

# The technological trajectories and policy influences in the development of EV in China

Sponsored by the CNSF (National Natural Science Foundation of China), project number: 71202012

SHEN Qunhong(Corresponding Author) and FENG Kaidong (PKU)



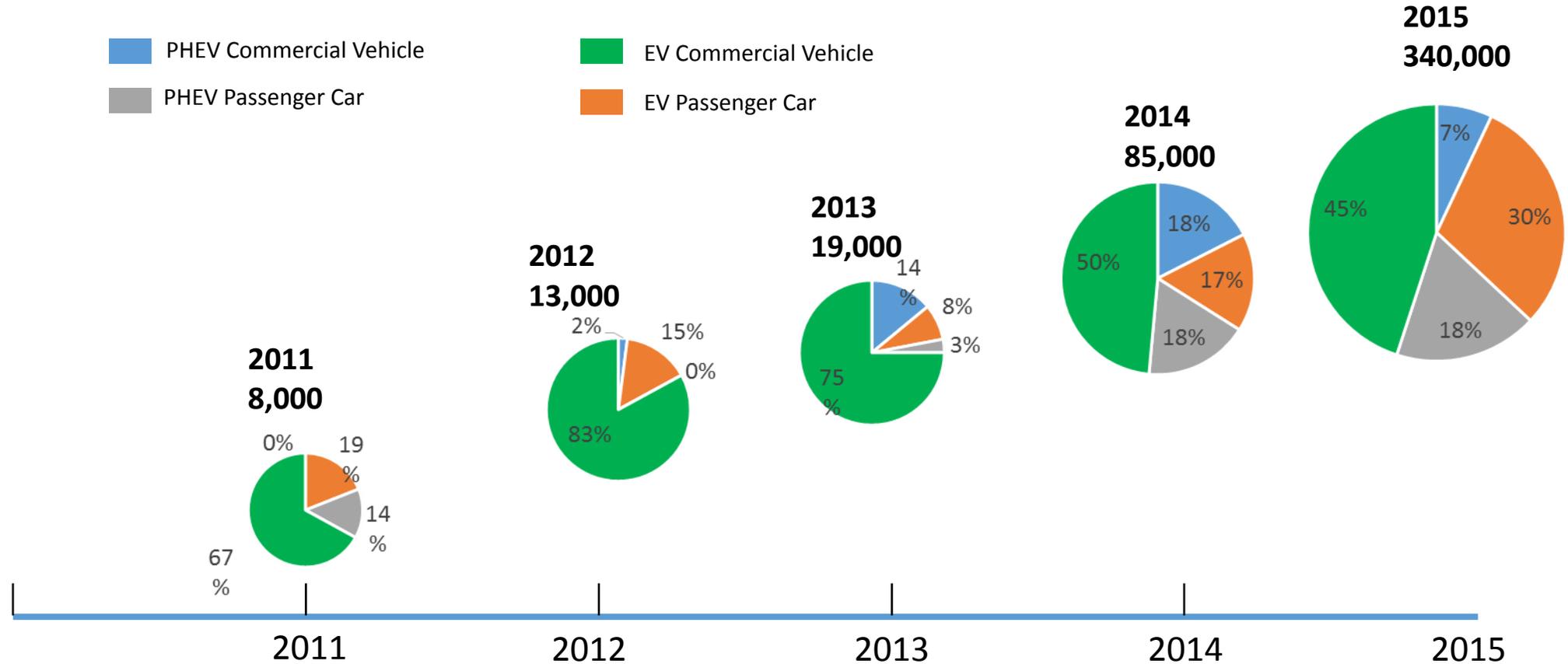
**1st IRENA Innovation Week  
Bonn, 2016**

# I. The Technological Trajectories of EV in China

- Stage 1(Before 2012):
  - Low speed with lead-acid battery
  - Hybrid EV – with Li-battery to reach high performance
    - Mostly failed
    - Except BYD (F3DM,dual-mode EV)
- Stage 2(From 2012 to present):
  - Pure EV with medium-level technological capacities to achieve relatively high performance ( range > 80, speed > 80 )
  - Extended-range EV, with medium-level battery capacity, equipped with small fuel engine
  - **Plug-in hybrid EV with medium-level technologies to reach high performance, comfort and relative luxury**
  - Low speed pure EV for informal market **supported by regional government** {had not been regarded as new energy vehicles(NEV)}

