BATTERY POWER

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

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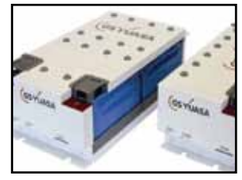

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Editor's Choice

Continental Enhances Electric Vehicle Safety

Continental, an international automotive supplier, has developed a sensor for electric and plug-in hybrid vehicles that will immediately shut off the high-voltage battery in the event of a collision. This means that emergency service personnel can come to the aid of accident victims without the risk of suffering an electric shock.

"The evSAT acceleration sensor is active in charge mode. It detects an accident and passes this information on to the battery management system, which then shuts off the high-voltage battery," said Dr. Axel Gesell, senior manager, Platform Development Sensors & Satellites, in the Passive Safety and ADAS business unit of Continental's Chassis & Safety Division. "The major benefit of our product is that it prevents fire and rescue service personnel sustaining high-voltage injuries when coming into contact with vehicle metal parts or if they have to cut through the vehicle to recover accident victims."

evSAT stands for Satellite for Electric Vehicles and essentially consists of an independent, triaxial sensor with a CAN (controller area network) interface. During the charge phase, the other vehicle electronics, including the airbag system are not operational. So to avoid the expense of adapting the airbag system to meet new requirements, Continental has developed evSAT for the vehicle's charge mode. The accelerator sensor employs an algorithm to detect a frontal, rear or side collision with another vehicle and immediately transmits a signal via the CAN interface to the battery management system that switches off the battery within half a second. evSAT reacts in the same way if it detects a rollover in driving mode. In this case, the battery is deactivated within four seconds. In the event of other types of driving accident, evSAT remains inactive. In such cases, the airbag system assumes the task of cutting off the battery. If the electric or plug-in hybrid vehicle has been switched off and is not being charged, the evSAT moves to a standby mode to prevent the battery discharging. As such, evSAT represents an additional passive safety system function for electric and plug-in hybrid vehicles.

Most high-voltage batteries in electric or plug-in hybrid vehicles generate a voltage of 400 volts, twice as great as the standard domestic plug socket and potentially fatal. In the US, there is a legal requirement for the vehicle power supply voltage to fall to below 60 volts within five seconds of an accident occurring.

Saft Lithium-Ion Battery Technology Selected for Solar Energy Storage Project in California

Saft will supply renewable energy storage for 2500 R Street, California's first microgrid, distributed energy community housing project. These advanced homes will use the latest in smart grid, solar generation and energy storage to ensure each home generates as much clean energy as it uses, thus maximizing homeowner utility bill savings.

Pacific Housing, Inc., a California nonprofit public benefit corporation, is developing the 2500 R Street project as an affordable, progressive, sustainable and efficient 34-home community in Sacramento. The homes are designed to meet stringent energy-efficient guidelines as well as offer an expedited construction schedule with emphasis on reducing construction waste. Additional advantages include reduction of resources, cost reduction and minimizing green house gas emissions. Each home utilizes Sunverge Energy's Solar Integration System (SIS), with energy storage from Saft, to shift electrical loads, flatten peak electricity demand and maximize return on renewable energy investments.

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Saft's Synerion E Li-Ion battery will be integrated into Sunverge's Solar Integration System to capture solar energy and store it for use when needed most by the homeowner. Li-Ion is the only technology that meets the project's need for 20-year battery life in a range of demanding environmental conditions.

HaloIPT to Wirelessly Charge Luxury Car

HaloIPT will supply its induction charging technology for 102EX, the Phantom Experimental Electric vehicle. Rolls-Royce Motor Cars has developed the test vehicle to explore alternatives to traditional internal combustion for the first time in the company's 107 year history. HaloIPT is part of a group of companies whose systems have been integrated into the experimental vehicle.

HaloIPT is the first company to bring to market wireless charging technology, which allows cars fitted with an integrated receiver to charge automatically when parked over transmitter pads buried in the ground. HaloIPT's wireless charging systems use inductive power transfer (IPT) to transfer power over large gaps and are tolerant to parking misalignment with power transfer efficiencies that can match a plug-and-cable. The technology is designed to function beneath asphalt, and even works under water or covered in ice and snow. IPT systems can be configured to work with all road-based vehicles from small city cars to heavy-goods vehicles and buses.

In the future, infrastructure providers will be able to embed IPT technology into roads, so HaloIPT cars can be charged on the move. This in-motion charging represents a way of solving the range issues faced by electric vehicles today and will significantly reduce battery size requirements as well as providing charging convenience.

SAE International Committee Develops Safety Standards for Rechargeable Cells

SAE International's Battery Standards Committee has created safety performance standards for lithium ion battery systems. These are the first minimum base standards for safety performance expectations (pass-fail criteria) for lithium ion battery systems.

The document, "J2929 - Electric and Hybrid Vehicle Propulsion Battery System Safety Standard - Lithium-Based Rechargeable Cells," provides a common foundation from which all battery and vehicle manufacturers can create safe battery systems. The standards will build consumer confidence in the safety of lithium ion battery systems.

SAE International battery committees are working to limit the potential for danger by developing standards that cover all aspects, from battery design, testing, storage, shipping and recycling of large advanced-technology batteries used in electric vehicles (EVs) and hybrid-electrics. Battery standards are useful for several reasons, but safety is paramount.

SAE International also is working with other organizations such as the National Fire Protection Association to recognize opportunities for improving EV battery safety knowledge, training, communications and vehicle designs for the First Responder community. In addition, the committees are supporting ISO12405 (electrically propelled road vehicles, test specification for lithium-ion traction battery packs and systems) standards development.

Lithium ion batteries are used in hybrid and electric vehicles. Their usage is expected to grow as more of the vehicles are introduced. Market size estimates for electric and hybrid vehicle batteries range widely from $2.3 billion to $10 billion by 2015. The US will have the capacity to produce 20 percent of the world's advanced batteries by 2012 and up to 40 percent by 2015.

Ford and DTE Energy Soak Up the Rays with One of Michigan's Largest Solar Power Projects

The primary part of one of Michigan's largest solar power generation systems at Ford's Michigan Assembly Plant is now up and running, delivering renewable energy to help power the production of fuel-efficient small cars. The system is the result of collaboration between Ford, DTE Energy, Xtreme Power, the city of Wayne and the state of Michigan.

The renewable energy captured by the energy system will help power the production of Ford's all-new Focus. The plant will also produce Focus Electric, Ford's first zero-emission battery electric passenger vehicle and the C-MAX Hybrid and C-MAX Energi plug-in hybrid.

The solar energy system will serve as a pilot alternative energy project to be evaluated for possible use at other Ford manufacturing facilities in the future. A secondary, smaller solar energy system will be integrated at Michigan Assembly to power lighting systems at the plant.

Ford collaborated with DTE Energy to install the 500-kilowatt solar photovoltaic panel system at Michigan Assembly. The system will be integrated with a 750-kilowatt energy storage facility that can store 2 million watt-hours of energy using batteries, enough to power 100 average Michigan homes for a year. The project will also include a 50-kilowatt-hour facility to demonstrate the potential reuse of vehicle electric batteries for stationary energy storage. Xtreme Power is supplying its Dynamic Power Resource on-site energy storage and power management system.

The solar energy installation is part of DTE Energy's pilot SolarCurrents program that calls for photovoltaic systems to be installed on customer rooftops or property over the next five years to generate 15 megawatts of electricity throughout southeast Michigan.

The Future of Battery Technologies

Environmental Considerations for Lithium Batteries

Intertek

There is a growing awareness of and interest in environmental issues across all sectors of society in recent years. Many people argue that our long-term survival depends upon reducing our impact on nature and that we must stop releasing toxic materials into the environment. Batteries are not yet covered by legislation on chemicals, but the "Regulation on Batteries," which is based on the EU Battery Directive, governs the use of certain heavy metals in batteries. Unfortunately, this legislation has not kept pace with technological developments in the battery field. This is also the case when it comes to environmental labeling requirements on batteries, such as the Swan Label.

There are at least three key factors that can be used when determining how environment friendly a battery is:

- Battery lifespan and the number of cells required to achieve the desired battery function in the equipment or apparatus
- Recyclability
- Chemical content

Upper Limits and Labeling Requirements

The EU Battery Directive is currently the most far-reaching directive on the regulation of hazardous elements that are used in batteries. The directive includes both fixed upper limits by weight for how much cadmium (20 ppm) and mercury (5 ppm) batteries can contain, with the exception of military and certain industrial batteries, plus batteries for emergency and alarm systems, cordless power tools and a number of medical equipment products. The Battery Directive and all related national legislation within the EU also covers labeling requirements for batteries with mercury, cadmium and lead (40 ppm) content along with requirements on the collection and treatment of spent batteries, irrespective of the particular type of battery.

Several countries in Asia (China, Japan and Singapore) have introduced regulation on heavy metals and batteries. Parts of the US and Canada have also come a long way on the collection and treatment of batteries.

