U.S.–China Clean Energy Research Center
中美清洁能源研究中心

清洁汽车联盟
Clean Vehicles Consortium

EVs in China: Technology pathway, Market progress & Incentive policy

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Outline of Chinese NEV Milestones

Electric Vehicle is China Auto industry from Big to Advance pathway.

President XI Jinping
June,2014

2000-2006
10th & 11th Development Plan(Tech.)

2009
NEV largely Demo & Deploy Project

2010
The 12th Development Plan(Tech.)

2012
•NEV industry Development Plan
•Strategic Emerging Industries

2013
NEV largely Demo & Deploy Project（II）

2014

Int'l collaboration

28 Jan.
NEVs Deploy & Application (II notice)（NDRC etc）

05 May Idea tank

09 July.
NEVs Tax Free Policy (incl. imported) (State Council)

13 July
Official & Public NEVs replacement blue print (>30%) (State Council)

21 July
Guideline for Accelerating NEVs Application (infrastructure) (State Council)

30 July
NEVs charging price notice（NDRC ）

Content

Technology pathway (dedicated on PEV)

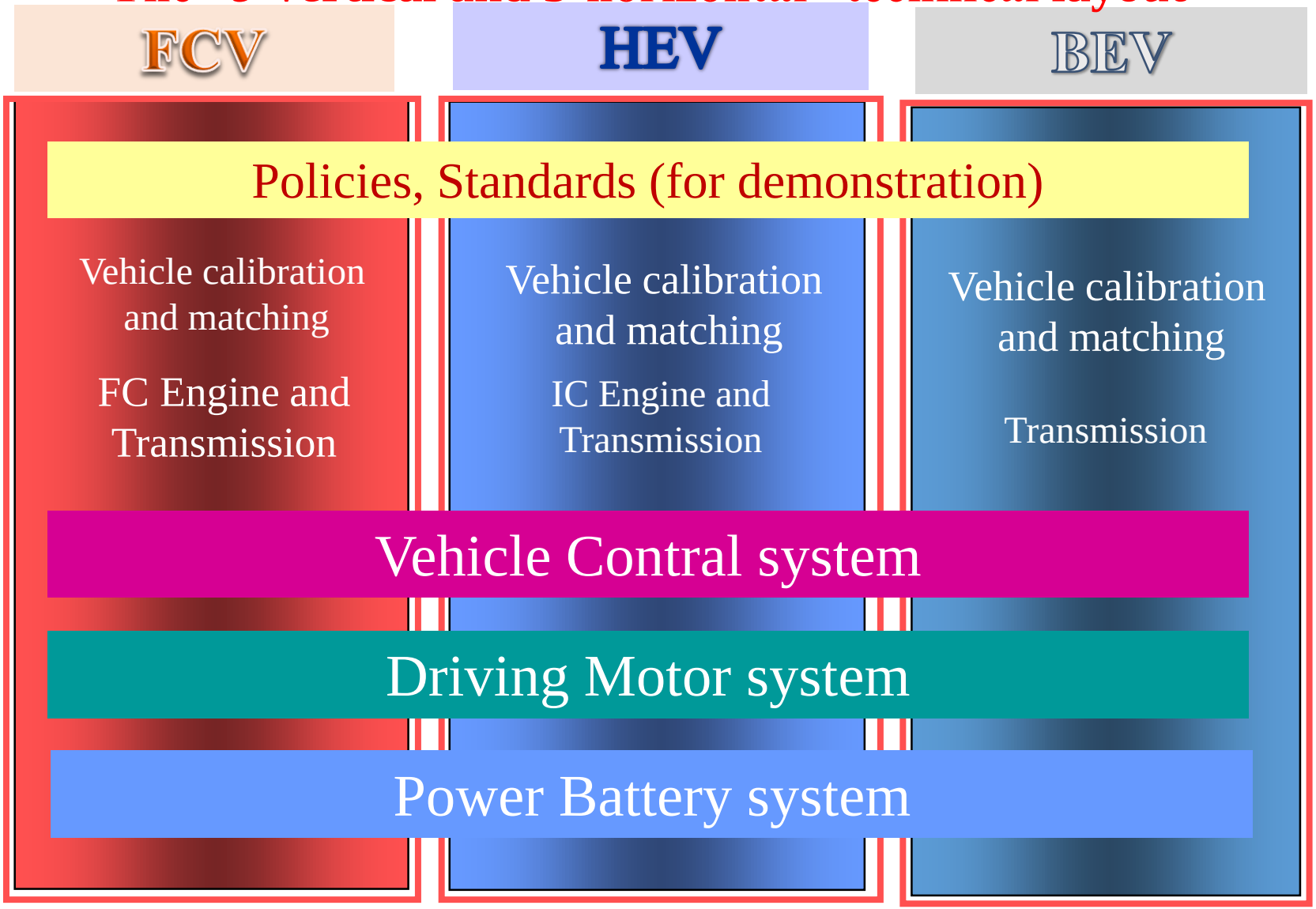
Market progress (focus on public fleets)

