



# China Brief: New Energy Vehicles

## Special Series, Part 4 of 4

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**Special:** Welcome to Part 4, the final issue of a special four-part series from CS Shanghai's "China Brief: New Energy Vehicles." In this issue, our focus is the technological position of Chinese companies in the global EV market. We will also discuss related opportunities for US companies.

**Technology:** According to Roland Berger Strategy Consultants, China's goal to become the global leader in "e-mobility" technologies is realistic; Chinese companies have already acquired critical technologies through their own R&D efforts. Below is a brief comparison of China's development in various EV-related research fields compared to the rest of the world.

<b>Battery Management System</b>	
Global Development:	3/8
China Development:	1/8
China is in the initial stages of BMS development.	

*x/8 = current technological development level; 1/8 = least developed, 8/8 = fully developed*

<b>DC/DC Converter (DC-direct circuit)</b>	
Global Development:	5/8
China Development:	2/8
DCs and DC Converters are already mass produced in China, but have not yet been adapted to EV.	

<b>Conversion Adapters</b>	
Global Development:	3/8
China Development:	2/8
China imports the critical components of conversion adapters, they are not integrated to the whole system.	

<b>Permanent Magnet Synchronous Motor</b>	
Global Development:	5/8
China Development:	4/8
Chinese manufacturers have developed high quality permanent magnet synchronous motors. Because China has 80% of the world's available neodymium – a raw material needed for permanent magnets – it is sourced domestically and production costs are significantly less than non-Chinese competitors.	

<b>Asynchronous Motor</b>	
Global Development:	3/8
China Development:	1/8
China is in the initial stages of Asynchronous motor development.	



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<b>Lead-Acid Battery</b>	
Global Development:	7/8
China Development:	7/8
China already mass produces Lead Acid batteries, but environmental concerns have prevented this technology from being adapted to EV.	

<b>NIMH Battery</b>	
Global Development:	6/8
China Development:	6/8
Chinese manufacturers already have the capacity to mass produce NIMH batteries; however, the NIMH battery will eventually be replaced by the LI battery. NIMH has been applied to the HEV sector.	

<b>Lithium-ion Battery</b>	
Global Development:	4/8
China Development:	4/8
A majority of the raw materials needed for LI Battery production, such as lithium, are processed in China and are therefore available at low cost. In addition, cheap labor provides Chinese Lithium-ion battery manufacturers with a cost advantage of about 30%. Because this market is becoming a volume market, economies of scale and scope are critical. China already has considerable production capacity for Lithium-ion batteries and is investing heavily in capacity expansion as well as R&D for new battery technologies.	

### Opportunities: *Electric Power Trains*

Electric and hybrid-electric vehicles use drive trains that are significantly different than traditional gasoline or diesel powered cars and trucks. As a result, companies must completely redesign their engineering and manufacturing processes for EVs.

Battery design and production will be core skills that will differentiate a vehicle.

Chinese auto manufacturers currently do not possess the electronics and software capabilities to efficiently manage battery power.

Partnerships with or acquisitions of innovative start-up firms may be a good strategy for foreign firms to enter the China EV market.

### *Batteries*

The most successful battery manufacturers will be the ones who move to systems-level capabilities designed to support specific vehicles. These systems will use electronics and software to offer power and thermal management capabilities that optimize the battery's performance for a specific vehicle.



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This will require a more complex engineering and production capability than currently exists in China.

Engineers estimate that the cost of a battery for a plug-in electric car that gets 40 miles per charge is \$11,800. The cost increases to \$24,000 for a car that gets 100 miles per charge. If the world were to see 6 million electric vehicles sold per year, the battery market could be greater than \$70 billion annually. Over the next ten years, some analysts expect a 6-10% drop in the price of an equivalent battery.

Warranty issues may be a challenge for battery manufacturers. Replacing an entire battery system and possibly the vehicle will require new approaches as well as very strong balance sheets.

Batteries have a life that grows shorter with each use; eventually, batteries must be replaced. This creates a new aftermarket opportunity for batteries. It also creates a disposal problem. Currently, there are no known efforts to address this problem.

### *Utility Companies*

Electric vehicles will create new opportunities in the electric utility industry. We are monitoring efforts by some venture capital groups working with utility companies to develop a "leasing model" for batteries. Instead of waiting 3-8 hours to recharge an EV, the consumer would just need 5-10 minutes to exchange their spent battery at a drop-off station.

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