# Production of EV and PHEV in China from 2011 to 2015

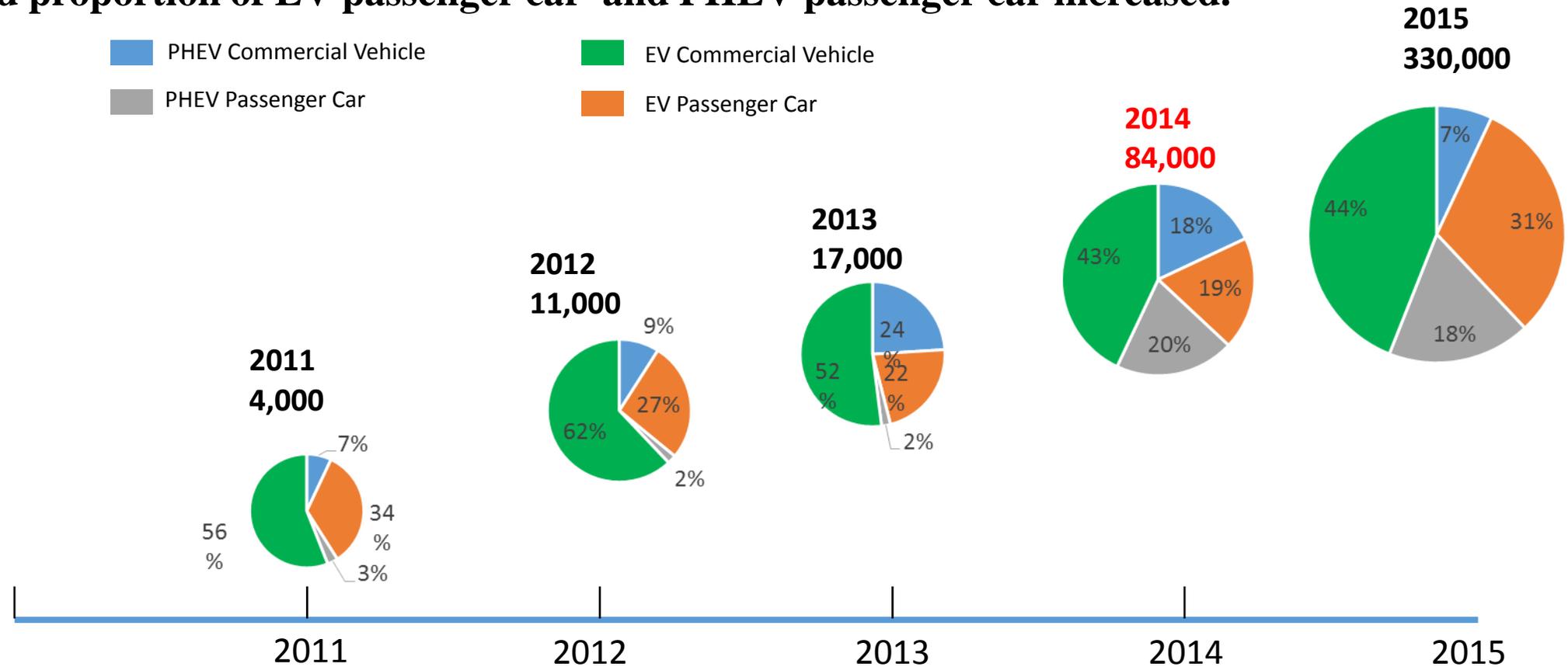
Production of new energy vehicles increased year by year.



Note: Data comes from China Vehicle Technology Service Center.