No Mercury, Cadmium or Lead

None of the listed elements (mercury, cadmium and lead) play a part in electrochemical cells in lithium batteries and therefore, there is no reason for manufacturers to deliberately include them. Where they are found is in the form of contamination of raw materials used. It is extremely unusual for lithium-based cells or batteries to contain problematic high levels of these elements. This has persuaded some manufacturers of these batteries to claim their products are "green" and environment friendly. The basis for such claims

is debatable as lithium batteries, and rechargeable lithium-ion batteries in particular, are extremely complex and can contain a large number of different elements in varying degrees. This relationship is also reflected in the environment labeling requirements specified by Swan, which currently regulates these three heavy metals and, in the case of rechargeable batteries, arsenic.

Rechargeable Batteries are Preferable

Generally speaking, rechargeable batteries are more environment friendly than single-use batteries when used in the same application. This is because the total amount of battery waste will be lower as the same battery can be recharged numerous times, hundreds of times as a rule. Within the group of primary batteries (single use batteries), lithium cells offer an advantage in the form of higher energy density compared to alkaline batteries, which enable a longer operating time. Most primary lithium cells also have a higher cell voltage, which means they need fewer cells to achieved the desired operating voltage in the apparatus. Both of these characteristics help make primary lithium cells appear more advantageous than other primary cells from an environment perspective, as fewer cells are required to achieve the same performance and lifespan. These same arguments can be used in favor of lithium-ion cells, as these have a higher cell voltage than other rechargeable cell types.

Nickel from the Toyota Prius can be Recycled

Recyclability is completely dependent on the availability of efficient collection systems that ensure batteries do not end up in landfill sites and that there are financial incentives to recover the materials found in batteries. Here, traditional chemical batteries (lead, nickel cadmium and nickel metal hydride batteries) are actually at an advantage compared to lithium-ion batteries, as traditional batteries have a higher content of metals that have a second-hand value on the commodities markets. Exhausted lead batteries can be used directly in the manufacture of new lead batteries. Nickel from nickel cadmium and nickel metal hydride batteries is used by the steel industry in the manufacture of stainless steel. However, recycled nickel is not yet of sufficiently high quality to be used in new batteries. Cadmium can also be recovered and recycled in the production of new nickel cadmium batteries.

Toyota has developed a method that enables them to recover nickel from old Prius batteries that can be used in new ones. It will be interesting to follow this development and whether this method can be used for nickel metal hydride batteries of the consumer type.

Spent Cell Content Used in the Construction Industry

Lithium-ion batteries contain relatively small quantities of elements that are financially viable to recover. The large variety of cell chemistries available on the market also makes recycling more difficult. There are recycling processes currently available for lithium-ion batteries that recover cobalt, nickel and copper from battery waste. The residual cell content is combusted and the ash can be used in the construction industry. The trend within lithium-ion technology is moving towards a development characterized by an increased use of materials that are not of interest to recover, such as manganese dioxide, iron phosphate and mixed oxide materials with little or no cobalt in the mix. As a consequence, the cost of collection and recycling of lithium-ion batteries can largely fall on users when the manufacturers attempt to recoup their manufacturer product liabilities.

Heavy Metals in Lithium-Ion Batteries

Although lithium-ion batteries do not contain mercury, cadmium or lead, the content of these batteries does include other heavy metals that can be problematical for the environment. Cobalt, copper and nickel are examples of metals that occur in significant quantities in many cases. There are also a large number of trace element metals that can reach toxic levels if batteries are discarded in sufficiently large quantities in a limited area. To which can be added electrolytes in the form of organic solvents with various different ingredients, such as flame-retardants that can damage the environment if the batteries are not collected and disposed of in a professional way. In this respect, one can also include the original environmental impact of mining the minerals that are used in the cell manufacturing raw materials. Cobalt production in Congo-Kinshasa has been named as a potential problematical process from both an environmental and ethical perspective. It is not out of the question that the fast growing demand for lithium-ion batteries globally within the car industry can lead to the focus falling on other elements and manufacturing processes.

Product Life Cycle Must be Considered

The environmental impacts of batteries is a very complex issue. In order to be able to evaluate and compare different batteries against each other, it is desirable to take the entire life cycle of the product into account: the extraction and refining of the raw materials, cell and battery manufacturing, product lifespan in operation plus waste disposal and recycling processes. Both manufacturers and consumers of battery-powered products should do their utmost to minimize the total number of batteries required during the lifetime of the product in order to minimize its environmental impact. It is also important to persuade users to take batteries to recycling points and to continue work on developing technology that enables as much recycled material as possible to be used.

Intertek's expertise in battery testing and energy storage services ensures products meet performance, reliability and safety criteria. Throughout design, manufacturing and system deployment cycles, Intertek provides evaluations for performance, electrical safety, interoperability, fit for use, component selection and more.

For more information, please visit www.intertek.com/energy-storage or call 800-967-5352.

Green Backup Power Solutions Growing

Fuel Cells Help Telecom Operators Reduce Carbon Footprint

Kathy Fosberg, Marketing Communications Manager
IdaTech LLC

As companies around the world are increasingly focused on reducing their carbon footprints, fuel cell technology is helping mobile network operators meet both sustainability and business goals. Driven by high energy costs, limited access to electricity in many developing countries, increased legislation and market pressure, network operators are more frequently choosing clean technology solutions for their backup power needs over traditional options. Clean and energy efficient fuel cells can help reduce CO_2 emissions by 50 percent as well as decrease other toxic emissions and deliver additional environmental and efficiency benefits, making them more often the first choice for telecom carriers today.

A Clean Alternative

With society's reliance on mobile networks to power smart communications devices, having backup power at base station sites is critical in the event of power loss from severe weather, natural disasters or limited grid capacity.

Traditional telecom backup power solutions include VRLA battery strings for short duration backup, and diesel and propane generators for longer duration backup. Batteries are relatively

Telecom Backup Power Technology Comparison
Fuel Cell Systems vs. Diesel Generator

	ElectraGen H2 System Fuel Cell System with Direct Hydrogen	ElectraGen ME System Fuel Cell System with Methanol-Water Reformer	Diesel Generator
Exhaust Emissions [1,2]			
Nitrogen Oxides (NOx)	0 g/kWh	0.007 g/kWh	7.5 g/kWh
Carbon Monoxide (CO)	0 g/kWh	0.17 g/kWh	8.0 g/kWh
Sulfur Oxides (SOx)	0 g/kWh	0 g/kWh	12.0 g/kWh
Particulate Matter	0 g/kWh	0 g/kWh	0.8 g/kWh
Carbon Dioxide (CO_2)	0 g/kWh	783 g/kWh	1,500 g/kWh
Noise Emissions[3]			
Decibel Rating	Quiet: 52 dB at 1 m	Quiet: 52 dB at 1 m	Loud: 68 dB at 7 m
System Efficiency			
System Efficiency (%)	50%	33%	10-25%
Operational Costs			
Maintenance (visits per year)	1	1	2-4
Theft Costs (fuel, parts)	None	None	Fuel & Parts
Reliability	Fewest Moving Parts	Few Moving Parts	Many Moving Parts

Note 1: ElectraGen™ ME System emissions data from IdaTech *(subject to change)*
Note 2: Diesel generator emissions data from EPA standards for 2007 and newer generators, *EPA Standards of Performance for Stationary Compression Ignition Internal Combustion Engines; Final Rule July 11, 2006*
Note 3: ElectraGen systems operated at 75% power output during noise test

inexpensive for one to two hours of backup power. However, batteries are not ideal for longer duration backup power applications because they can be expensive to maintain, unreliable after aging, temperature sensitive and hazardous to the environment after disposal.

Diesel and propane generators are capable of longer duration backup power. While diesel generators are popular primarily due to their relatively low initial cost; unreliable operation for diesel generators is common, and operating costs are high due to poor efficiency and high service costs. Their environmental impact is significant due to their high emissions, low efficiency and loud operation.

Fuel cells offer improved system reliability, more predictable performance in a broad range of climates and a reliable service life when compared to battery strings and diesel generators.

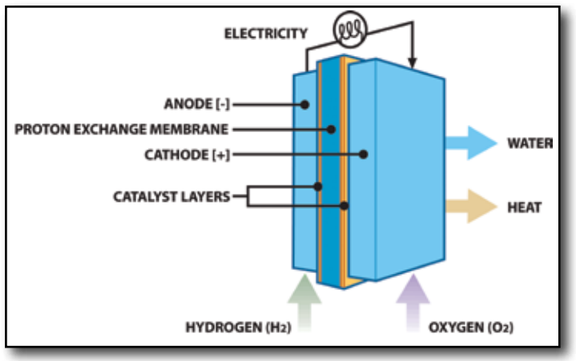
Lower fuel cell operating costs are the result of only one maintenance visit per year and significantly higher system efficiency. Fuel cells also offer environmental and economical advantages to end users because disposal costs and liability risks related to lead acid batteries are an increasing concern. In California, for example, telecom sites with more than 500 pounds of lead acid batteries or one gallon of acid face fees from the state.

How Fuel Cells Work

A fuel cell is a solid-state DC power generator that converts chemical energy into electricity. Hydrogen and oxygen (air) are the two fuels of that reaction. One great appeal of fuel cells is that they generate electricity with zero pollution; hydrogen and oxygen are combined to generate electricity, with water and heat as the only by-products.