Incentive policy (Vehicle & infrastructure)

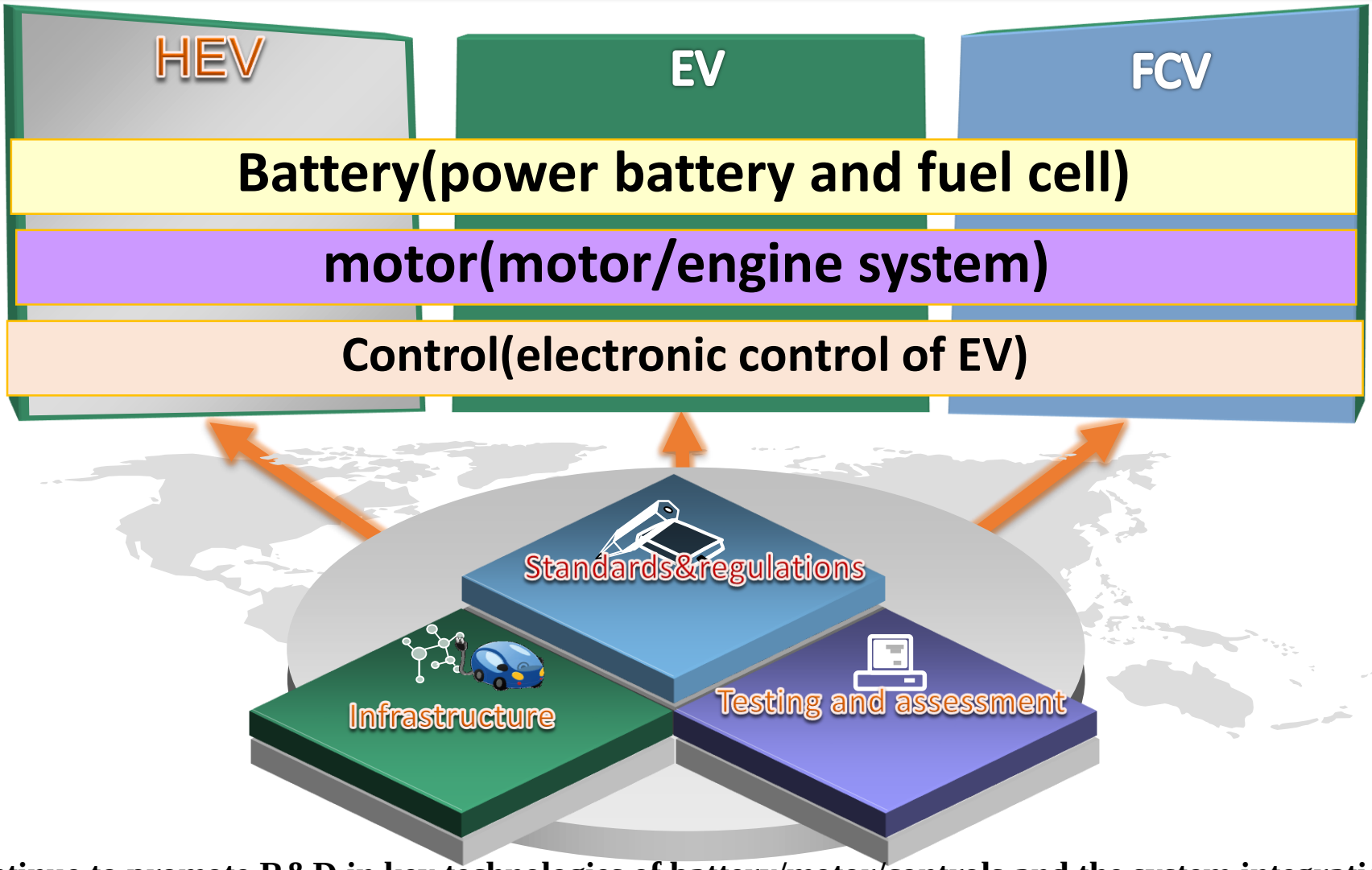
CERC-CVC Next step (China side project)

Chinese EV Technology R&D during the 10th-11th 5-year plans(2000-2010)

The "3-vertical and 3-horizontal" technical layout



Layout of 12th 5-year plan on electric vehicle



Continue to promote R&D in key technologies of battery/motor/controls and the system integration technologies of HEV/EV/FCEV, especially the next generation of powertrain electrification technology.

