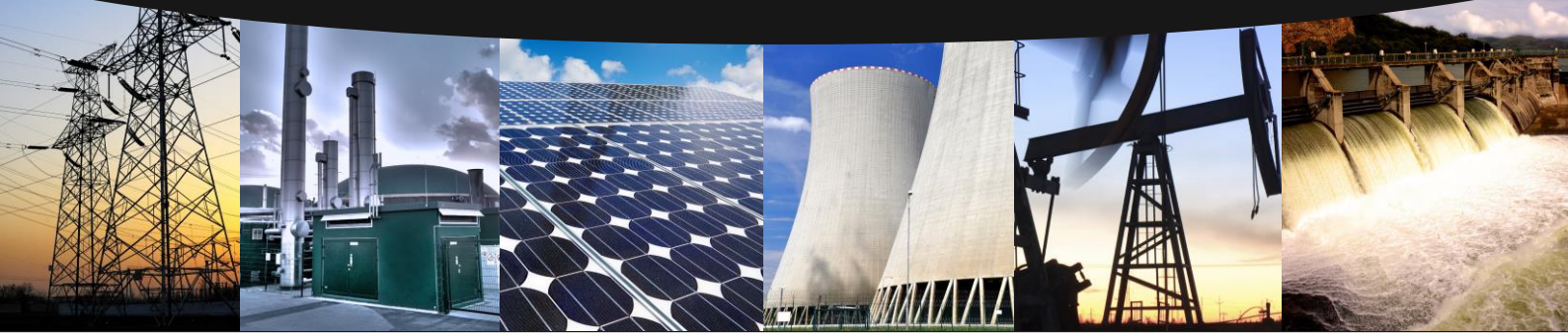




**NRGExpert**  
Energy Intelligence

Analyst Briefing



This Analyst Briefing was prepared by NRG Expert

We hope you find it both interesting and informative and we would welcome your feedback.

If you would like any further information or would like to be included in our mailing list, please contact:

Edgar van der Meer

+44 (0)20 8432 3059

edgarv@nrgexpert.com

## NRG Expert Analyst Briefing

02 May 2013: Electric Vehicles

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## Share Price Data – Selected Companies

Company	Currency	Price 17/04/13	Price 14/05/13	% Change	Market Cap 15/05/13 Billion US\$
Tesla Motors	USD	45.45	83.24	+83.15	9.80
Nissan	JPY	1024.00	1098.00	+0.07	46.90
GM	USD	29.27	31.55	+0.07	44.23
Mitsubishi	JPY	102.1	122.0	+19.49	11.6

Source: Google Finance

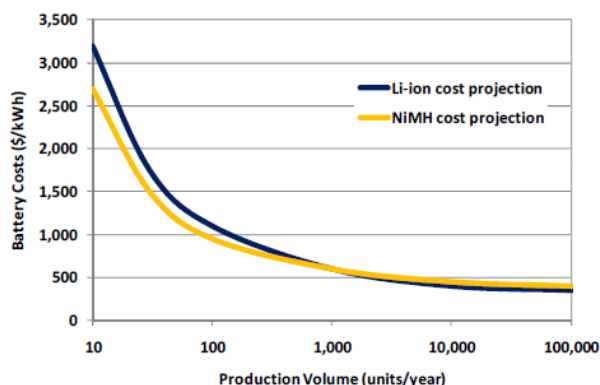
## Industry and Company News

- Tesla Motors has reported its first profit of over USD 11.2 million, well above its own expectations.<sup>1</sup>
- Nissan and Car Charging Group Inc. have partnered to develop quick charger infrastructure.<sup>2</sup>
- The goal is to find the best locations to begin deploying quick-charger stations.
- March was the strongest month yet for sales of the Nissan LEAF<sup>3</sup>, with 25,000 models now sold.