The system continuously senses the direct current (DC) bus voltage and seamlessly takes over critical loads if the DC bus falls below a customer-determined set point. The system is fueled by hydrogen, which is delivered to the fuel cell stack in one of two ways: either from a commercial-grade hydrogen supply or a methanol and water liquid fuel, using an integrated reformer system.

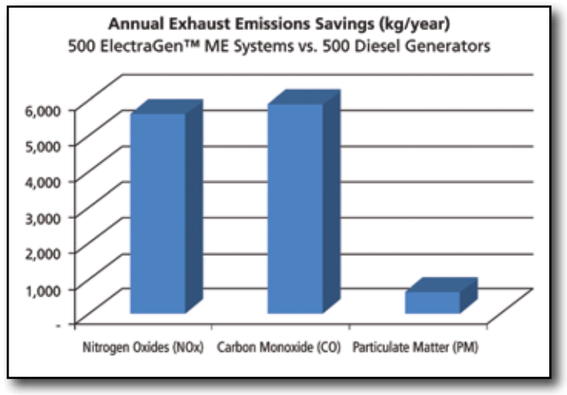
Electricity is generated by the fuel cell stack as direct current. The DC energy is passed to a DC/DC converter, which converts the unregulated DC electricity from the fuel cell stack into high-quality regulated DC electricity to serve the required loads. Fuel cell systems can provide multiple days of backup power since run time is limited only by the amount of hydrogen or methanol-water fuel stored on site.



Eliminating Emissions

Fuel cells can virtually eliminate the two most highly toxic emissions of diesel generators: nitrogen oxides (NOx) and sulphur oxides (SOx), which together are the main causes of acid rain and also contribute to the ozone formation in the air and ground.

Network operators who choose a methanol-water fuel cell system over a traditional diesel generator can realize significant exhaust emissions savings of a 50 percent reduction in CO_2 emissions and more than a 95 percent reduction in CO, nitrogen oxide and sulphur oxide emissions. Unlike methanol, diesel generators also produce particles and un-reacted heavy hydrocarbons.



Increased Efficiency

Fuel cell systems can be more than twice as efficient at producing electricity than internal combustion engines such as diesel and LPG generators. Increased efficiency reduces fuel consumption and lowers operating costs. Furthermore, a more efficient system produces fewer exhaust emissions, lowering the impact on the environment

Fuel cell systems are quieter and have significantly less vibration than diesel generators. Quiet operation is highly valued in areas where people live and sleep and can result in a lower incidence of vandalism.

Other Green Benefits

A fuel cell stack consists of graphite plates and polymers, whereas VRLA batteries include materials harmful to the environment and are difficult to dispose. Fuel cell stacks are recyclable, and refurbished (replacement) fuel cell stacks are available.

Another benefit is that fuel cells require less air conditioning. In tropical environments, telecom cabinets and shelters are typically cooled using traditional AC air-conditioning units. Typical VRLA batteries are required to be maintained at temperatures around 22°C (± 2°C), in order to avoid rapid degradation.

However, most telecom transmission equipment can operate at temperatures up to 35°C to 40°C without any deterioration or performance degradation. By removing batteries from the shelter, a more efficient cabinet cooling method can be used such as DC air-cooling systems.

New-generation DC air-cooling systems offer improved efficiency and performance for telecom sites. Backup power fuel cell systems operate at temperatures up to 46°C and do not require air conditioning. Reducing batteries at a telecom site and adding a fuel cell system will relax the temperature cooling requirements and will lower operating costs.


Photo Courtesy of IdaTech, LLC

Renewable Fuel Possibilities

Fuel cell systems that run on methanol-water can also use a renewable fuel, a combination of bio-methanol and water. Bio-methanol can be produced from synthesis gas, derived from biomass feedstocks, such as wood waste. A fuel cell system powered by a renewable fuel has a very low impact on the environment.

Government rebate programs are available for telecom carriers to buy fuel cell systems at a substantially discounted price. In California, federal and state incentives for implementing a system that uses bio-methanol renewable fuel can potentially offset the entire system purchase price. New Jersey, Oregon and Tennessee also offer state rebate incentives. In addition, all states are eligible for 30 percent federal cash rebate for installing fuel cell systems.

As our society continues to increase its reliance on wireless technologies and also its commitment to protecting the planet, backup power fuel cell systems will present clean technology solutions that lower operating costs, improve network reliability and benefit the environment.

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Large-Format Lithium Ion Batteries Provide Enhanced Energy Storage for Solar Generated Power

John Battaglini, Vice President
International Battery, Inc.

President Obama's "Clean Energy Standard for America" seeks to achieve 80 percent of electricity to come from renewables and other clean energy sources by 2035. It's an ambitious goal, however one that can be met through the help of new innovations in grid technologies. Certainly, the quest for more reliable, cleaner alternatives to fossil fuels is driving technological advancement in the smart grid. According Greentech Media research, "6.5 gigawatts of solar demand will be reached by 2015, with a 2009 to 2015 CAGR of 109 percent and a total market value of $13.0 billion. In 2009, the entire US photovoltaic (PV) market received an estimated $2.4 billion in total project investment, a number that will be exceeded as early as 2011 in the utility market alone." Managing and storing solar energy is the Holy Grail of success for not only utilities, but for consumers as well. Secretary John Hanger of the Pennsylvania Department of Environmental Protection said, "Renewable energy is booming, gaining an ever larger share of our electricity generation mix. To take it to the next level, though, we must improve our ability to store energy in large amounts."

The integration of intermittent renewable energy sources into the smart grid has presented challenges due to the inconsistent nature of the energy source. While solar power can provide a clean alternative to fossil fuels, the energy produced is difficult to store and utilize during the off-peak hours, which include cloud cover and night time. Difficulties in load leveling, back-up power, grid regulation and line efficiencies have created the need for enhanced energy storage systems. The ability to have energy stored and prepared to return to the grid during peak demand has inspired developments in both lead-acid and lithium ion batteries to satisfy growing energy storage needs. Just as smaller, longer-lasting lithium batteries became the standard energy storage format utilized by laptops and cell phones, solar integrators are applying battery systems with advanced chemistries and larger formats to fill the needs of the growing renewable energy storage requirements.

Energy Storage System Formats

Solar integrators are employing several different battery technologies including: lead-acid, lithium ion, ultracapictors, sodium sulfur, vanadium redox, flywheels, compressed air, fuel cells and pumped hydro. With so many choices, system designers and integrators need to consider the following:

- Weight- effecting mounting, installation, maintenance and mobility issues
- Footprint/Location- volume reduction, when space matters
- Modularity/Scalability/Mobility- ease of system expansion and relocation

Storage Technologies	Main Advantages (relative)	Disadvantages (Relative)	Power Application	Energy Application
Pumped Storage	High Capacity, Low Cost	Special Site Requirement		●
CAES	High Capacity, Low Cost	Special Site Requirement, Need Gas Fuel		●
Flow Batteries: PSB VRB ZnBr	High Capacity, Independent Power and Energy Ratings	Low Energy Density	◑	●
Metal-Air	Very High Energy Density	Electric Charging is Difficult		●
NaS	High Power & Energy Densities, High Efficiency	Production Cost, Safety Concerns (addressed in design)	●	●
Li-ion	High Power & Energy Densities, High Efficiency	High Production Cost, Requires Special Charging Circuit	●	○
Ni-Cd	High Power & Energy Densities, Efficiency		●	◑
Other Advanced Batteries	High Power & Energy Densities, High Efficiency	High Production Cost	●	○
Lead-Acid	Low Capital Cost	Limited Cycle Life when Deeply Discharged	●	○
Flywheels	High Power	Low Energy density	●	○
SMES, DSMES	High Power	Low Energy Density, High Production Cost	●	
E.C. Capacitors	Long Cycle Life, High Efficiency	Low Energy Density	●	◑

- Cycle Life- evaluate length of life and capacity, e.g. high C rates
- Service/Maintenance- projected life for specific operating temperatures
- Charge Times- will be different for various battery chemistries
- Capacity loss at high rates of discharge- evaluate and compare

Premium Performance Provided by Large-Format Lithium Ion Batteries

Due to lack of options in the past, the lead-acid battery has been one of the earliest formats to be applied to solar energy storage applications. Though lead-acid has a loyal following due to the initial purchase price, their limits are being recognized and replaced by lithium ion for demanding solar and other high energy density storage systems. The lithium ion battery as a supplement to the lead-acid type of battery offers many advantages as they are better at moving large amounts of energy into the battery without overheating and offer much higher round trip efficiency top-off charging of the fully depleted batteries by stationary charges can be accomplished in just two or three hours with lithium, versus a six-to eight hour charge time required by lead-acid batteries. The advantages of lithium over lead-acid also include:

- Dramatic weight reduction, up to 80 percent in high C-Rate applications
- Footprint/volume reduction, up to 65 percent in high C-Rate applications
- Dramatically longer cycle-life
- Use 100 percent of capacity of lithium battery without shortening rated cycle life, verses 40 to 60 percent of capacity for lead acid
- No service for the lifetime of the battery
- Shorter charge times (1.5 to two hours verses five to eight for lead-acid)
- Lithium has lower effective capacity loss at high rates of discharge

International Battery, Inc. is one such company manufacturing these new types of large-format lithium cells. The company's current generation of large-format cells is up to 70 times the capacity of the prior generation of cylindrical lithium cells. Large-format cells offer much lower system integration costs when aggregated into large battery packs. Having an order of magnitude reduction in the number of cells also enables reduced number of battery interconnections, further improving the reliability of the battery pack and providing for a much higher value proposition. Individual cell monitoring with the use of a battery management system is a key to success with these systems.