12nd 5-year plan on electric driving technology transition

large City Bus
EV/PHEV

Energy-saving vehicles

HEV

Passenger car
EV/PHEV

Small Micro EV
(short range)

Content

Technology pathway (dedicated on PEV)

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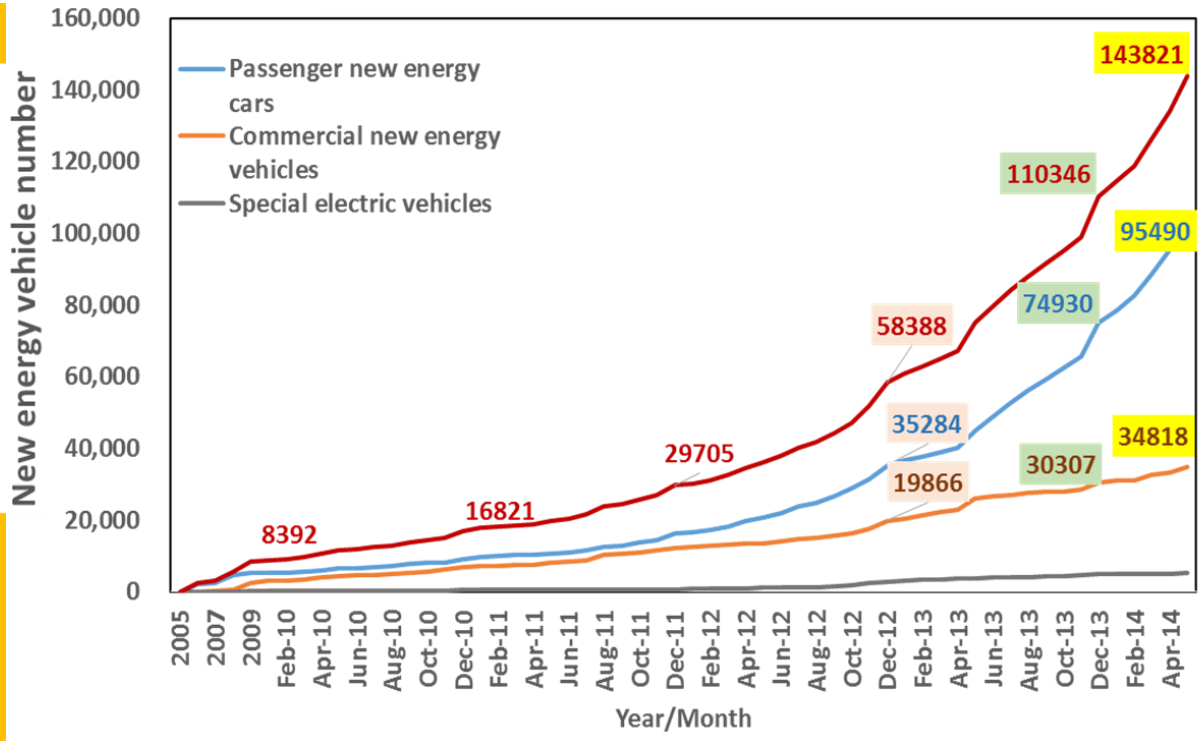
NEV Fleet in the stock

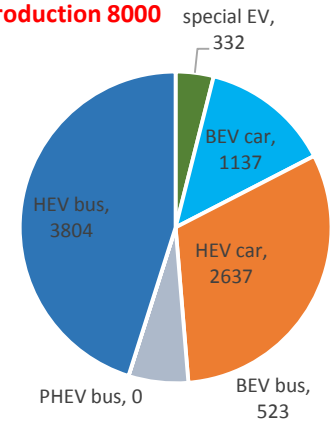
- From 2009 to 2013, the NEV fleet doubled per year, more than 110thousand in the end of last year.
- In this year, the monthly production was about 8000,
- The total in-stock number was 140 thousand in the end of May 2104.
- The passenger car increased faster than commercial vehicles, with percent more than 70%