# Sales of EV and PHEV in China from 2011 to 2015

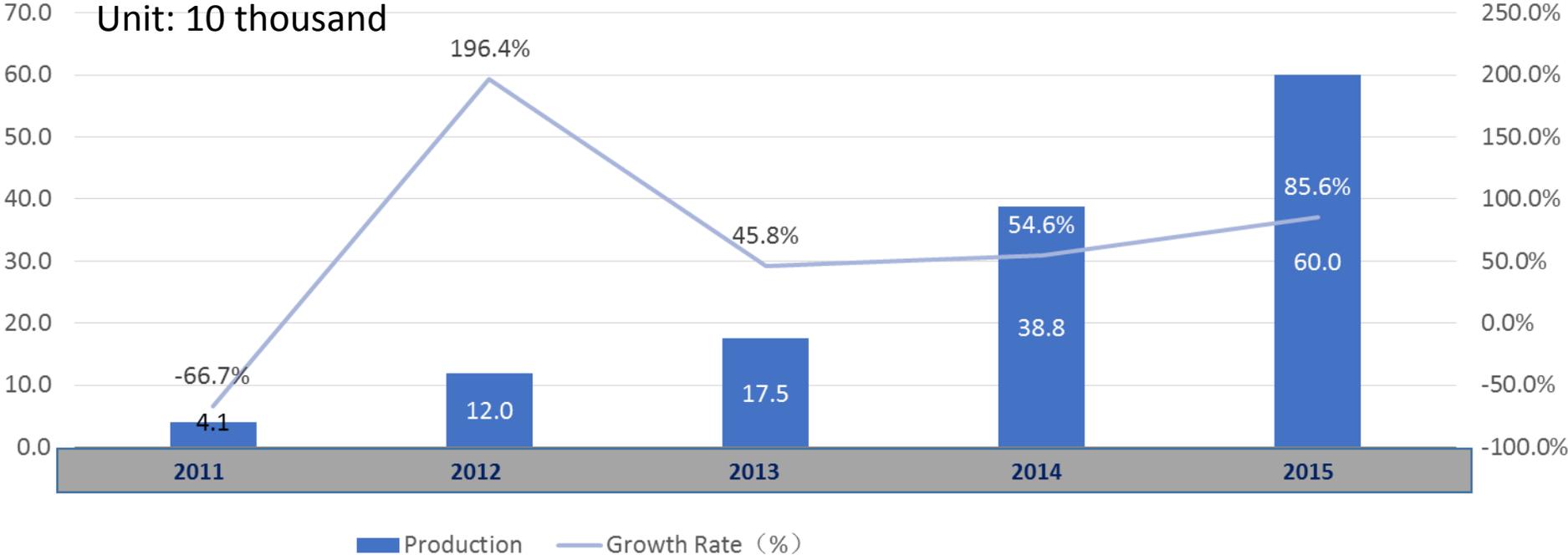
Sales of new energy vehicles increased year by year, the proportion of commercial EV decreased, and proportion of EV passenger car and PHEV passenger car increased.



Note: Data comes from MIIT of China.

# Low speed EV is the real dominant product in informal market

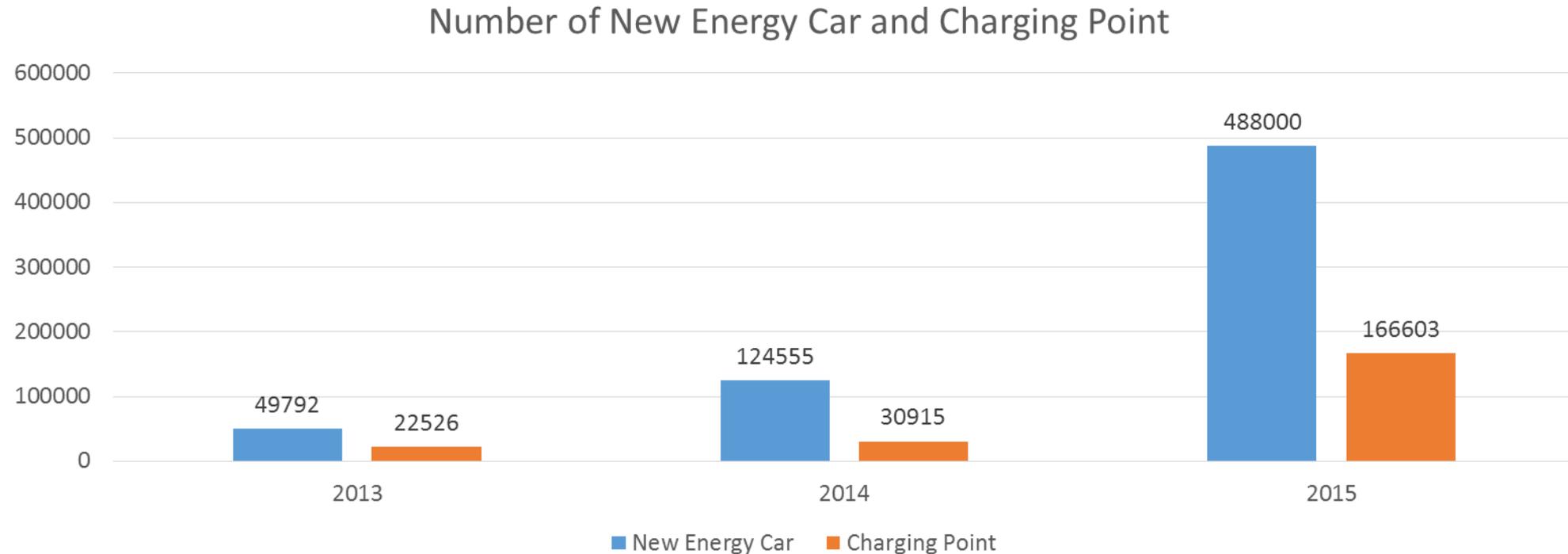
Production of LSEV of Shandong Province in China grow rapidly , has exceeded the growth rate of electric vehicles.