Energy Storage at Work

To further revolutionize the integration of renewable energy into the smart grid in the US, several pilot demonstration programs have been launched to prove the practicality of energy storage and its potential to impact the grid. Besides grid stabilization and load leveling, the inclusion of storage systems can potentially provide back-up power to thousands of residential and commercial customers, especially when renewable energy is not available.

Large-format lithium ion cells are being utilized by Sunverge Energy. Sunverge's turnkey Solar Integration System (SIS) is currently being demonstrated as part of a micro grid project at the Philadelphia Navy Yard's Energy Innovation Hub. The Hub is a national center for research, education and the commercialization of energy-related technologies, combining efforts of researchers from academia, the private sector and national research laboratories to save energy, reduce carbon emissions and position the US as a leader in renewable energy resources. The Navy Yard Campus in Philadelphia encompasses 1,200 acres, more than seven miles of waterfront, a workforce of 8,000 in more than 100 companies, 5.5 million square feet of facilities and more than $500 million of private investment. Within the Energy Innovation Hub includes a live demonstration of a micro grid with a 2,700 square foot net-zero energy home. Sunverge's efficiently designed, integrated system includes an inverter, gateway interoperability and lithium ion energy storage technology, making it a unique and comprehensive solution. The Sunverge SIS captures solar energy at its most plentiful and stores it for use during peak demand hours, when cost to produce and deliver electricity is at its highest. The Navy Yard project showcases the next-generation zero-energy home and the importance of managing, distributing and storing energy within the smart grid.

Large-format lithium ion cells have also been adapted by Princeton Power, who is developing a $1.5 million solar generation system with a 200-kilowatt solar array and energy storage system that will be connected to the grid. The project funded in part by the State of New Jersey's Clean Energy Manufacturing Fund, will demonstrate advanced smart grid functionality including micro grid operation, demand response, time shifting, frequency regulation and power dispatch. Princeton Power's inverter and International Battery's energy storage system will be housed in a mobile shipping container that is expandable to include one mega-watt-hour of storage.

As the Smart Grid continues to develop and integrates more renewable energy sources, energy storage will represent a key value proposition for the electricity grid of the future. Solar and wind will certainly pose challenges to the grid as more of these intermittent energy sources come online. Moreover, with the future adoption of plug-in vehicles, smart energy management will be needed to assure the quality and reliability of the grid. To this end, energy storage systems will serve as a key foundation technology that will advance the grid to its full potential.

Contact International Battery, Inc. at www.internationalbattery.com.

Opportunities in the Stationary Lead Acid Batteries Market

Vishal Sapru, Research Manager - Energy & Power Systems
Frost & Sullivan

Critical power applications demand a highly reliable and cost-effective energy storage technology. A stationary lead acid (SLA) battery offer these benefits and continues to be the battery chemistry of choice for backup power, emergency lighting, utilities, security systems, railway backup systems, oil and gas explorations, renewable energy systems and other applications. A lead acid battery is an energy storage device that has been used for more than a century to protect critical power appliances. Power quality has emerged as a highly discussed topic over the last 10 to 15 years, and is anticipated to remain so going forward, as more applications continue to become increasingly microprocessor-based. With this strong dependency on electronics, the need for power quality is not expected to cease. This has a cyclical effect on the demand for batteries, as they are the powerhouses designed to provide electrical power to the systems.

Competitive Analysis

Competition in this market is extremely fierce, with a mix of global participants and an increasing number of niche regional vendors. Price pressures have intensified since 2005, due to the escalating and volatile price of lead. This has affected profit margins for most tier one vendors. The major end-user segments such as telecommunication and UPS/data communication focus on having the required power for their facilities. Therefore, brand equity plays a key role in this competitive marketplace. Vendors that offer an increased value proposition and a complete suite of support services that is geared toward the critical end-user segments are sure to succeed.

Market participants aggressively try to maintain existing clients as well as venture into new markets to increase revenue profits and maintain company growth. The major competitive challenges include the vendor's capability to meet production capacities or control inventory supply impacted by fluctuating demand in several application markets.

In addition, the ability to keep pace with the capabilities of newer applications will decide the overall revenue growth for lead acid batteries. The lack of product originality has created a more competitive environment for vendors struggling to differentiate their commodity products from those of others. Revenue growth becomes a challenge due to the increased competition from Asia Pacific vendors that can manufacture low-end, low-priced batteries for various applications. The competitive structure of the market is highly diverse due to the varying market stages of each end-user application market.

Market Opportunities

The stationary lead acid battery market has shown steady growth, and is estimated at $4 billion to $4.3 billion in 2010. The two major segments that contribute to its growth (telecom and UPS/data communication) show a steady performance. A steady increase in unit shipments is also expected. Simultaneously, there has also been an increase in price due to lead price volatility, which has been responsible for the revenue growth. The stationary lead acid battery technology is widely used despite several advances in the alternative energy sectors. Hence, the opportunities for lead acid batteries are expected to continue to increase steadily.

The key factors that are likely to drive the growth of the SLA battery market include:

- Proven technology earns end-user loyalty and encourages growth
- Lowest comparable prices driving continued reliance on batteries
- Recovery of telecommunication and data communication industries instills growth
- Next-generation wireless technology expected to prod demand
- Environmental concerns provoke renewed interest in lead acid battery power sources
- Increased requirement for protection of facilities raises demand for lead acid batteries

The key factors that are likely to restrain the growth of the SLA battery market include:

- Price increase in components minimizes profitability
- Extremely competitive industry subject to continual price pressure
- Limited product differentiation
- Alternative energy chemistries pose growth challenge in the long term
- More stringent standards and regulations shrink profit margins
- Decrease in capital spending influences growth

As market maturity intensifies, it can be seen that profit margins tend to decrease, despite consistent sales. Factors attributed to this include depleting resources and increasing lead prices, price volatility due to high competition, increased competitive pressure mounting from niche regional vendors and increased investments in marketing campaigns to promote individual product brands.

The strong economic growth in the Asian economies has resulted in strong demand in the SLA battery end-user industries. The growth of the data center and telecommunication industries is expected to drive the demand for SLA batteries. The increased foreign direct investment into Asia is expected to facilitate the development of infrastructure and capital equipment. This is expected to increase the demand for power reliability and backup power. This in turn is likely to maintain the demand for SLA batteries going forward.

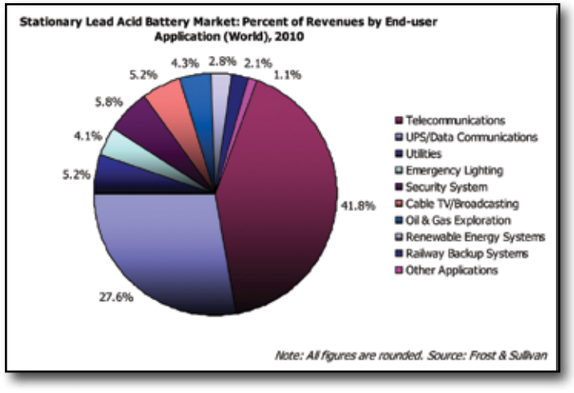

Figure 1 illustrates percentage of revenues by end user application.

As pollution levels continue to increase globally, government and local authorities are realizing the impact of these issues and are emphasizing environment preservation. The green technology or green energy movement has impacted battery markets in a positive manner. This movement constitutes a more environmentally-friendly and sustainable technology, and is one of the key strategies to mitigate the negative impacts of pollution. It is desirable that lead acid battery manufacturers practice the recycling of old lead acid batteries because it has an immediate impact on production and operational cost when obtaining manufacturing material. Lead acid batteries utilize 60 to 80 percent of the recycled lead, as the energy used to process recycled lead is lesser than that of primary ore. This protects the environment from the toxic effects of lead and plastics, and satisfies end-user requirements as they are price-sensitive. By being reliant on metals and chemicals, battery manufacturers are constantly pressured by market prices and raw material availability challenges.

Distribution Channel Analysis

The original equipment (OE) market contributed 64 percent of the SLA battery market revenues for 2010. Stationary lead acid batteries are used in coordination with a backup power device such as an inverter or a UPS to provide the necessary backup to the equipment being powered. Lower capacity SLA batteries are used with devices such as emergency lighting and security equipment. The life of a stationary lead acid battery var-

ies based on the application in which it is used and the environment that it is exposed to. This varies from anywhere between two years to a maximum of seven or eight years. Therefore, the battery cells are replaced at least once during the equipment lifetime, and this is done by the equipment provider. Thus, it becomes an original equipment sale for the battery vendor.