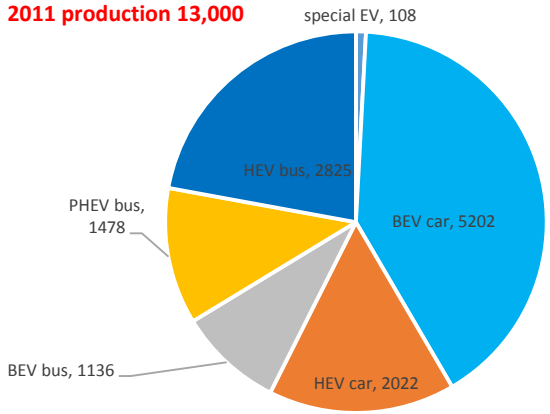
- The estimated production was 90,000 to 120,000 this year and about 200,000 in 2015.
- The New demands of NEV deployment in 100 demonstration cities was 330,000 in 2014-15.
- The target of 500,000 NEV in stock (in 2015) was achievable.

EV annual production by type

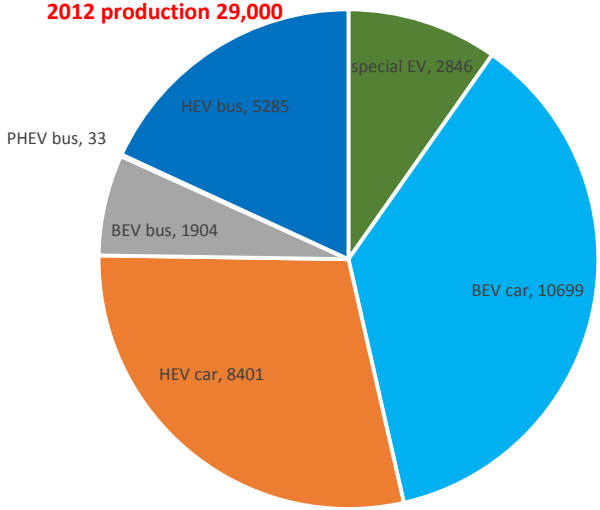
2010 production 8000



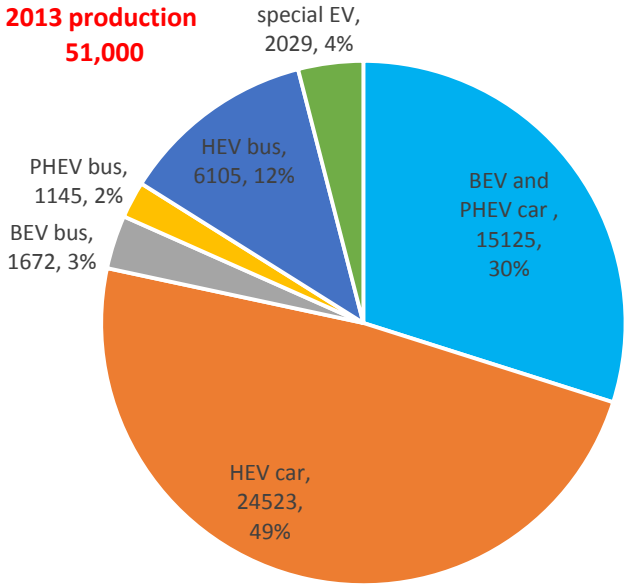
2011 production 13,000



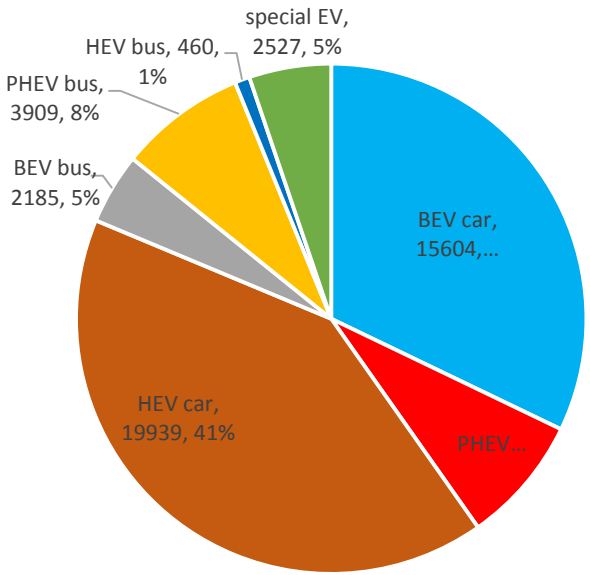
2012 production 29,000



