

## Getting the Most Out of Your Batteries

At some point during a utility power interruption, batteries have a crucial role to play. For sites with generators, the batteries must maintain power to the load until the generators have started up, in which case they may only have to provide standby power for a few minutes. However, many outside plant systems don't have generators, in which case the batteries must be capable of maintaining backup power for several hours. As expectations on network runtimes grow, and while utility outages become more frequent<sup>1</sup>, multiple-system operators (MSOs) should review their deployed battery backup solutions. The challenge facing network operations is how to safely and cost-effectively increase energy densities across the hybrid fiber-coax (HFC) network.

In this article EnerSys® energy storage experts share their knowledge on battery technologies and discuss the factors that need to be considered when designing a solution which maximizes both network runtime and total cost of ownership (TCO).

### Battery Technologies

Today, two main battery chemistries are deployed within telecommunications networks: lead-acid and [thin plate pure lead \(TPPL\)](#). Alternative chemistries such as lithium-ion are emerging as potential solutions for sites with high energy density requirements.

#### Lead-Acid

Lead-acid batteries have been the industry workhorse for many years for both inside and outside plant sites. Valve regulated lead-acid (VRLA) batteries using gel or absorbent glass material (AGM) have less water loss and lower gas emissions than traditional flooded lead batteries. VRLA batteries lose their charge over time and must be charged on a regular basis, even if they are not being used.

#### Thin Plate Pure Lead

TPPL batteries are a type of AGM VRLA battery which use higher purity lead. This high purity lead enables the construction of thinner grids, more of which can be stacked into the battery, providing additional surface area for higher energy densities. The thinner electrodes in TPPL batteries facilitate better materials utilization, enabling higher current peaks and faster discharge times. The higher purity lead in TPPL batteries has the advantage of slowing down grid corrosion, leading to longer lifetimes than for traditional lead-acid chemistry. TPPL batteries can also hold their charge for longer periods without the need for a refresh charge and are more tolerant to changes in temperature.

TPPL batteries have obvious benefits for network sites where space is fixed or limited, and standby times need to be increased. A site with one cabinet housing three lead-acid batteries could be upgraded to TPPL batteries, for example. When taking the increased energy density of TPPL into account this could

---

<sup>1</sup> <https://medialibrary.climatecentral.org/resources/power-outages>

more than double battery backup capacity. Faster charging times and longer lifetimes are also important where utility interruptions are frequent.

TPPL batteries are heavy, however, and this additional weight may not be practical for many pole-mount sites. Also, where runtime requirements are demanding and space is limited, TPPL may still not deliver enough standby time. For scenarios like these, lithium-ion batteries are emerging as a viable solution.

### **Lithium-Ion**

Although it has been over 30 years since lithium-ion batteries were first commercialized<sup>2</sup>, the technology is constantly evolving with considerable ongoing research and development. The operation of lithium-ion batteries is very different from lead-acid and is based upon the shuttling of lithium ions between electrodes. This shuttling operation, and therefore battery capacity, is limited by temperature, charge voltage, and end of discharge voltage. As such, lithium-ion batteries must be carefully managed.

Multiple lithium-ion chemistries exist, with different operating voltages and temperature tolerances; as such, selecting the right one for a specific application is very important. Also, with lithium-ion batteries, a battery management system (BMS) is critical for safe operation, maximum performance and life expectancy.

Overall, lithium-ion batteries are lighter than TPPL and can enable a further doubling of battery backup capacity for the same space, although they are more expensive.

## **Getting the Most from Your Batteries**

TPPL batteries are more expensive than traditional lead-acid, and lithium-ion batteries even more so. These higher upfront investments however can be more than offset by longer lifetimes and lower operating costs. Getting the best TCO from a given technology is based on optimizing energy density for a given space and maximizing battery performance and lifetimes. This can only be achieved through a combination of battery expertise, power systems capability and network experience.

The overall design of the backup solution must be tailored to the constraints of the specific site and the characteristics of the chosen battery technology. Both TPPL and lithium-ion batteries require multi-mode charging cycles for maximum operational life, and temperature compensation and thermal management is essential.

Thus, designing a battery backup solution is a complex task requiring specialist knowledge and expertise. With over 100 years of experience in battery technology, no organization is better placed than EnerSys® to ensure that your solution meets the operation demands.

## **EnerSys® Understands Energy Density**

The EnerSys comprehensive portfolio of stored energy solutions draw upon a wide range of capabilities to deliver world-leading network power and backup solutions. EnerSys has focused product development on the energy density challenge, developing systems that will meet 72-hour runtime requirements, such as those recently mandated by the California Public Utilities Commission (CPUC).

<sup>2</sup> <https://iopscience.iop.org/article/10.1149/2.0251701jes>

The EnerSys high-capacity [PowerSafe® SBS](#) 190F or AlphaCell® 210FTX batteries deliver industry leading float service life and energy capacity. The next-generation Alpha® XM3.1-HP [broadband UPS](#), with programmable charging modes, provides optimal battery charging to ensure maximum performance and operational battery life, while the extensive Alpha® range of enclosures deliver exceptional thermal management and protection against the elements.

Remote monitoring of power supply battery backup status is growing in importance and the communications module within the Alpha® XM3.1-HP broadband UPS enables status monitoring and communications using DOCSIS® protocols. When coupled with the powerful Alpha® Continuity and XD platforms, customers gain an in-depth and real-time overview of the health of their network power solution.

If you need to increase your network runtime capability, please visit us at [www.enersys.com](http://www.enersys.com), sign up for email notifications and search for EnerSys Cable Broadband to connect on LinkedIn.

## About EnerSys

EnerSys, the global leader in stored energy solutions for industrial applications, manufactures and distributes energy systems solutions and motive power batteries, specialty batteries, battery chargers, power equipment, battery accessories and outdoor equipment enclosure solutions to customers worldwide. Energy systems, which combine enclosures, power conversion, power distribution and energy storage, are used in the telecommunication, broadband and utility industries, uninterruptible power supplies, and numerous applications requiring stored energy solutions. Motive power batteries and chargers are utilized in electric forklift trucks and other industrial electric powered vehicles. Specialty batteries are used in aerospace and defense applications, large over-the-road trucks, premium automotive, medical and security systems applications. EnerSys also provides aftermarket and customer support services to its customers in over 100 countries through its sales and manufacturing locations around the world. With the NorthStar acquisition, EnerSys has solidified its position as the market leader for premium thin plate pure lead batteries which are sold across all three lines of business. More information regarding EnerSys can be found at [www.enersys.com](http://www.enersys.com).

## SUSTAINABILITY

Sustainability at EnerSys® is about more than just the benefits and impacts of our products. Our commitment to sustainability encompasses many important environmental, social and governance issues. Sustainability is a fundamental part of how we manage our own operations. Minimizing our environmental footprint is a priority. Sustainability is our commitment to our employees, our customers and the communities we serve. Our products facilitate positive environmental, social and economic impacts around the world. To learn more visit: <https://www.enersys.com/en/about-us/sustainability/>.



### World Headquarters

2366 Bernville Road  
Reading, PA 19605 USA  
+1 610-208-1991 / +1 800-538-3627

### EnerSys EMEA

EH Europe GmbH  
Baarerstrasse 18  
6300 Zug Switzerland

### EnerSys Asia

152 Beach Road  
Gateway East Building #11-08  
Singapore 189721 / +65 6508 1780