The aftermarket contributed 36 percent of the SLA battery market revenues in 2010. Aftermarket SLA battery sales are lucrative in comparison to the OE sales that are currently predominant in the industry. Batteries form the most critical part of the backup power system of any network, and its importance is also very well understood. As the backup power system is incomplete without the battery, backup equipment manufacturers also realize the importance of the batteries used in the system. Moreover, during the life of the backup energy device, batteries tend to be replaced at least once, and this is a lucrative proposition for equipment vendors.

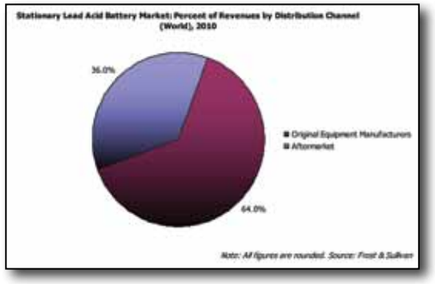

Figure 2 shows percentage of revenues by distribution channel.

Battery Construction Type Analysis

The two different types of lead acid batteries available are flooded and sealed or valve-regulated lead acid (VRLA). The difference is in the construction of the battery and the form in which the electrolyte is available in the battery. Equipment that uses lead acid batteries is generally designed around the battery itself. This includes factors such as mounting, connectors, charging circuits and load components. The necessity for ventilation systems, handling and other maintenance issues is also responsible for the difficulties faced in changing from VRLA to a less expensive but more rugged flooded battery, and this prevents the possibility of switching between VRLA and flooded.

Flooded lead acid batteries are the oldest battery type and are less expensive when compared to the sealed type. A key advantage of using flooded versus sealed/VRLA is battery life. A flooded battery is expected to last between seven and 20 years, depending on maintenance. On the contrary, VRLAs have a shorter life span of three to five years depending on maintenance. Flooded lead acid batteries are expected to decrease their implementation in stationary applications. The inability to store as much energy as VRLA batteries and the tendency to sulfate make this battery unattractive for stationary applications. Similarly, this battery suffers in terms of hydrogen gas leakage and corrosion.

Sealed lead acid batteries are the preferred choice due to their safe handling capabilities. This capability is necessary to ensure product functionality during power outages. Lead acid batteries have seen little technological advancement in the market. Nevertheless, vendors have introduced new products that offer enhancements in the form of longer life and durability.

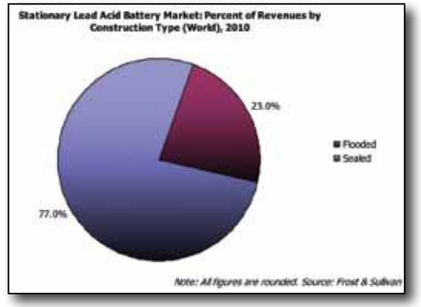

Figure 3 shows percentage of revenues by battery construction type.

Some of the advantages that VRLA or sealed batteries offer for stationary applications are as follows:

- Monitoring can be reduced to a large extent, and is limited to charging parameters
- Performance is not affected at lower temperatures
- There is no electrolyte leakage, resulting in safe batteries, which can be operated in any orientation
- The fear of explosion is reduced, as gases are not released in normal operating conditions
- Batteries can be used immediately after charging; no cool-down time is needed
- Very low self-discharge rates
- High resistance to vibration

Conclusions

With the competition among battery vendors becoming global, and the ever-increasing threat to the dominance of SLA batteries by competing chemistries and alternative energy sources, the demands on the vendors are multiple. The SLA battery market has witnessed a series of consolidations since 2000. With increasing competition in the marketplace and the commoditization of batteries, differentiating factors either in the product, the marketing activities, or the support functions are likely to help sustain a profitable, value-driven venture in the SLA battery market. One of the key strategies would be to employ a local strategy toward the manufacture and use of lead acid batteries, and minimize the cost of the batteries by employing less-expensive manufacturing facilities in Asia Pacific countries. In addition, effective marketing strategies to uphold brand equity and brand loyalty should be sustained and increased.

Contact Frost & Sullivan at www.frost.com.

Battery Power 2011

September 20-21 • Nashville, Tenn.

Battery Power 2011, an international conference highlighting the latest developments and technologies in the battery industry, will be held September 20-21 in Nashville, Tennessee.

This ninth annual event will feature more than 30 presentations designed for OEM design engineers, system engineers, integrators, end-users, technical and management professionals involved in battery powered products and systems, battery manufacturing, battery technology research and development and power management technology.

Battery Power 2011 will provide you with the most up-to-date developments and technologies in the battery and power management market. If you are involved in the battery industry or if your products and systems run on batteries, this is a must attend event.

The conference will be held September 20-21 in Nashville, Tennessee at the Gaylord Opryland. Use these two days to network with peers, professionals and potential business partners involved in technology solutions serving a variety of applications. Learn about the latest products, services and technologies available and discover what is on the horizon.

Battery Power 2011 will be co-located with other industry-leading conferences: Advancements in Thermal Management, Remote Monitoring and Control 2011, Antenna Systems and Technology 2011, Energy Efficiency Expo and EMCW. The events will share a combined exhibit hall floor, which is open to all attendees.

Register by July 28th for Only $695 - a Savings of $600!

Pre-Conference Workshops

Lithium-Ion Battery Design Tutorial

Presented by Robert Spotnitz with Battery Design LLC, this full day course surveys all aspects of lithium-ion battery design ranging from materials and processes, to cells to packs. A thorough overview of the issues involved in life estimation, thermal behavior and abuse tolerance is provided.

How to design lithium-ion cells is discussed in detail with an emphasis on comparing different chemistries. The Battery Design Studio software is used to illustrate design techniques for cells and packs.

Battery Power Management Challenges and Solutions: Safety, Charging, Fuel Gauging, and Cell Balancing

Presented by Jirong Qian with Texas Instruments, this half day 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, cell balancing from handheld, power tools, e-Bike, electric vehicle, to medical applications.

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Additional Sessions and Descriptions are Available Online at www.BatteryPowerOnline.com

Exhibitors

GS Yuasa Lithium Power Releases LIM50E Series of Lithium-Ion Battery Modules

GS Yuasa Lithium Power, Inc. has released two new lithium ion battery modules, the LIM50E-7G and the LIM50E-8G.

This new line of battery modules provides a new level of value to customers in need of energy storage solutions that offer high energy density and long service life. LIM50E module applications include utility grid ancillary support, community energy storage, industrial electric vehicles, telecommunications back-up power and others. The LIM50E modules features high energy density and integrated battery management electronics.

Saft Nife's Maintenance-Free Uptimax Battery for Stationary Power Backup Applications

Saft Nife ME Ltd. has launched its new generation maintenance-free Uptimax battery optimized for stationary power backup applications in the oil and gas, utility and electricity industries. The main advantage of the nickel-based Uptimax is that it doesn't need topping off with water throughout service life.

Advantages of the new generation Uptimax include better chargeability at elevated temperatures, so that well over 90 percent capacity is available after a single 15-hour charge at 40°C. Performance has also been improved by up to 10 percent, according to the relevant discharge time. This enables customers to benefit from using a size of battery more closely optimized to suit their specific application, reducing the initial purchase cost in addition to the savings resulting from the reduced maintenance requirements throughout the life of the battery.

Renata Batteries Develops Zero Percent Mercury Button Cells in Advance of New Regulations

To help OEMs of portable medical and consumer electronic devices remain compliant with new laws banning the use of mercury in button cell batteries, the Renata Batteries division of The Swatch Group has developed a line of 0 percent mercury silver oxide batteries. These batteries are used to power a wide range of devices, such as watches, medical devices including insulin pumps, glucose meters, surgical tools, heart rate monitors, computer battery back-up, RFID tags, keyless remotes, flashlights, laser pointers, children's toys and talking books.

On July 1, 2011, laws enacted by the states of Connecticut, Rhode Island and Maine will become effective, making it illegal to sell devices powered by battery button cells that contain mercury, including all 1.4 V zinc-air and 1.5 V alkaline batteries, as well as 1.55 V silver-oxide batteries. However, the Maine law initially limits the ban to five silver-oxide battery types until January 2015, when all button cell batteries must be mercury-free. NEMA has identified these five types as representing 80 percent of the mercury used in silver-oxide batteries. Some 30 other states have also enacted or are proposing regulations addressing the use of mercury in batteries, meaning that OEMs must use 0 percent mercury button cells in their products if they are to be sold in the regulated states.

NexSys Battery and Charger System Provides Enhanced Cycling Performance and Rapid Recharging

The EnerSys NexSys battery and charger system provides a flexible, virtually maintenance-free energy solution for small traction applications. Unlike conventional lead-acid batteries, NexSys batteries offer increased cycling performance and high rate recharging capability, contributing to longer service life and increased machine availability.

NexSys batteries feature positive and negative plates with low impedance, high corrosion resistant thin-plate grids manufactured from pure lead in a unique process. The NexSys battery offers high energy throughput up to three times the battery capacity per 24 hours, as well as an increased maintenance-free life cycle of up to 1,200 cycles at 60 percent depth of discharge (DOD). Additionally, the batteries feature a microporous glass mat separator with high electrolyte absorption and stability to enhance cyclic capability.