Note: Data comes from Beijing Business Today.

# Charging Point in China from 2011 to 2015

**Compared with the(NEV) new energy vehicles, construction of charging infrastructure is seriously lagging behind.**

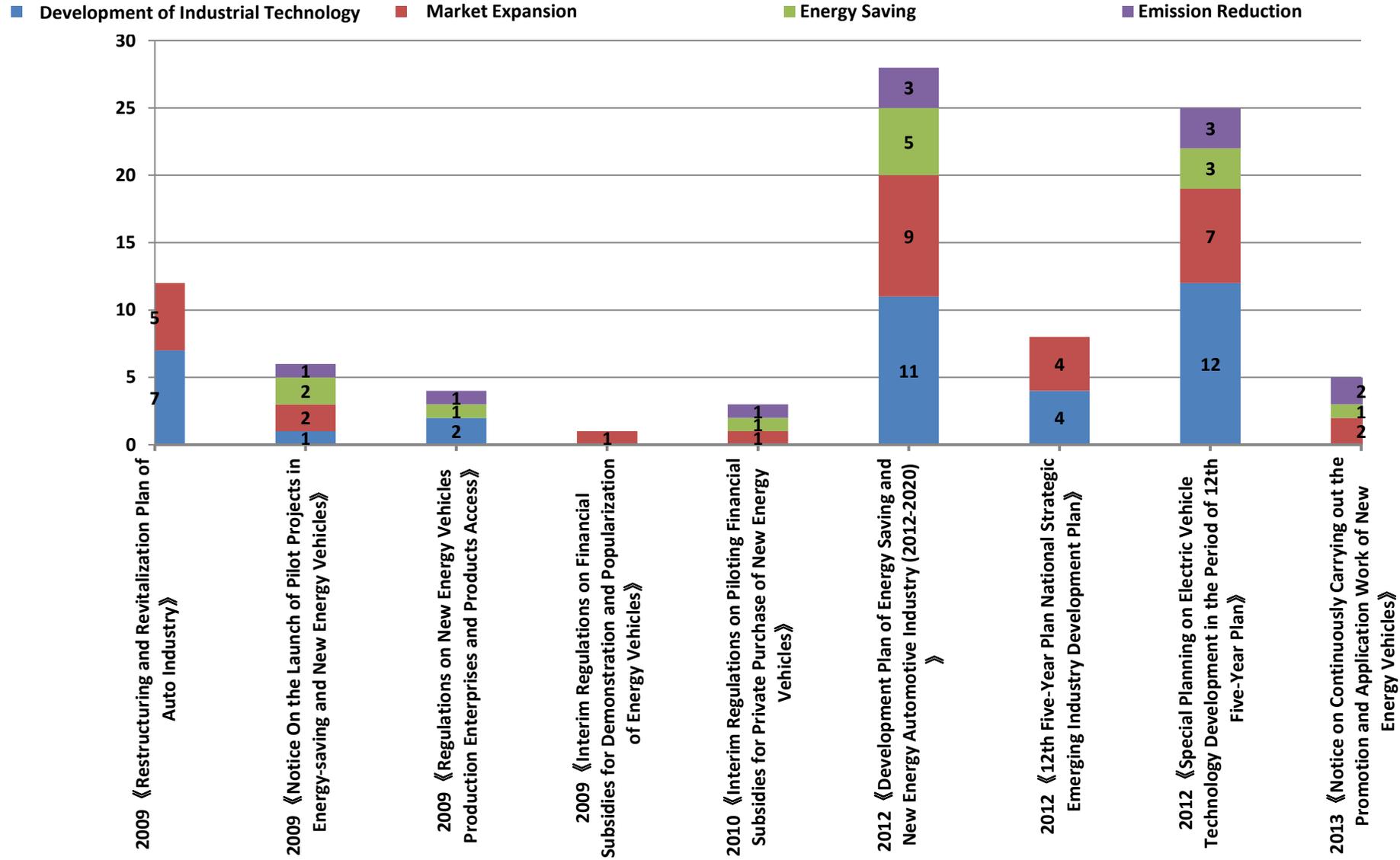


Note: Data comes from China Association of Automobile Manufactures.

# **II. The change of policy priorities and the influence**

- **Central government and its influence**
  - **Before 2014: Policy packages driven by economic concerns**
  - **2014- present : The new changes**
- **Local governments and their influence**

# The economic-friendly EV policy (till 2014)



# The new change and tendency of policy priorities

Since 2014

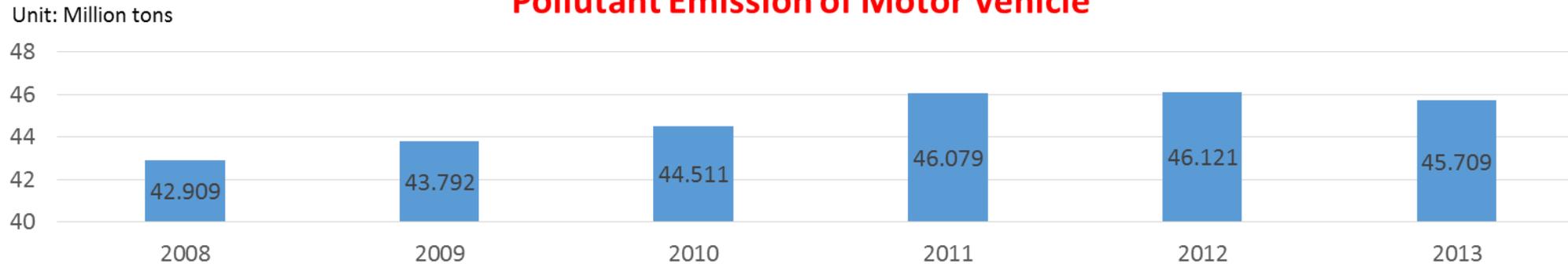
- Higher preference for environment-friendly policy packages