## The Future of Battery Prices

The cost of electric vehicle batteries has been a considerable hurdle in the adoption of this technology. However, as EVs become more prevalent the cost per kWh will continue to decline:

Figure 1 Battery Cost Decline vs Production



Source: NRG Expert Energy Storage Report

<sup>1</sup> From: <http://www.nbcnews.com/business/electric-car-maker-tesla-defies-skeptics-1C9893924>  
Retrieved May 15, 2013

<sup>2</sup> From: <http://www.hybridcars.com/nissan-car-charging-expanding-ev-quick-charger-network-educating-consumers/> Retrieved May 15, 2013

<sup>3</sup> From <http://www.electric-vehiclenews.com/2013/05/nissan-leaf-crosses-25000-us-sales.html>  
Retrieved May 15, 2013



The extent of price decline will depend on technological developments and the availability of materials for cathodes. For example:

- The decline in costs for the nickel metal hydride batteries may be affected by rising nickel prices.
- The recent discovery of a huge lithium deposit in Wyoming (estimated at up to 18 million tons or equivalent to 720 years of current global production)<sup>4</sup> could affect the economics of lithium-ion battery production (lithium-ion batteries being one of the most popular electric vehicle technologies).

The demographics of a particular country can also affect the battery production industry within its borders:

- While vehicle ownership in China is relatively low at present, it is expected to expand rapidly as the nation's burgeoning middle class continues to grow. The country's large lithium reserves and relatively limited oil and gas reserves suggest that it could be battery-powered electric vehicles that will fill the gap.

## EVs as Renewable Energy Storage

There has been some discussion of using electric vehicles to capture and store renewable energy. While onboard batteries could accomplish this, grid constraints would have to be observed. Additional peak load could be created if, for instance, large groups of people all began charging their vehicles at once (i.e. at the end of the working day). Solutions might include:

- Public awareness programs so that vehicles are charged when renewable output is highest (taking into account seasonal changes).
- Smart chargers that automatically stagger charging time to avoid overburdening the grid.

Ideal Power Converters<sup>5</sup> and Better Place<sup>6</sup> have both recently announced technologies that could accomplish this.

## Infrastructure Developments

Establishing sufficient charging infrastructure for electric vehicles may also present a challenge. While a charging station is cheaper and simpler to install than a petrol station, location and safety concerns may complicate matters – i.e. not all consumers have a garage in which to house a charging station or currently live close enough to existing infrastructure. Some companies have begun initiatives to address this, including:

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<sup>4</sup> From: <http://www.mining.com/web/america-finds-massive-source-of-lithium-in-wyoming/> retrieved May 14, 2013

<sup>5</sup> From: <http://finance.yahoo.com/news/ideal-power-converters-national-renewable-130500032.html> Retrieved May 14, 2013

<sup>6</sup> From: <http://www.betterplace.com/How-it-Works/smart-energy-management/2> Retrieved May 14, 2013



- General Motors
  - Has announced plans to install charging stations at all dealerships that sell the Chevy Volt.
- ECOtality.
  - In a project valued at USD230 million and backed by the US government, Nissan and Chevrolet, ECOtality is studying the use patterns and infrastructure requirements of the emerging EV market.
- Coulomb Technologies.
  - Their ChargePoint America project, valued at USD 37 million, aims to jump start the electric vehicle market in the United States by installing charging infrastructure in 9 selected US regions.

## Additional Opportunities

As the electric vehicle sector continues to expand, commentators are seeing growth in other sectors apart from just electric cars and charging infrastructure. Novel areas of growth are emerging including:

- Small batteries for e-bikes and micro-hybrid vehicles in China.
  - Annual production of e-bikes in China tops USD 17 million.
  - Battery technology is primarily lithium-ion due to rich lithium reserves and a recent end to lead-acid battery manufacturing on environmental grounds.
- Retired EV batteries repurposed for energy storage.
  - General Motors and Nissan (amongst others) have begun looking into what to do with still-useful lithium-ion batteries after they been retired from service in an electric vehicle.
  - After approximately 10 years of driving the batteries will have lost approximate 20%-30% of their capacity, meaning they would not be suitable for an electric vehicle but would still be suitable as a storage bank for backup power or to store off-peak renewable energy.