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- **Energy Storage/Standby**
Lead – The most efficient technology
- **Motive Power**
Lead – The best overall solution
- **Hybrid Electric Vehicles (HEV)**
Lead is getting lighter
- **Safety and Reliability**
Lead – A longer track record in safety and reliability than other rechargeable battery technologies
- **Sustainability/Recycling**
Lead – One of the highest recycling rates on the planet

Informational Sources:

¹ America's Battery Recyclers 2009: http://www.americasbatteryrecyclers.com/pdf/brochure_final.pdf

² ©2011 Battery Council International

³ Energy Storage Association:
http://www.electricitystorage.org/technology/storage_technologies/technology_comparison

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Energy Storage/Standby

Lead –The most efficient technology

With a dependable supply line, mature manufacturing, and long cycle life, lead technology is the most cost effective and practical battery storage solution.

Lead-Based Technology Delivers the Lowest Cost Per Unit

An established infrastructure of lead mining and mature manufacturing has made lead one of the most cost effective energy storage technologies. Lead comes out on top as the lowest cost of energy and power output per kilowatt-hour.

The availability of lead provides a lower market cost

Well-established and stable mining, together with years of perfecting the recycling process, has created a dependable supply source. In fact, 74% of the lead used in manufacturing new lead batteries comes from recycling.¹ Collection points for lead batteries include automotive stores, retailers, auto, shops, and battery distributors across the country. This vast and established network ensures that a continual supply of used lead products is transported back for proper recycling and reuse.² Alternative technologies that don't have well-established supply sources or recycling infrastructures are prone to raw material cost fluctuations that could significantly increase supply interruptions and costs to manufacturers and consumers.



The maturity of manufacturing and shipping of lead products provides a significant advantage in optimizing cost efficiency

With lead products as the leading technology for energy and back-up power storage, it's easy to see that lead-based technology is very compatible with today's needs. One of the main reasons lead products are so widely used is the cost efficiency associated with lead technology. A highly developed and mature manufacturing process brings economies of scale. Years of advancing manufacturing equipment to deliver higher production rates have helped even further optimize cost savings.

Lead-based storage has more value per energy and power output while delivering a long cycle life.

When factoring the cost for the amount of power and energy per kilowatt-hour, lead has the best value in the industry.³ As research to maximize the lead battery's energy density develops, this value will continue to grow. Combining this with lead technology's long cycle life performance results in the most cost effective battery storage solution.

The Evolution of Lead Battery Products

Lead may have been around for a while but still experiences steady technological advancement. As the technology continues to grow, more and more applications are benefiting from its dependable and cost effective use.

A steady progression of advances with lead technology has occurred over the past 150 years. In that time, the expertise and experience with ways of using this technology to serve the industry have been remarkable. No other battery chemistry has served industry in such a widespread capacity, and with the proven dependability, of lead. Many alternative battery chemistries have not been around long enough to go through a single lifespan as a commercial product. Much of the life data is forecast, and only time will tell if these predictions hold true. Lead has over a century and a half of proven use, and its battery life only gets better.

For over 150 years, the lead battery industry has served consumers with an ever-growing list of new and improved products.

The use and service of lead technology has experienced a steady progression of development and change. With each new application, lead technology has evolved. As needs continue to change and grow, lead technology will adapt and advance to deliver dependable battery power to future applications.

For instance, research on grid-scale energy storage systems, using advanced lead batteries, is improving frequency regulation and demand management service for electrical utility companies. This is just one example of how advanced lead technology will help with new ways of achieving energy savings, increasing energy efficiency, and fostering the growth of renewable energy sources.

Lead is getting lighter — lead technology continues to find new ways to deliver more power-per-pound

Research to maximize the lead battery's energy density shows great promise, as manufacturers develop new ways to make current collectors more efficient and take up less space. This leaves more room for active material, improving the battery's power density. Lowering the weight-to-power output is an important benefit to applications where weight is a critical issue in performance.

Lead is moving right into the next generation of new applications

Newly developed carbon-based advanced lead technology has the ability to provide and absorb charge rapidly, making it ideal for applications that operate at a partial state of charge. Advanced lead batteries will support these applications at 1/3 of the cost of nickel cadmium and 1/4 of the cost of lithium ion batteries.³

