



# Developing Electric Vehicles in China: New technologies, Corporate Strategies, Public Policies

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# Agenda

1. The role of government and public policies
2. A value-chain perspective of electric vehicles in China
3. Strategies of key Chinese carmakers
4. Conclusion






# 1.1 Clean vehicle as a nation's strategy

1. Increasing air pollution
  2. Increasing dependence on imported oil
  3. Gaining the nation's new competitiveness
- 



## **1.2 The evolution of automobile industry policies**

- 1. Industrial Policy of 1994**
  - 2. Industrial Policy of 2004**
  - 3. Special measures during the 2009 financial crisis**
  - 4. Automobile and new energy automobile industrial planning (2011-2020)**
- 





# 1.3 Technology roadmaps and standard

## By technology

**Before 2015:**  
co-development of  
hybrid, EV, fuel cell.

**After 2015:**  
progressively shift to EV.

**Objective:**  
1M EV in 2015, 10 M in 2020.

## By vehicle type

**Short term:**  
Medium and heavy  
duty buses  
+  
Small EV

**Long term:**  
Next generation EV.

Source: OUYANG Mingguo, 2010, The 10 year roadmap of China EV industry, EVS25, Nov. 5th 2010, Shenzhen, China.



# 1.4 Stimulation of consumption


## 1. Government vehicle purchase system

- Global size: 2 million units/year
- Defined objective for EVs

## 2. Experimental cities


- “10 cities, 1000 vehicle” project
- Extension on the N° of cities

## 3. Carmakers (and eventually Consumers)

- Subvention of 6000 euros/car for pure EV
  - Subvention of 5000 euros/car for hybrid EV.
  - 300 euros/car for vehicles below 1.6L.
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## 1.5 Achievement by 2010

1. China becomes the biggest lab of new energy vehicles.
  2. In 2009: subsidies of 1 billion euros on the new energy public transportation system, entails industrial investment of 8.5 billion euros.
  3. In 2010: new energy vehicles 150,000 units (estimation).
  4. Established 36 technology standards, within which 13 standards are based on the international standards.
  5. Capacity of testing on battery, motor, car, and equipments.
  6. The biggest new energy vehicle component industry.
  7. Forecast in 2011-2020: 10 billion euros investment by central government. Cumulated N<sup>o</sup> of new energy vehicles by 2020: 5 million.
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# 2.1 Battery technology in China

## 1. Two battery technologies

### Ni-MH:

- + Mature technology
- + the value chain of Ni-MH battery is complete in China
- + two times cheaper than the lithium-ion battery
- + Most of Chinese companies are producing Ni-MH batteries
- Less performing technical feature

### Lithium-ion

- + Better performing technical feature
- Expensive
- Employing different technology, but covering Lithium iron phosphate (LFP) and Lithium-nickel-manganese-cobalt (NMC) technologies
- Chinese companies are still in the early stage of volume production.
- + BYD is one of the leaders. Formed strategic alliance with Volkswagen and Daimler.



**Lead acid battery for low speed EV as the third type.**

# 2.1 Battery technology in China

## 2. China's advantage in the battery production

### Raw materials

- The advantage in the rare earth metals (REEs) -> NiMH batteries -> Hybrid cars, including Prius and Lexus of Toyota, Civic and Insight of Honda, Fusion of Ford
- The world monopoly in terms of rare earth production, and exportation
- China's industrial output of rare earth ore accounted 96.8% of the world production in 2008
  
- China is also the very important producer of lithium carbonate -> lithium-ion battery -> electric vehicle
- The global ranking of salt lake brine lithium reserves and lithium ore reserves of China is the 3rd and 4th respectively.
- China is the third largest country to produce lithium carbonate.

### Industrial base of battery production

- China is among the top three countries for the production of various types of batteries, together with Japan and Korea.



**The quality consistency of battery is the biggest handicap.**



## 2.2 Electric vehicles in China

### 1. Current situation

- 100+ Chinese carmakers have announced their planning of electric vehicles.
- All the top ten auto groups have announced EV projects.
- Small carmakers, component suppliers are rushing into this segment.
- Some SMEs outside the automobile industry are also exhibiting their ambition and dynamics to reach the technological and business model breakthrough.

