well as various digital/analog I/O cards. This flexibility combined with an open architecture gives the user a powerful and cost effective test system for EV/HEV power electronics.

Exide Technologies Introduces Energy Efficient Exide High Frequency Series Industrial Charger

Exide Technologies has launched the Exide High Frequency (EHF) series industrial charger, a multi-profile range for standard-flooded, low-maintenance-flooded and valve-regulated lead-acid (VRLA) motive power batteries.

The EHF series charger line, with models ranging from 24 V to 80 V, is designed with a number of environmentally-advanced elements that contribute to a reduced carbon footprint because of an energy-efficiency design. The charger uses less electricity resulting in increased utility savings, a higher power factor (the percentage of electricity that is delivered and used effectively) and efficiency optimization, all which help customers use batteries to their maximum potential in conventional motive power applications.

Reduced maximum input currents allow for reduced circuit breaker, cabling and distribution equipment sizes. The charger also ensures that the charging current and voltage remain constant during any mains fluctuations, guaranteeing a constant and optimized charge.

Quallion LLC Develops Lithium-Ion Battery for the Boeing X-51A WaveRider

On May 26, 2010, on its first flight attempt, the Boeing X-51A WaveRider successfully completed the longest supersonic combustion ramjet-powered flight in history travelling at a top speed of Mach 5 for nearly three and a half minutes.

For this demonstration, Quallion developed an advanced lithium-ion system to power various components within the unmanned vehicle. The program chose to use a rechargeable lithium-ion chemistry over the traditional silver-zinc and thermal battery solutions to reduce ground maintenance prior to launch, which would allow for testing of the system without the need to replace the battery. Quallion developed a high energy density and high discharge rate pouch cell, which served as the basis for three separate battery packs enclosed in one envelope on the vehicle. This cell design had to be robust enough to handle three different performance requirements while maintaining the program's weight goals.

The lithium-ion cell was designed for high discharge power capabilities with high safety characteristics. "Being able to design the proper lithium-ion cell to meet the unique envelope, weight and performance requirements of the X-51A program was key to meeting the mission requirements and providing the X-51A power," said CEO and CTO Dr. Hisashi Tsukamoto.

In addition, due to the unique environmental conditions of traveling in a vehicle capable of greater than Mach 5 speed, Quallion utilized its battery packaging designs to reduce the overall loads and stress on the lithium-ion cells. "Quallion leveraged our experience of designing unique batteries for military and aerospace applications in order to enable the successful qualification of this battery design and performance in flight," said the VP of Military/Aerospace Power, Vincent Visco.

Saft and Acciona Energia to Offer Improved Stability, Power Management and Grid Connection

Saft has announced a three-year deal to work with Spain's Acciona Energia SA as part of a Eurogia+ labelled project aimed at improving the viability of photovoltaic and other renewable energy source power plants. The project will demonstrate the technical and financial benefits of using a containerized energy storage, conversion and management system to provide grid ancillary services as well as power management to help smooth the plant output.

As part of the initial project at a photovoltaic (PV) plant in

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Tudela, Spain, Saft will develop a modular lithium-ion (Li-Ion) battery system to be housed inside a six-meter container designed for industrial applications. The container includes active temperature control systems and a fire suppression system. The long-life Li-Ion battery offers very high energy efficiency, no battery maintenance and an easy way to measure the battery state-of-charge, even while in use.

As part of the system, Saft will be able to offer the customer 1.1 MW power at up to 1,000 V. Each container is easily scalable and will interface with existing power conversion devices.

Palladium Energy Achieves ISO 13485 Certification

Palladium Energy, a manufacturer of high-performance lithium-ion and lithium polymer battery packs, has achieved ISO 13485 certification, a globally recognized quality standard for the medical device industry. ISO 13485 certifies Palladium Energy's consistent performance in systems and processes related to the medical device field. The certification from the International Organization for Standards positions the company as the gold standard in battery power for critical medical equipment.

The primary objective of ISO13485 emphasizes meeting regulatory as well as customer requirements, risk management and maintaining effective processes, namely the processes specific to the safe design, manufacture and distribution of medical devices. Attaining the certification demonstrates Palladium's ability to engineer, test and manufacture battery packs that consistently meet customer requirements and regulatory requirements applicable to mission-critical medical devices.

Johnson Controls to Acquire Delkor Corp.

Johnson Controls, Inc. has signed an agreement to acquire 90 percent of its existing joint venture with Delkor Corp., an automotive battery manufacturer based in Seoul, South Korea. The remaining 10 percent will be acquired by the local management team.