Complementing its virtually maintenance-free characteristics, the EnerSys NexSys battery withstands shock and vibration while providing eco-friendly performance. Its minimum gassing makes it well suited for use in shops, public areas and sensitive manufacturing areas. Additionally, NexSys batteries typically occupy up to 30 percent less space than the equivalent lead calcium batteries due to the thin plate design's high energy density properties. NexSys batteries have a long shelf life, up to two years at 77°F.

National Semiconductor Introduces SolarMagic ICs For Microinverter, Power Optimizer and Charge Controller Systems

National Semiconductor Corp. has introduced ten new SolarMagic integrated circuits (ICs), the first in a series developed to reduce cost, improve reliability and simplify design of photovoltaic (PV) systems. Ranging from the industry's first full-bridge gate driver to a micropower voltage regulator, the ICs are well-suited for a variety of photovoltaic electronic applications including those found in microinverters, power optimizers, charge controllers and panel safety systems.

The SolarMagic ICs are developed to meet photovoltaic renewable energy-grade qualification requirements. Each IC is engineered specifically for demanding rooftop environments that range from extreme cold to severe heat, and each passes rigorous testing with enhanced reliability specific to solar requirements. In addition, the ICs ensure long-term operation, developed to meet and exceed the 25-year life expectancy of photovoltaic modules.

Texas Instruments Step-Down Regulators Deliver High Power Density and Efficiency in a Small Package

Texas Instruments, Inc. (TI) has introduced efficient step-down regulators with integrated FETs to support up to 25 A for telecommunications, networking and other applications. The easy-to-use, 25 A, 14 V, TPS56221 synchronous Swift switcher with integrated NexFET MOSFETs achieves a power density greater than 200 W/in^3 with greater than 90 percent efficiency at high loads from a 12 V input to a 1.3 V output, delivering up to 25 A of continuous output current at 500 kHz switching frequency. The TPS56121 15 A, 14 V synchronous switcher is three percent more efficient at 5 V input to 1.2 V output and switches twice as fast as similar 15 A products in the market.

The TPS56221 and TPS56121 come in a thermally enhanced 5 mm by 6 mm QFN package, and achieve a total solution size of 315 mm^2. Both devices are the first switchers to integrate TI's NexFET technology, providing increased thermal performance, protection, efficiency and reliability. The switchers offer three selectable frequencies of 300 kHz, 500 kHz and 1 MHz for design flexibility and support input voltages of 4.5 V to 14 V.

The TPS56221 and TPS56121 come in an easy-to-solder, 22-pin, 5 mm by 6 mm QFN package with a single PowerPad thermal pad. Suggested resale pricing for the TPS56221 is $5.25 and the TPS56121 is $4.35 in 1,000-unit quantities.

Complete Energy Measurement SoC Provides More Management and Control of AC/DC Power Supplies in Servers and Data Communication Equipment

Maxim Integrated Products has launched a new Teridian/Maxim energy-measurement system on chip (SoC), the 78M6613. The 78M6613 is a SoC energy-measurement solution for AC/DC power supplies that brings a higher level of management and control to servers and other equipment in data centers.

The 78M6613 is a highly integrated, single-phase, fully self-contained AC power-measurement and monitoring SoC integrated circuit with embedded AC load monitoring and control firmware. The 32-pin QFN package is well suited for real-estate-limited designs such as power supplies, where power density and space are a premium. The 78M6613 features the full range of AC power diagnostics including power, power factor, voltage current, voltage sag and dip. On-chip flash and a microcontroller (MCU) enable the storage of calibration coefficients and eliminate the need for external components.

Second Generation High Voltage Battery Stack Monitor Advances Hybrid/Electric Vehicle Battery Management Systems

Linear Technology has introduced the LTC6803, a second generation high voltage battery monitor for hybrid/electric vehicle (HEVs), electric vehicles (EVs) and other high voltage, high performance battery systems. The LTC6803 is a complete battery measuring IC that includes a 12-bit ADC, a precision voltage reference, a high voltage input multiplexer and a serial interface. Each LTC6803 can measure up to 12 individual battery cells in series. The device's proprietary design enables multiple LTC6803s to be stacked in series without optocouplers or isolators, permitting precision voltage monitoring of every cell in long strings of series-connected batteries.

The maximum total measurement error of the LTC6803 is guaranteed to be less than 0.25 percent from -40°C to 125°C. The LTC6803 offers an extended cell measurement range from -300 mV to 5 V, enabling the LTC6803 to monitor a wide range of battery chemistries, as well as supercapacitors. Each cell is monitored for undervoltage and overvoltage conditions, and an associated MOSFET is available to discharge overcharged cells. Added functionality is provided by an onboard 5 V regulator, temperature sensor, GPIO lines and thermistor inputs.

Flux Power Introduces Lithium Battery Upgrade Kit For Polaris Ranger EV

Flux Power has introduced a lithium battery upgrade kit for the EV ATV market that lasts up to 10 years or up to 3,000 cycles. This Flux Power kit is targeted at customers wanting better performance from their existing Polaris Ranger EV ATVs. The kit fits in the existing space while saving weight, improving performance and safety. The 48 V kit comes in 8, 9.6, 16, and 19.2 KWh versions.

The kit comes with all necessary hardware while remaining compatible with the Polaris on-board charger. Included are batteries with integrated BMS (battery management system), communication cables, CAN current sensor, state of charge indicator, and all mechanical hardware for battery hold down. Each 12 V module is monitored by Flux Power's BMS and charging is regulated by an advanced CAN current sensor to assure a maintenance free long-life.

EnerSys Wi-iQ Battery Monitoring System Collects Performance Data for Peak Battery Performance

The EnerSys Wi-iQ battery monitoring system collects a range of battery operating data including amp hours (AH) charged and discharged, temperature voltage and electrolyte level. This data can be uploaded via wireless communication to a computer containing the Wi-iQ Reporting Suite analytical software, which provides quick-glance exception reporting as well as easy to use battery operation and condition reports. Ensuring proper charging and discharging of the battery fleet will increase available battery capacity and reduce battery replacement costs.

Among the Wi-iQ battery monitoring system's features are universal DC cable sizing, for all battery types with up to 4/0 cable sizes; a temperature warning, which enables the monitoring of high-temperature risks; and voltage imbalance notification, which indicates possible trouble with cells before battery failure occurs. The device captures and records up to 2,555 cycles of battery data and provides wireless data downloading to a personal computer within a range of 100 feet.

BASF Introduces High Purity HED Cathode Materials

BASF has released its high purity HED cathode materials, plastic solutions and novel materials as components for electrolytes for the lithium-ion battery market.

Due to a high degree of purity and product characteristics, BASF's HED cathode materials are well-suited for the evolving requirements of batteries in automotive drivetrains. For example, recent testing showed HED NCM-111 cathode material had less chromium and iron impurities than comparable products. Lower metal impurity levels can result in longer cycle and calendar lifetimes.

BASF is one of only two licensed cathode suppliers of the US Department of Energy's (DOE) Argonne National Laboratory-patented NCM (Nickel Cobalt Manganese) cathode materials, which employ a unique combination of lithium and manganese-rich mixed metal oxides. The license covers the broadest scope of NCM chemistry, which can be used in lithium-ion batteries.

Cole Hersee Introduces the FlexMod Voltage Sensing Relay and Timer

Cole Hersee has introduced the voltage sensing relay and timer (VSRT). The FlexMod VSRT conserves the starting power of a vehicle battery by shutting off auxiliary loads when either starting voltage drops to a low level, or a pre-set timer times out.

Excessive battery discharge is a problem that is sometimes unavoidable, particularly for law enforcement and emergency vehicles. When a vehicle is left idling with active warning lights and other onboard loads, a battery deficit can still arise and the emergency vehicle cannot be re-started.

Cole Hersee utilizes solid state technology in the creation of the FlexMod VSRT, providing long life and zero maintenance or replacement. Its service life exceeds 1,000,000 on/off cycles, operating for the entire lifetime of the vehicle. This device has a rating of 10 A, and can handle many loads directly or drive a relay or solenoid for higher amperages. Overvoltage and overcurrent protective measures are also included, providing extra levels of assurance.

Low Profile PCB Holders for 18650 Li-Ion Batteries

A new series of low profile, SMT and THM lithium-ion holders for 18650 batteries has been released by Keystone Electronics Corp. to meet increased demands for higher energy, light weight, rechargeable batteries for new generations of electronic products.

These compact holders feature low profile, heat resistant Nylon housings and Gold-plated Phosphor Bronze contacts. They are well suited for use with many consumer and industrial electronic products. The design accommodates lead free solder and traditional reflow processes and accepts all major manufacturers' of 18650 batteries.

Battery Pack and Five-Bay Battery Charger System For Mobile Handheld Equipment

GlobTek's five-bay lithium-ion battery chargers and cradles meet IEC 60950 (ITE), UL 1310 (Class 2), IEC 60601-1 (medical) international EMC standards. The charger charges battery in three phases: conditioning, constant current and constant voltage.

Charge is terminated based on minimum current level and a programmable charge timer provides a safety backup for charge termination. The design also incorporates an MCU for battery identification, charge status display and battery temperature monitoring using HDQ communication protocol from BQ27000 battery fuel gauge IC embedded inside the battery pack.