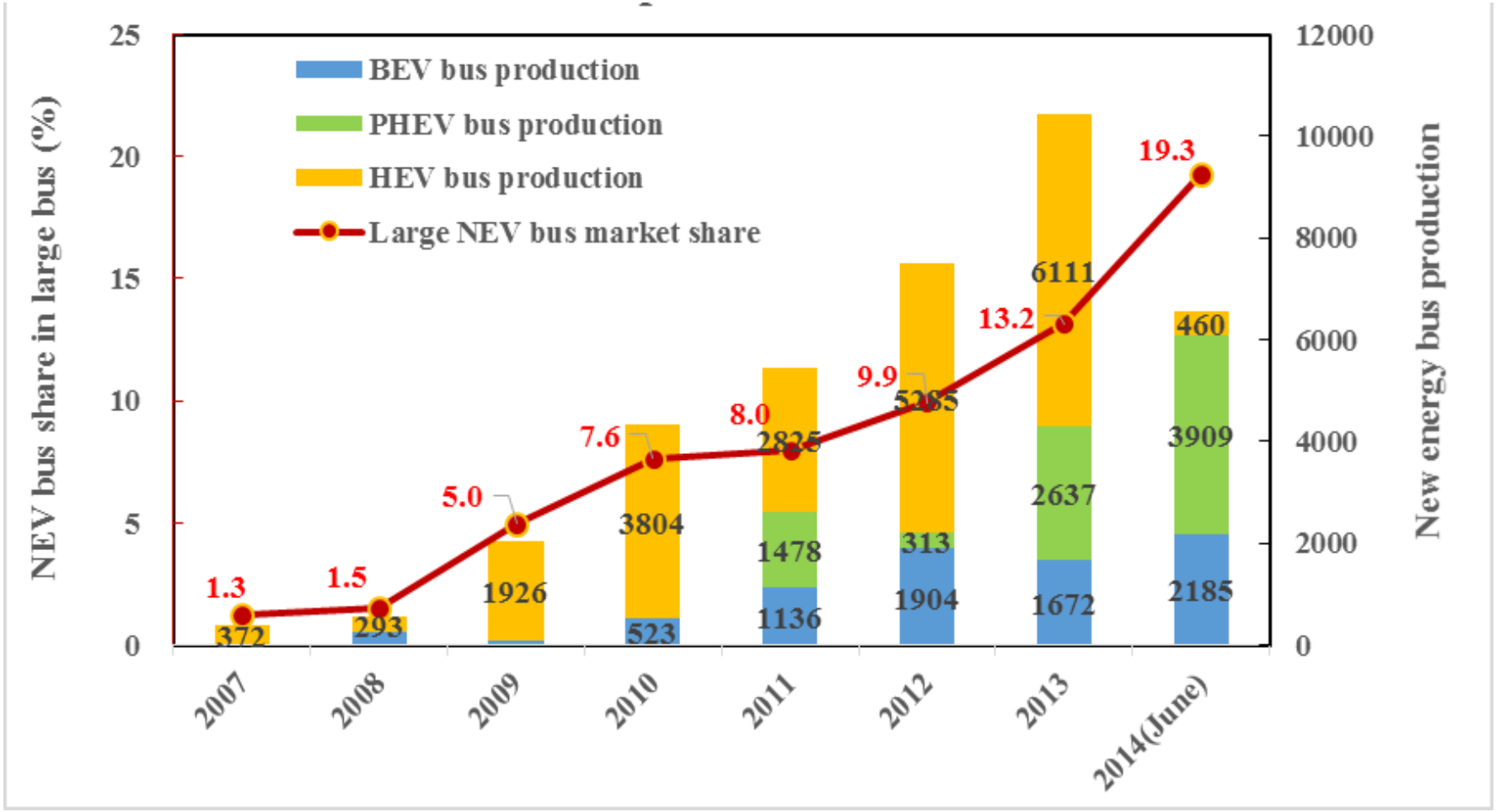
2013 production 51,000



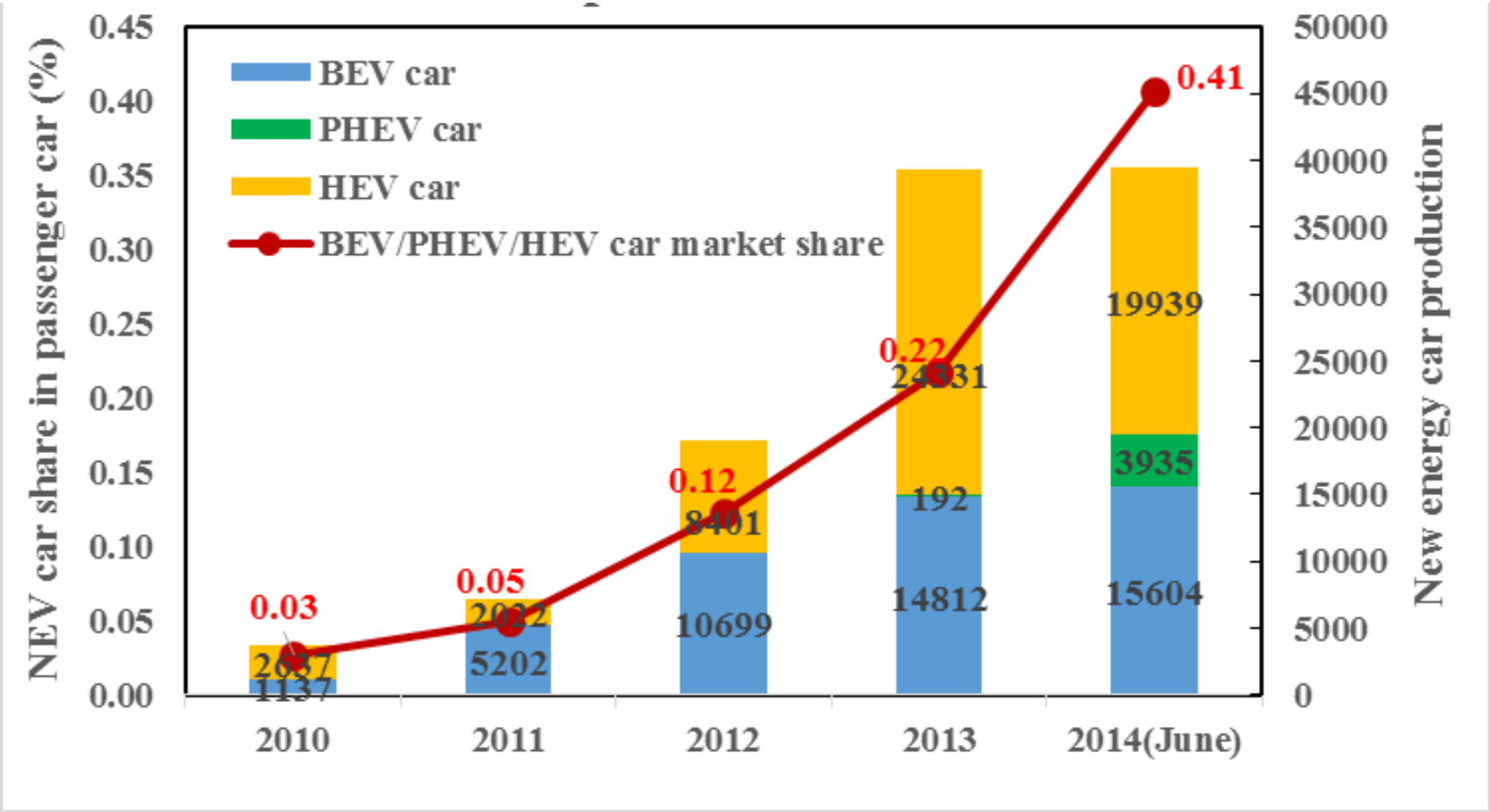
2014(half year) production, 46032



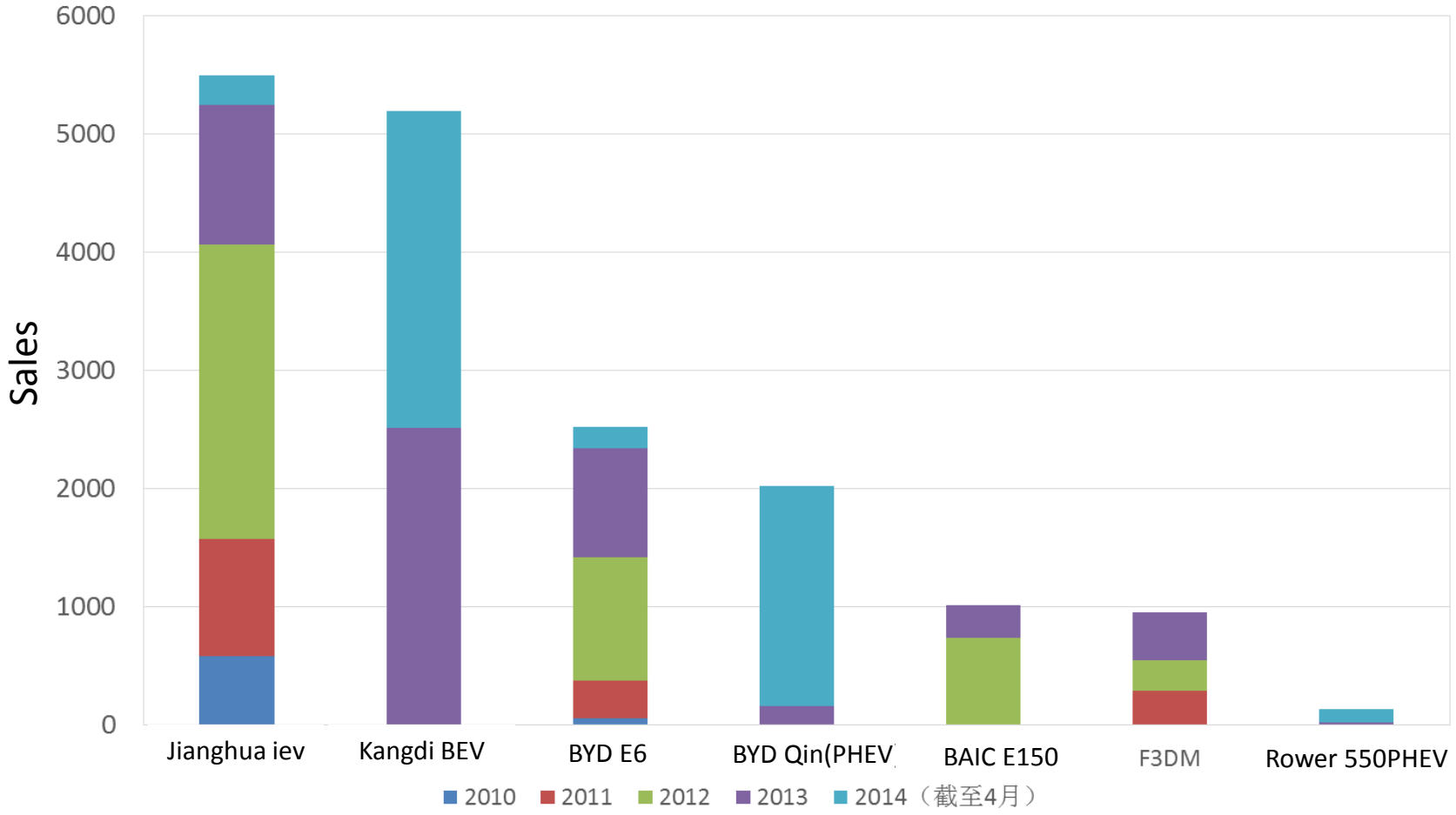
NEV Bus production and market share



NEV car production and market share