Johnson Controls will invest approximately $90 million in the acquisition. The company is also investing an additional $40 million to add 2.7 million units in capacity, increasing Delkor's total capacity to approximately 10 million batteries per year.

The Delkor joint venture was part of Johnson Controls' acquisition of Delphi's global automotive battery business in 2005.

FIAMM Bringing Alternative Energy Sodium Batteries To North America

FIAMM and MES-DEA have partnered to create a new company called FZ Sonick that will manufacture and market alternative energy storage solutions throughout the world.

Currently, MES-DEA sells advanced battery technology under the ZEBRA brand for use in electric vehicles. A version of the ZEBRA batteries is scheduled to power the first electric vehicle fleet of the European postal service. The new company's SONICK-branded sodium-nickel-chloride product portfolio will improve energy storage in wireless cell sites, telecom data centers, uninterruptible power supplies, wheelchairs, busses, trains, and electric utility SmartGrid applications.

The SONICK advanced battery technology provides increased capacity, longer lifecycle, zero emissions, low-cost raw materials, enhanced safety and high energy density that reduces the battery size and weight compared to lithium ion and lead acid batteries, according to Nicola Cosciani, FIAMM's director of strategic development and FZ Sonick's new managing co-director.

Based on projected market demand for energy storage solutions, FZ Sonick plans to increase annual production to 170 MW from the 90 MW level recently achieved by MES-DEA. The company is evaluating additional manufacturing capacity for this advanced battery technology in North America.

4,400 Chevrolet Volt Owners to be Eligible for Free Home Charging Stations

The first buyers of the Chevrolet Volt electric vehicle with extended-range capability will be eligible for one of 4,400 free home charging stations. The program will provide Volt owners with a 240-volt charge station from either ECOtality, Inc. or Coulomb Technologies. In many cases, it will include the cost of home installation. The projects are made possible with a grant of American Recovery and Reinvestment Act funds from the Transportation Electrification Initiative administered by the US Department of Energy (DOE).

"Many owners will plug their Volt into a normal 120-volt electrical outlet, charge overnight and drive to work in the morning using only battery power," said Tony DiSalle, product and marketing director for the Chevrolet Volt. "For Volt owners who want to install a faster 240-volt charge station, we expect the Department of Energy project to save $1,000 and $2,000."

The US DOE projects were established with two objectives: installing charging stations in residential, workplace and public areas to encourage consumers to purchase electric vehicles; and studying electric vehicle usage to optimize future electric vehicle charging infrastructure.

To study electric vehicle usage, the programs will collect data such as average charge time, energy usage and the starting and ending time of the charging process. This data will be analyzed by the US DOE to understand how electric vehicles are driven, how and when they are charged, and ultimately what is required for widespread adoption of electric vehicles.

At the time of purchase, Volt buyers will receive a portable 120-volt charge cord, and will have the option of installing a 240-volt charge station available from Chevrolet. Volt buyers that live within the program cities may apply for a free 240-volt home charging station through the Coulomb or ECOtality programs if they are willing to share their charging information.

Calendar of Events

October

6-8 - CTIA Enterprise & Applications 2010 Conference and Exposition, San Francisco, Calif.

12-14 - Advanced Energy Storage 2010, San Diego, Calif.

19-20 - Battery Power 2010, Dallas Texas

November

3 - Battery Safety 2010, Boston, Mass.

4-5 - Lithium Mobile Power, Boston, Mass

Send Calendar of Event listings to Shannon Given at shannong@infowebcom.com.

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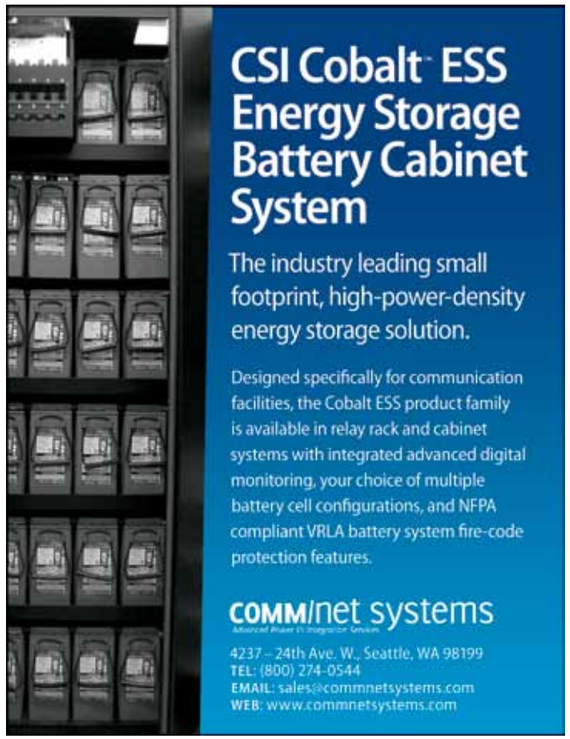