Each bay can provide bulk charge current up to 750 mA at 4.2 V maximum voltage for off-the-shelf GlobTek 2GL-523450-G or customer designed battery packs. Modified, custom and higher wattage designs adaptable to customer battery packs or alternate specifications are also available.

Portable Fuel Cell Charger Provides Instant Power Anywhere

PowerTrekk, from myFC, is a pocket size, lightweight charger for users who spend time away from the electricity grid. Providing instant power anywhere, PowerTrekk uses fuel cell technology that cleanly and efficiently converts hydrogen into electricity.

PowerTrekk is a two-in-one solution that is both a portable battery pack and fuel cell. The portable battery pack can be operated on its own as a ready source of power or storage buffer for the fuel cell. The fuel cell enables instant charging from a depleted battery state without ever needing a wall charge. Users insert a fuel pack and add water. To charge portable devices, users connect a device to Power Trekk via a USB port.

LG Mobile Phones Introduces Wireless Charging Solution

LG Mobile Phones has released the LG Wireless Charging Pad (WCP-700). With inductive coils built into the battery doors and internal contacts, advanced wireless charging technology allows for a cord-free power source, alleviating the need for external connections that limit the phones usability.

The LG Wireless Charging Pad features audible and tactile feedback when a phone is placed on the pad, as well as multi-colored LED lights to indicate charging status.

650 Watt AC-DC Single Output 1U Low Profile Power Supply, Active PFC, 90 to 264 VAC

Power Sources Unlimited, Inc. has released the Cotek AK-650 series of single output 650 W low profile AC-DC power supplies. The AK-650 series is a family of high performance 1U profile fan cooled AC-DC power supplies.

Measuring 9.80 inches by 5.00 inches by 1.61 inches, the single output AK-650 series has a universal active PFC 90 to 264 VAC input, and output voltages of 5.0, 12, 15, 24, 24, 27 or 48 VDC. Units feature programmable output voltage and current.

Additional features include intelligent LED indicators, forced current sharing at parallel operation, power OK signal, remote on-off, remote sense. Protections include OVP, OLP, OTP, SCP and fan failure. CE, TUV, UL approved and comes with a three year warranty.

TMH Series 40 Watt DC/DC Converters

ConTech, a Division of Calex, has released the TMH series of DC/DC converters. The TMH series offers up to 40 watts of fully regulated output power with an industry standard 2 inch by 1 inch footprint. The series offers a 2:1 input range with nominal input voltages of 12 VDC, 24 VDC, and 48 VDC. Single outputs offered are 3.3, 5, 12 and 15 VDC. Dual outputs are +/-12 and +/-15 VDC.

The TMH series operates with efficiencies as high as 92 percent. Features include remote on/off, output trim and short circuit protection. The operating ambient temperature range of the TMH is -40°C to 55°C with no de-rating. The non de-rated temperature range can be extended to 65°C ambient with an optional heat sink. The unit is encapsulated with a thermally conductive potting compound in a six-sided metal case for improved thermal performance in still air environments. The TMH series is RoHS compliant.

FBW Series Wide Input Range 400 Watt DC/DC Converter

Calex Mfg. Co., Inc. has released the 400 watt FBW DC/DC converter series. The FBW series offers an industry first, a 9 to 36 VDC and 18 to 75 VDC input range in a 4.6 inch by 2.4 inch by 0.55 inch high package. The wide input range provides a solution for industrial and military COTS applications that have a wide input voltage requirement. Examples include mobile 12 and 24 V battery applications. The FBW is housed in a metal case and encapsulated with a thermally conductive potting compound for improved thermal characteristics as well as protection against the environment. Efficiencies run as high as 93 percent reducing the need for heatsinking or forced air. Threaded through holes are provided in the case for the attachment of a heatsink for extended temperature applications. The case operating temperature of the FBW is -40°C to 100°C.

The output voltages available are 5, 12, 24, 28 and 48 VDC. The FBW offers output voltage remote sense and trim. The output voltage trim range is -25 to 10 percent. All models are isolated input to output and from the case. The input to output isolation voltage is 1,544 VDC. The case can be grounded to either the input or output ground, depending on system requirements. The FBW also offers on/off for minimal current drain during system down-time. Options include positive on/off logic and negative on/off logic. All models include input undervoltage lockout and input reverse voltage protection. On the output, protection is provided through overvoltage protection, pulse-by-pulse current limiting and overcurrent protection. Thermal protection is provide through thermal overtemperature shutdown with auto restart. Units are available with both RoHS and non-RoHS construction.

Wildcat Discovery Technologies Discloses Advances In Rechargeable Battery Materials Technology

Fundamental advances in rechargeable battery technology disclosed by Wildcat Discovery Technologies could result in battery performance improvements of 25 to 65 percent or more in electric cars, portable electronics, military, medical devices and other demanding applications.

Wildcat has developed a pair of new materials that set new standards for the rechargeable battery industry, by providing energy density of more than 675 Wh/kg while operating in full cells at 5 volts.

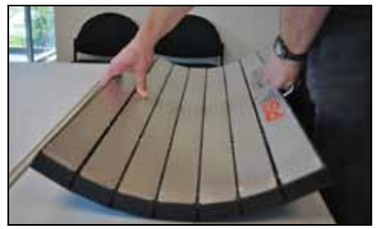
Wildcat's EM1, a novel 5 V electrolyte formulation, and CM1, a new high voltage cathode material, have been shown to deliver a 25 percent improvement in gravimetric energy density, and a 61 percent improvement in volumetric energy density in the electrode, compared with existing battery materials with comparable attributes. Thus far, batteries made with EM1 and CM1 have expected power and safety performance comparable to lithium iron phosphate (LiFePO4), while also handling more than 100 charge/discharge cycles in full-cell testing.

The EM1 electrolyte's high-voltage capability is of special interest for the automotive sector, where cell development has been restricted by the inability of existing electrolyte formulas to cycle at high voltages. Current EV systems based on low voltage cells require complex and expensive pack designs and battery management systems. EM1 enables high voltage systems that are expected to reduce required cell quantities 30 percent to 40 percent versus competing materials such as LFP and NMC. Fewer cells and simpler pack designs translate into substantially lower costs for auto makers.

Wildcat is actively seeking licensees and partners for further development and commercialization of EM1 and CM1 and successor materials.

PowerGenix and PSI Team Up to Supply Batteries for Traffic Light Backups

PowerGenix has announced an exclusive agreement with PSI Acquisition, LLC to supply battery cells for UP-Stealth, an uninterruptible power supply (UPS) for the traffic industry. Starting in April, PowerGenix NiZn battery packs were deployed in traffic installations in metropolitan areas in the US, Canada and Mexico.



PowerGenix and PSI teamed up to bring innovation to the battery backup traffic market. UP-Stealth can be installed in previously unutilized space in existing traffic control cabinets, replacing traditional lead-acid based UPS systems and eliminating the bulky, heavy external battery cabinet attached to the primary traffic cabinet.

"PowerGenix's NiZn rechargeable chemistry enabled us to create a lighter, higher-performing, hazard-free and more reliable product that will make intersections safer," said PSI Acquisition CEO Tim Hysell. "UP-Stealth allows budget challenged traffic agencies to reduce maintenance and installation costs while enhancing traffic safety. Since the United States alone has over 300,000 intersections with traffic lights, we're addressing a sizable market opportunity. We look forward to developing additional intelligent battery backup products for the traffic industry with PowerGenix."

Compared to the current lead-acid standard, the PowerGenix-PSI solution is about 70 percent lighter, with a much longer service life and requires no maintenance. NiZn batteries are also recyclable and RoHS compliant, with no toxic heavy metals, providing an environmentally friendly alternative to lead-acid and other battery chemistries.

European Commission Backs First Project for Battery Switch

A consortium coordinated by Better Place and including Renault SA, Continental, Ernst & Young, TÜV Rheinland, KEMA and five leading European institutions have announced formal approval from the European Commission for an R&D program to make it easier for European automobile and battery manufacturers to build electric cars with switchable batteries.

The project calls for the EASYBAT Consortium to develop off-the-shelf automotive grade components and interfaces that enable the auto industry to easily integrate battery switching technology into their electric car platforms. The first large scale application of battery switching technology will be shown by Better Place and Renault with the commercial launch of the Renault Fluence Z.E. in Israel and Denmark by year end.

The EASYBAT solution will consist of interfaces for switching a battery in and out of an electric car quickly and safely; the connector interfaces between the car, the battery, the communications network and the battery cooling system; and design specifications that meet European industry and safety standards. The solution will be integrated and tested on fully electric vehicles to ensure it meets production-grade manufacturing criteria and European safety standards.

Upon conclusion, EASYBAT will have a next generation, commercially available solution for battery switch integration components and design plans that allow for different types of batteries, not just a single standardized battery. Car manufacturers that want to focus on proprietary battery technology can do so and still be able to integrate their technology into a switchable battery electric car platform as envisioned by EASYBAT.

Part of the Seventh EU Framework Program (FP7), EASYBAT is a two and half year project, which is expected to run until June 2013. The European Commission will contribute $3.1 million to fund the project.

