



# Automotive Batteries and their competitors

## Report Background

This brand new report examines market for and technology used for various energy storage technologies used in Micro, Mild, Full, Plug-In Hybrids and Extended Range and all Electric Vehicles.

Leading industry analysts expect rapid growth in the market for these technologies, which will see them quickly become one of the highest value sectors of the automotive industry supply chain. For many applications the technology is disruptive, and will drive new technology investments, attract new companies into the supply chain and force vehicle manufacturers and their suppliers to collaborate or make acquisitions to stay competitive in the future.

So called 'green' vehicle technologies will all require advanced energy storage systems, ranging from improved SLI (starting, lighting, and ignition) batteries for micro hybrids with stop-start and regenerative braking, to larger traction batteries for electric vehicles and hybrids, as well as ultra-capacitors, hydraulic hybrids or flywheel systems. The report concentrates on the advanced energy storage for hybrid and electric vehicles and their variants, comparing the requirements for the alternative drivelines to the power requirements of conventional vehicles.

Written in association with Knibb Gormezano and Partners, the 190 page report, focuses on advanced battery systems, but also looks at ultra-capacitors, hydraulic and flywheel energy storage systems.

The report includes market penetration forecasts out to 2015 and 36 company profiles of major players in the sector.

## Report sample

put in place, where the vehicle manufacturer or its appointed agent takes the battery back and recycles them into new battery packs either for automotive or non-automotive use.

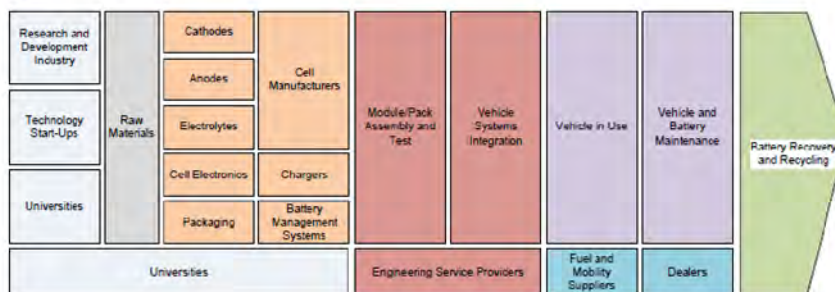
### Safety

Safety is a critical consideration when rolling out advanced power storage devices is the safety aspect. Vehicles with higher voltages and advanced batteries need to be engineered to fail or crash safe and maintenance and repair procedures will need to be reviewed to ensure customers and mechanics do not accidentally electrocute themselves. Lithium ion batteries, as used in laptop PCs and mobile phones could be considered unsafe in larger applications hence the development of alternative chemistries that are inherently more safety.

### The Value Chain

The value chain in the automotive industry will change as there is a move toward more electric vehicles. This would mean dealers will have to develop a capability to service electric vehicles and hybrids, which is likely to require different skills and investment than current conventional powertrains. The fuel sector will also change, with new models for delivery of electricity through a network of charging points, which may or may not be based at current gas/petrol stations. It is difficult to put a value on the complete value chain that will be generated by advanced energy storage, as many of the investments and technologies will find their way into non-automotive applications. However it is certain that a cross-fertilisation of R&D from the automotive to non-automotive 'green' energy sectors will be beneficial to the global economy.

Figure 71: Value chain



### Rationalisation and Consolidation

With such a large potential market there is room for a number of players but investment levels, potential consolidation of the customer base, and other market forces leaves significant potential for rationalisation and consolidation in a number of areas. Though not covered explicitly there is potential for vehicle manufacturers to strengthen their ownership of battery suppliers and integrate downwards, through some of the component systems in their desire to protect their intellectual property, value chain and supply base. Examples to date include Cobasys which has been acquired by SB LiMotive, Avestor by Bolloré and Sanyo which is being acquired by Panasonic. Alliances will also be required to share technology and reduce investment levels. A number of examples are covered in Figure 67.

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Safety

Charge-discharge efficiency

Charge Time

Thermal Operating Characteristics

Durability and Reliability

Packaging

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Self-Discharge

Weight

### ***Batteries***

#### ***Advanced lead acid (VRLA or AGM)***

#### ***Other Advanced Lead Acid Batteries***

#### ***Nickel Metal Hydride (NiMH)***

#### ***Advanced batteries - Lithium***

Cathodes

Anodes

Separators

Electrolyte

Cell Packaging

Safety Circuits

Packaging

***Lithium Chemistries***

Lithium Nickel Cobalt Aluminium - Li(NiCoAl)O<sub>2</sub> - NCA  
Lithium Cobalt Oxide (LCO) – LiCoO<sub>2</sub>  
Lithium Iron Phosphate (LFP) – LiFePO<sub>4</sub>  
Lithium Magnesium Iron Phosphate (LFMP)  
Lithium Manganese Spinel (LMO/LMS)- LiMn<sub>2</sub>O<sub>4</sub>  
Lithium Nickel Cobalt Manganese (NCM)- Li(NiCoMn)O<sub>2</sub>  
Lithium Iron Sulphide (LFS) – LiFeS  
Lithium Polymer (Li-Po)  
Lithium Nickel LiNiO<sub>2</sub>  
Lithium Titanate Oxide (LTO) - Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>  
Lithium Metal Polymer (LMP)  
Lithium Vanadium Phosphate (LVP) – Li<sub>3</sub>V<sub>2</sub>(PO<sub>4</sub>)<sub>3</sub>  
Lithium Sulphur  
Lithium Manganese Titanium (MNS)

***Other battery chemistries***

Zinc-Nickel  
Nickel Sodium  
Others  
Zinc-Air  
Lithium-Air (Li-Air)

***Major Advanced Battery Suppliers***

A123  
AESC  
Bolloré-Batscap  
BYD  
Evonik  
Hitachi EV  
Johnson Controls-Saft  
LG Chem  
GS Yuasa  
Panasonic EV Energy (PEVE)  
Sanyo  
SB Limotive  
Valence  
Others

## ***Ultra-Capacitors***

### ***Major Ultra-Capacitor Suppliers***

Maxwell

Others

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Conventional Vehicles

Micro Hybrids

Mild Hybrids

Full hybrids

Plug-in Range Hybrids

Extended Range Electric Vehicles (EREV)

Electric Vehicles (EV)

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BMW

Chrysler

Daimler

FHI

Fiat

Ford

General Motors

Honda

Hyundai

Mitsubishi

PSA Peugeot Citroen

Renault-Nissan

Toyota

Volkswagen Group

Other manufacturers

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A123

Advanced Battery Technologies

Altair Nanotechnologies

Asahi Kasei

Axion Power

Bolloré

BYD

Cobasys

Continental

EEStor

Electrovaya

Enax

Ener1

Energy Conversion Devices

Evonik  
Exide Technologies  
Fiamm  
GS Yuasa  
Hitachi  
JEOL  
Johnson Controls  
LG Chem  
Lithium Technology Corporation  
LS Corporation  
Maxwell Technologies  
MOLL  
NEC-Tokin  
NessCap  
Nichicon  
Nippon Chemi-Con  
Panasonic  
Saft  
Sanyo  
SK Energy  
TDK  
Valence

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