Adventures in Microsolar Supported by Microelectronics and MEMS Techniques

Sandia National Laboratories scientists have developed tiny glitter-sized photovoltaic cells that could revolutionize the way solar energy is collected and used. The tiny cells could turn a person into a walking solar battery charger if they were fastened to flexible substrates molded around unusual shapes, such as clothing.

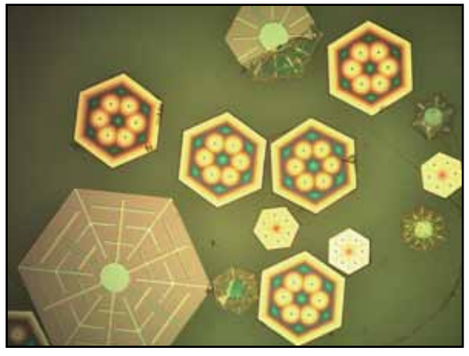
The solar particles, fabricated of crystalline silicon, hold the potential for a variety of new applications. They are expected eventually to be less expensive and have greater efficiencies than current photovoltaic collectors that are pieced together with 6-inch- square solar wafers. The cells are fabricated using microelectronic and microelectromechanical systems (MEMS) techniques common to today's electronic foundries.

Sandia lead investigator Greg Nielson said the research team has identified more than 20 benefits of scale for its microphotovoltaic cells. These include new applications, improved performance, potential for reduced costs and higher efficiencies.

"Eventually units could be mass-produced and wrapped around unusual shapes for building-integrated solar, tents and maybe even clothing," he said. This would make it possible for hunters, hikers or military personnel in the field to recharge batteries for phones, cameras and other electronic devices as they walk or rest.

Even better, such microengineered panels could have circuits imprinted that would help perform other functions customarily left to large-scale construction with its attendant need for field construction design and permits.

Said Sandia field engineer Vipin Gupta, "Photovoltaic modules made from these microsized cells for the rooftops of homes and warehouses could have intelligent controls, inverters and even storage built in at the chip level. Such an integrated module could greatly simplify the cumbersome design, bid, permit and grid integration process that our solar technical assistance teams see in the field all the time."



Representative thin crystalline-silicon photovoltaic cells; these are from 14 to 20 micrometers thick and 0.25 to 1 millimeter across. (Image by Murat Okandan)

Sandia project lead Greg Nielson holds a solar cell test prototype with a microscale lens array fastened above it. Together, the cell and lens help create a concentrated photovoltaic unit. (Photo by Randy Montoya)

Part of the potential cost reduction comes about because microcells require relatively little material to form well-controlled and highly efficient devices. From 14 to 20 micrometers thick (a human hair is approximately 70 micrometers thick), they are 10 times thinner than conventional 6-inch by 6-inch brick-sized cells, yet perform at about the same efficiency.

A commercial move to microscale PV cells would be a dramatic change from conventional silicon PV modules composed of arrays of 6-inch by 6-inch wafers. However, by bringing in techniques normally used in MEMS, electronics and the light-emitting diode (LED) industries (for additional work involving gallium arsenide instead of silicon), the change to small cells should be relatively straightforward, Gupta said.

Each cell is formed on silicon wafers, etched and then released inexpensively in hexagonal shapes, with electrical contacts prefabricated on each piece, by borrowing techniques from integrated circuits and MEMS.

Offering a run for their money to conventional large wafers of crystalline silicon, electricity presently can be harvested from the Sandia-created cells with 14.9 percent efficiency. Off-the-shelf commercial modules range from 13 to 20 percent efficient.

Solar concentrators, low-cost, prefabricated, optically efficient microlens arrays, can be placed directly over each glitter-sized cell to increase the number of photons arriving to be converted via the photovoltaic effect into electrons. The small cell size means that cheaper and more efficient short focal length microlens arrays can be fabricated for this purpose.

High-voltage output is possible directly from the modules because of the large number of cells in the array. This should reduce costs associated with wiring, due to reduced resistive losses at higher voltages. Other possible applications for the technology include satellites and remote sensing.

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