Maxwell Technologies Awarded $7.01 Million Contract from US Advanced Battery Consortium for Hybrid Auto Energy Storage System

Maxwell Technologies, Inc. has been awarded a $7.01 million cost-shared technology development contract by the US Advanced Battery Consortium LLC (USABC) to develop an advanced energy storage system for power-assist hybrid electric vehicles (PAHEVs). USABC will provide more than $2.8 million directly to Maxwell and approximately $3.5 million in total, including payments to technology development partners, over the course of the 24-month program.

Maxwell will lead a team that is tasked with the development and integration of advanced capacitor technologies to produce an energy storage system that meets performance requirements outlined in the USABC Lower Energy-Energy Storage System specification for PHEVs while managing cost to the lowest possible level. This will require technology advances in energy and power density compared with existing capacitor systems. Maxwell will be responsible for capacitor technology development, module technology and design, electrode formulation and system integration. Development partners will provide low-cost, high performance separator membrane and electrolyte specifically developed for this program.

Nissan Begins Construction of Portuguese Battery Plant

Nissan Motor Co., Ltd., has begun construction of an advanced lithium-ion battery plant in Cacia, Portugal to support the rollout of electric vehicles from the Renault-Nissan Alliance in Europe.

The battery plant is being built on a 30,450-square meter plot of land belonging to the Renault CACIA gearbox assembly plant following an investment of $221 million. The facility will start operations in December 2012 and will have a total capacity of 50,000 units a year. About 200 jobs are expected to be created by the new plant.

"The Cacia plant will be one of three facilities in Europe supplying batteries to electric vehicles produced by the Alliance, starting with the 100 percent electric Nissan LEAF. Together, the three plants will enable the Alliance to rollout electric vehicles in Europe on an unprecedented scale, bringing the world one step closer to a zero-emission future," said Nissan's COO Toshiyuki Shiga.

Last April, Nissan began construction of a battery plant in Sunderland, United Kingdom, which will start operations in early 2012 with an annual capacity of 60,000 units. Renault's battery plant in Flins, France will have a total production capacity of 100,000 units a year.

The Alliance is taking a comprehensive approach towards the mass-marketing of electric vehicles which encompasses both the product and the infrastructure. To date, Renault and Nissan have entered into more than 90 partnerships with governments, municipal authorities and companies around the world to put in place the necessary incentives and infrastructure for the successful adoption of such vehicles.

In 2008, Portugal became the first country in Europe to partner with the Alliance for zero-emission mobility. The country is building an extensive network of charging stations and this summer expects to have installed 1,350 units across the nation, including 50 quick chargers.

Electric Vehicle Traction Batteries 2011 to 2021

Research and Markets has announced the addition of the "Electric Vehicle Traction Batteries 2011-2021" report to their offering. This report has detailed assessments and forecasts for all the sectors using and likely to use traction batteries. There are chapters on heavy industrial, light industrial/commercial, mobility for the disabled, two wheel and allied, pure electric cars, hybrid cars, golf cars, military, marine and other.

With vehicle traction batteries it is important to look at the whole picture. The rapidly growing market for traction batteries will exceed $55 billion in only ten years. However that spans battery sets up to $500,000 each with great sophistication needed for military, marine and solar aircraft use. Huge numbers of low cost batteries are being used for e-bikes but even here several new technologies are appearing. The largest replacement market is for e-bikes today and the value market for replacement batteries will not be dominated by cars when these batteries last the life of the car, something likely to happen within ten years.

Vehicle manufacturers are often employing new battery technology first in their forklifts or e-bikes, not cars, yet there is huge progress with car batteries as well - indeed oversupply is probable in this sector at some stage. The mix is changing too. The second largest volume of electric vehicles being made in 2010 is mobility aids for the disabled but in ten years time it will be hybrid cars. The market for car traction batteries will be larger than the others but there will only be room for six or so winners in car batteries and other suppliers and users will need to dominate their own niches to achieve enduring growth and profits.

International Battery and Hydro-Québec to Collaborate on Water-Based Manufacturing Processes for Lithium-ion Batteries

International Battery, a US manufacturer, designer and developer of large-format lithium-ion rechargeable cells, batteries and energy storage systems (ESS), has entered into a collaboration and license agreement with Hydro-Québec with the purpose to further develop water-based manufacturing processes of lithium-ion batteries.

Both companies believe that there are significant environmental advantages by using a water-based process in the manufacture of lithium-ion cells as well as a reduction in manufacturing costs. As part of the joint collaboration, the companies plan to expand water-based manufacturing processes for additional lithium chemistries.

Wind Turbine Makers Adopt Ultracapacitors to Generate Reliable, Clean Energy

Brendan Andrews, Vice President of Sales and Marketing
Ioxus, Inc.

Cleantech energy is attractive for numerous reasons. Environmental considerations, compounded by the volatility of the oil markets, have spurred recent innovation and investment in solar and wind power generation. In both areas, however, manufacturers have struggled to create an energy source that remains reliable, regardless of meteorological happenings. If cleantech energy is to become viable in wide deployment, it must solve the problem of efficient energy storage to bridge any gaps in production caused by shifts in the weather. The wind turbine market is poised to do just that by swapping its reliance on batteries for smarter components: ultracapacitors.

Ultracapacitors Versus Batteries

Ultracapacitors offer high energy density and power. When used in conjunction with traditional batteries, ultracaps increase the overall power density of an energy source and relieve the typical strains on batteries that can limit their life cycles. Unlike batteries, this component has no plating or chemical reactions to introduce wear. Therefore, ultracapacitors can complete millions of charge and discharge cycles with limited degradation. Any performance fade in the devices are predictable and easily monitored so that the end of application life is predicted. While the replacement period for batteries is between two and four years, the expectation for ultracapacitor lifespan is more than a decade.

This difference in lifespan is

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no small matter when it comes to wind turbines. Beyond the cost of replacing batteries, swapping out components can be a dangerous task depending on the location and status of individual turbines. The less often operators need to perform these tasks, the better. With batteries, temperature extremes can significantly affect lifespan. Whereas ultracapacitors operate optimally at a temperature range between -40°C and 65°C, batteries function best on a modest spectrum of -20°C to 40°C. When batteries have to operate at the extremes of this spectrum or beyond, they need to be replaced even more often. There is a staggering difference between these two components in terms of cycling capability, as well. The battery can offer 10,000 to 50,000 cycles in comparison to an ultracapacitors's million-plus cycles.

Perhaps most importantly, batteries do a poor job of delivering the frequent, short power boosts wind turbines need to make rapid rotor blade adjustments and create electricity. The pitch of a wind turbine's three rotor blades can be adjusted to respond to current conditions and maximize the elements to create clean energy. However, these adjustments create waste, since the energy storage systems frequently used are sized to meet the highest possible power demands, even if those rates only occur briefly and sporadically. Ultracapacitors solve that problem, since they are specifically designed to deliver high power bursts and energy recapture.

On price, too, ultracapacitors beat batteries. During the past 10 years, the price of these components has dropped by 99 percent, from $5,000 for a 3,000 Farad ultracapacitor to $50. In comparison, the cost of a battery during the same time period has fallen 30 to 40 percent.

Expanding Wind Turbine Market Calls for Better Energy Storage

For many of the same reasons why the wind turbine market is picking up after several flat years, the manufacturers who supply this space are making changes to their energy storage strategies. Estimates for new installed capacity through 2015 suggest a rebound in growth. If this new generation of wind turbines is to fulfill the promises of cleantech power generation, their makers must solve the problem of efficient, reliable energy storage. Ultracapacitors deliver that solution.

Today's wind turbines offer pitch control for each of three blades, ensuring optimum positioning for efficient use of wind speed for both performance and safety. That pitch control is derived either mechanically or electrically, but electrical control systems replace mechanical movements with more reliable electrical systems. However, when electrical control systems rely on battery-based backup systems, the potential maintenance advantage over hydraulic systems is not necessarily realized. For this reason, designs for backup in the past few years have included ultracapacitors rather than batteries.

Electrical pitch controlled systems have certainly won the favor of the market; current estimates show that 60 percent of newly installed turbine systems are electrical pitch controlled systems. This share should continue to expand as more new turbine developments focus on electrical-based systems enabled by ultracapacitors.

Ultracapacitors are in use in 14,000 turbine installations, where they are solving the peak-power and storage problems that once limited the market. Ultracapacitor's offer advantages over batteries, including lifecycle length, temperature tolerance, reliability, cost and operational safety. By solving many of the problems battery-powered energy storage represented to the market, ultracapacitors are helping wind turbine manufacturers harness the elements to create clean, green, cost-effective energy.

Brendan Andrews is the vice president of sales and marketing at Ioxus, Inc. He is responsible for the leadership and coordination of Ioxus' sales and marketing functions and for educating the global market regarding existing and future ultracapacitor technologies. For more information, please contact Ioxus, Inc. at www.ioxus.com.

Calendar of Events

June

6-10 - **Advanced Automotive Battery Conference Europe**, Mainz, Germany

7-10 - **LABT'2011: 8th International Conference on Lead-Acid Batteries**, Albena, Bulgaria

September

20-21 - **Battery Power 2011**, Nashville, Tenn.

October

9-13- **INTELEC 2011**, Amsterdam, The Netherlands

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

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