  - **Focus on air-pollution control**
- Also encouraging low-speed PEV with relatively low technological capacities
  - **More deregulation and open to newcomers**
- More integrated policy packages, stressing integration of the recharging infrastructure, smart grid and power storage system

# -Exhaust Pollution of Automobiles Caused Serious Social Problems in China

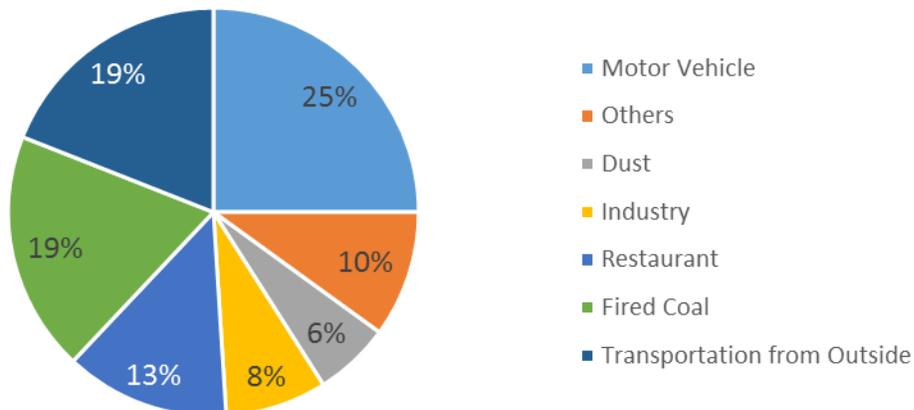
Automotive is a major contributor to the total amount of pollutants, according to Ministry of Environmental Protection report, which shows that, **the national motor vehicle emissions of pollutants in 2013 reaches 45.709 million tons**

It is analyzed that pollution caused by motor vehicles accounted for 25% PM2.5 in Beijing and Shanghai.