### 2. How to produce electric vehicles

- Vertical integration of battery and electric car production – BYD
- The cooperation between local battery suppliers and carmakers – FAW, DFM, Chang'an
- The cooperation with foreign suppliers – SAIC with A123 Systems Inc (USA), Geely with two Danish companies.
- The beginning of assembling project by foreign companies – Nissan Leaf



**Most of carmakers at the stage of technology transfer**





## 2.3 Charging station in China

### 1. Strong motivation of power grid groups

- Duopolists of China's energy industry: State Grid Corporation of China (SGCC), and China Southern Power Grid (CSG)
- SGCC: announced to establish 75 charging stations and 6209 charging columns, and some battery replacement stations in 27 provinces and regions
- CSG: has established 2 charging stations with 134 charging columns in 2009

### 2. Participation of petrochemical giants

- Duopolists of China's charging station biz: SinoPec and CNPC, no clear commitment. (28,000 and 19,000 stations respectively).
- The monopolist in the offshore oil and gas production in China: CNOOC is aggressive to step in to the EV business. (only 187 charging stations by 2008)



**No clear sign on the winner**

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# 3.1 Extensive test on prototypes: SAIC

Way of cooperation	Time	Key activity
Joint R&D research	3rd Nov. 2010	<b>Strategic cooperation memoremndum with GM: cooperation on</b> <ol style="list-style-type: none"> <li>1. Basic technology of new energy cars</li> <li>2. New generation car model.</li> <li>3. Share the experience of industrialisation and commercialisation</li> </ol>
Joint Venture	17th Dec. 2009	<b>A Equity JV of 51:49 between SAIC and A123 (USA)</b> Joint R&D, produce, and sales on battery system, technology, and after sales service
Testing of products via World Expo	May to Oct. 2010	<b>1125 vehicles (passenger car, bus, taxi, mini tourist car) from SAIC, including: hybrid, pure EV, fuel cell, super capacitor.</b>  <b>Test in 168 days,</b>  <b>Cumulated passenger: 11.758 million</b>  <b>Cruising distance: 6.63million KM.</b>  <b>Valuable operating data on various road condition: over loading, excessive time, extreme weather (hot, thunder, storms).</b>



**Not putting eggs in the same basket**





## 3.2 Trial on different business models

Company	Pure EV	Time to market	Price (euros)	Business model
BYD	E6	May 2010	17.98 K	Taxi ( 50-100units)
Cherry	QQ3	March 2010	Rent. 9/day Sale : 4.98K	Rent oriented.
Zotye	5008 EV	July 2010 Jan 2010 Future	10.8K 250/Mo nth N.A.	Car purchase Rent (100units) Sell the car, lease the battery



**In the beginning of trial, no volume production yet.**

## 3.3 Specific local dynamics - Low speed EVs

### Low-speed electric cars – a niche market?

- Mainly in the rural area of China
- Product feature: two to four seats compact vehicle, powered by lead-acid battery, charging by 220 home electric outlet, a highest speed of 60 km/h, price range between 20,000-40,000 Yuan (2,000-4,000 Euros)
- Industrial player: more than 100 local companies, annual production and sales of more than 300,000 units and 100,000 units respectively.
- Targeted market: low income consumers in rural area.



**A commercial viable solution in China?  
One type of leapfrogging in China?**





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## 4.1 China's aggressive expansion

- 1. Chinese automobile industry – a history of leapfrogging in 30 years**
    - By 2010, 16+ million units of vehicles, Number 1 in terms of production and sales of automobiles
  - 2. Chinese carmakers are emerging.**
    - In 2009, passenger cars with Chinese brands took 31% market share
  - 3. The electric vehicle industry is in the early stage of take off in China.**
    - China has the foundation to build an integrated value chain of electric vehicle
- 

## 4.2 Specific local dynamics

### 5. Enormous challenges for the future industrialization of electric vehicles

- Still weak at the basic R&D. Low number of patents.
- Key components are still under the control by foreign companies.
- Companies are apt for competition than coordination.
- Standards have not yet been established.
- Central and regional governments have demonstrated strong motivation to stimulate the growth of this industry, but the coordination among different ministries, and between central and regional governments are also vital. The governments need improve its efficiency of governance.



## 4.3 Inspiration from China

- Do not forget different motivations of developing electric vehicles (in western countries, and in China)
- China: not one unified market. Dual structure of Economy
- User oriented vs. Technology oriented approach of EV development
- Urban solution (mission possible) vs. total transportation solution (mission very difficult)
- One possible and viable trajectory:  
Car -> urban usage EV car -> urban usage smart EV car.  
A question of car, or shifting lifestyle and social networking?







Thanks

Q & A