Progress on industrialization of PEV car

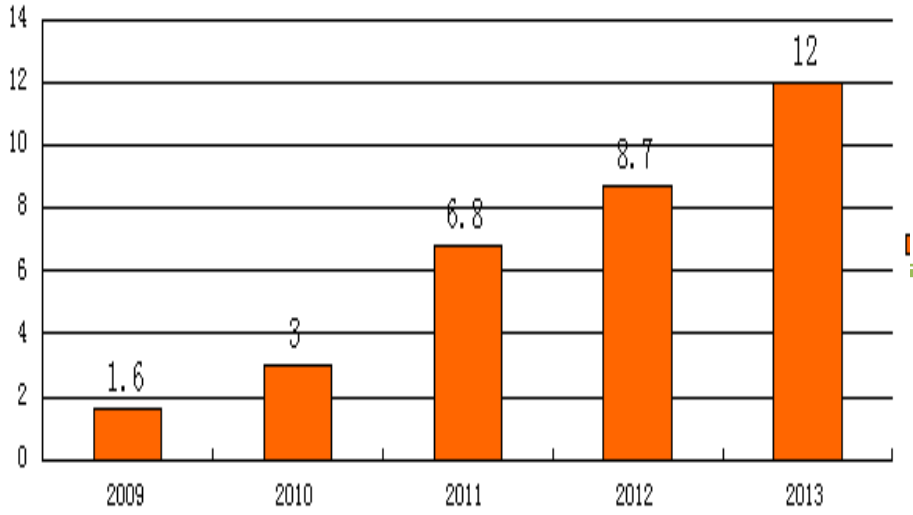


PHEV and BEV car production（upto April 2014）

Progress on Micro BEV

Production scale of Micro BEV expanded gradually, having a large market potential