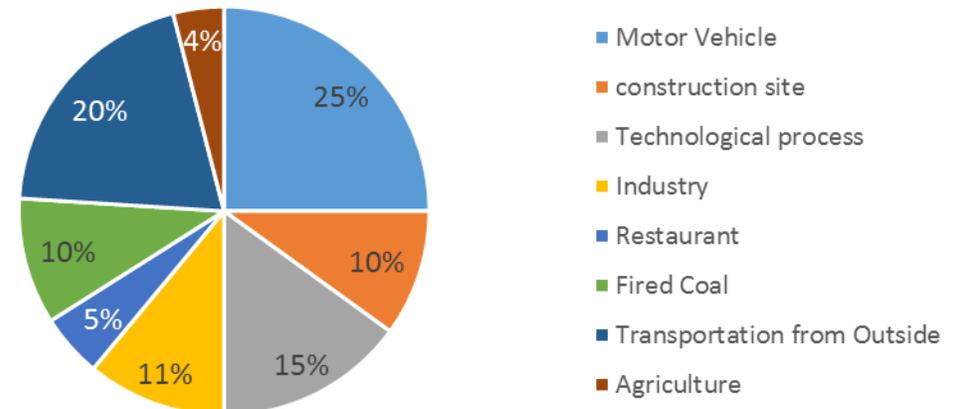
## Pollutant Emission of Motor Vehicle



Source Analysis of PM2.5 in **Beijing**



Source Analysis of PM2.5 in **Shanghai**



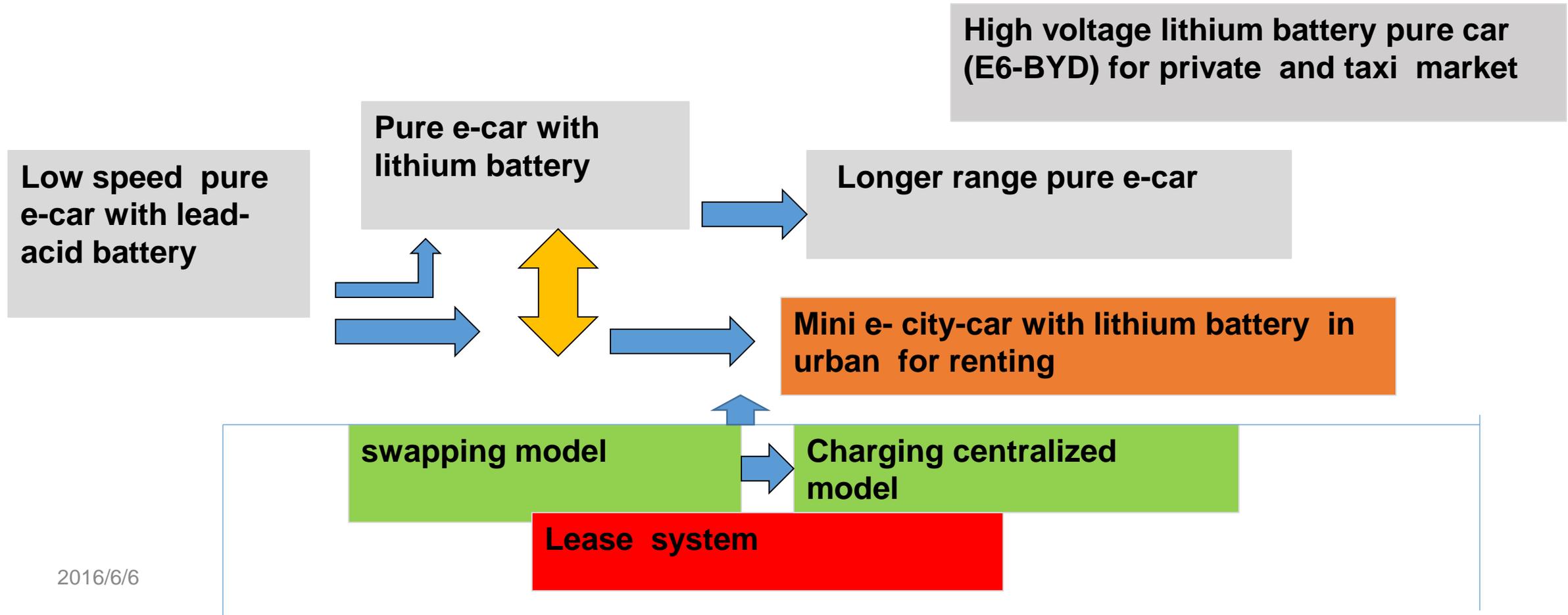
Note: Data comes from MEP of China.

# Regulation change: the permission of the newly built pure electric passenger cars

- *On Jun. 2, 2015*, the National Development and Reform Commission, the Ministry of Industry and Information Technology released *Provisions on the Administration of Newly Built Pure Electric Passenger Cars*
- Being limited to produce pure electric passenger vehicles
- Total investment and production scale is not subject to the minimum requirements of *the Development of the Automotive Industry Policy*, but must be under supervision of the authorities
- Focus on process regulation, relatively open to newcomers

# Case: the regional government choices and influences

- Fast newcomer without any obvious advantages in ICE sector
- Better performance in private e-car sector than other cities



# The time-share lease model(mini-e-bus system) in Hangzhou



# The experiences of other 5 cities

cities	private market	characteristics of city policy
Beijing	<ul style="list-style-type: none"> <li>•2010 in rural regions</li> <li>•Slow in urban areas since 2008</li> </ul>	<ul style="list-style-type: none"> <li>•Local Protectionism ,with strong motivation to protect local producers</li> <li>•air pollution control pressure is very high</li> </ul>
Hangzhou	<ul style="list-style-type: none"> <li>•Very good</li> <li>•Diversified in technological choices and business models</li> </ul>	<ul style="list-style-type: none"> <li>•Ambitious and clear objectives</li> <li>•More systematic approaches</li> <li>•More practical thinking on EV</li> <li>•More open domestically and internationally</li> </ul>
Hefei	<ul style="list-style-type: none"> <li>•Good</li> <li>•Very dependant on local technological supply networks</li> </ul>	<ul style="list-style-type: none"> <li>•More government driving</li> <li>•Consistent and ambitious industrial development</li> <li>•More closed to local OEM and battery suppliers</li> </ul>
Shanghai	<ul style="list-style-type: none"> <li>•Relatively slow before 2013</li> <li>•Increased significantly recently</li> </ul>	<ul style="list-style-type: none"> <li>•Open to the outside counters</li> <li>•Keep balance between demonstration and local economic development</li> </ul>
Shenzhen	<ul style="list-style-type: none"> <li>•Very good</li> <li>•Leading both in the EV and battery</li> </ul>	<ul style="list-style-type: none"> <li>• good performance both in air-pollution control &amp; renewable power strategies and New energy automobile industry clustering and</li> </ul>

# The emerging of newcomers in EV sector

- Internet operators
- Cell-phones producers
- Logistic operators
  - **All have strong power in the internet world and have enough market influences**

# III. Possible technological choices in the future

- PEV +PHEV+ERPEV:
  - PHEV(Plug-in EV)&ERPEV(extended range PEV)\_\_urbans & metroplis ;
  - LSPEV\_\_small cities & towns
- Increasing the battery density/capacity
- Improving the battery safety
  - **Safety will have priority over performance & capacity**
  - Systematically improving safety , consistencies and reliabilities
- Lightweight and digital-smart car
  - Clean, efficient, compact and lightweight engine
  - More user-oriented design and production
  - Reengineering with lightweight , especially for the newcomers, private OEMs

- **More integrated system among electric vehicles, smart grid, car network and smart transportation**

- **Energy storage terminals**

- **To be connected with energy grid and internet to develop smart transportation**

- **More integrated system**

- **Smart transportation**

- **Decentralized smart grid**



**Smart city -IOT**

- **New business models, such as time-shared lease, and financial models will be more deeply influenced on the technological choices**

# Thanks for your attention!

**Qunhong Shen, Associate Professor of SPPM, Tsinghua University**  
**shenqh@mail.tsinghua.edu.cn**

**Kaidong Feng, Associate Professor of School of Government, Peking University**  
**fengkaidong@pku.edu.cn**



# Related ministries:

- **NDRC**: National development and reform commission
- Ministry of S&T
- Ministry of Finance
- State Administration of Taxation
- **SASAC**
- MOEP
- MOFCOM

## 2.2 Inter-government Interaction for Institutional Complexity

In terms of policy formation and execution, the Chinese governmental system is divided into different “tiao” and “kuai”, i.e. departments and regions.