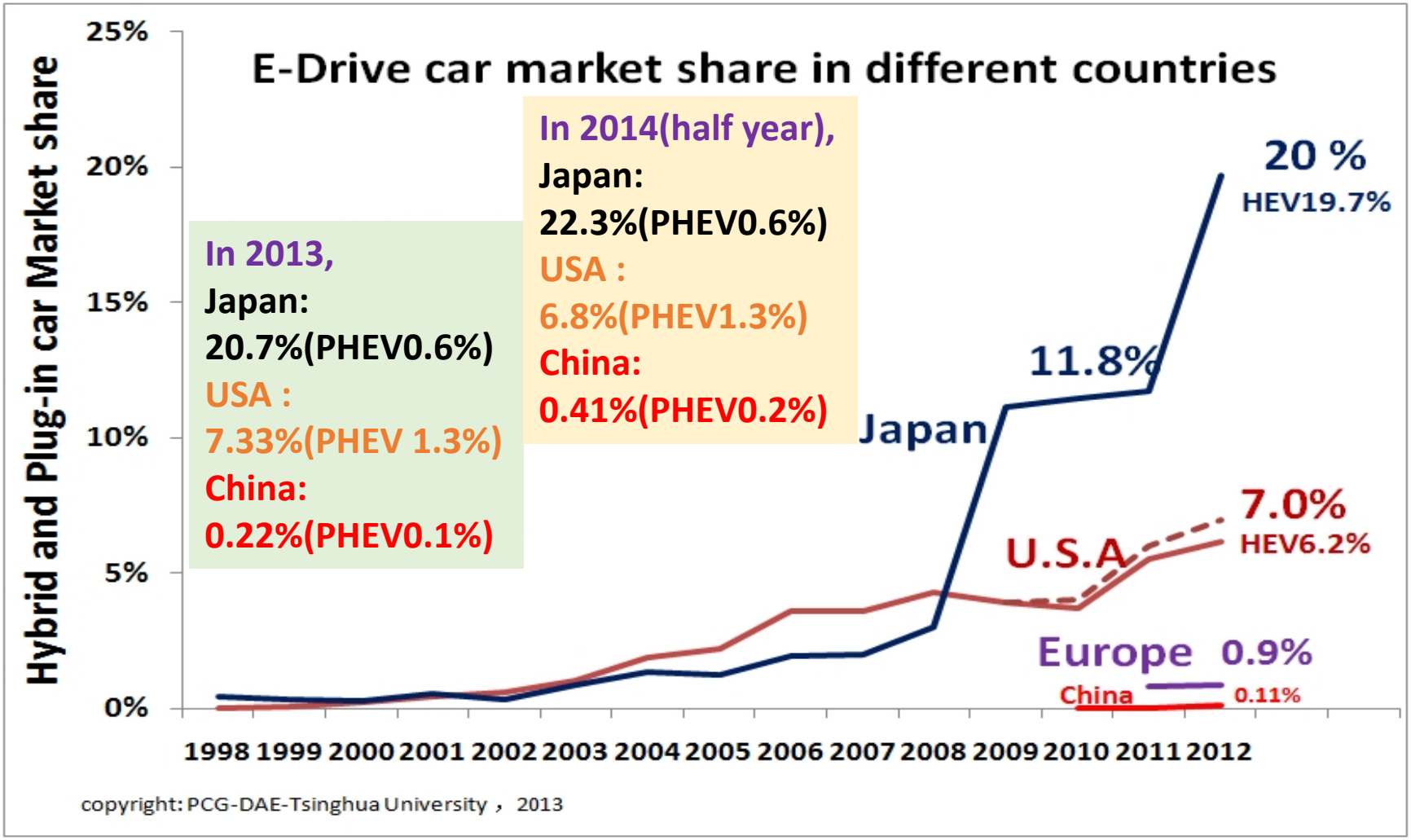
- **Statistics from Municipal Commission Economy and information technology of Shandong Province**
  - **2010：Production 29,700**
  - **2011：Production 77,200**
  - **2012：Production 128,088**
  - **2013：Production 171,537.**



Micro BEV production in Shandong Province

- **Shandong is the major Micro BEV maker province, which accounts 70% production.**
- **The annual production increased 6 times in 4 years. (16,000 in 2009, 120,000 in 2013.**

Passenger EV market comparison



Content

Technology pathway (dedicated on PEV)

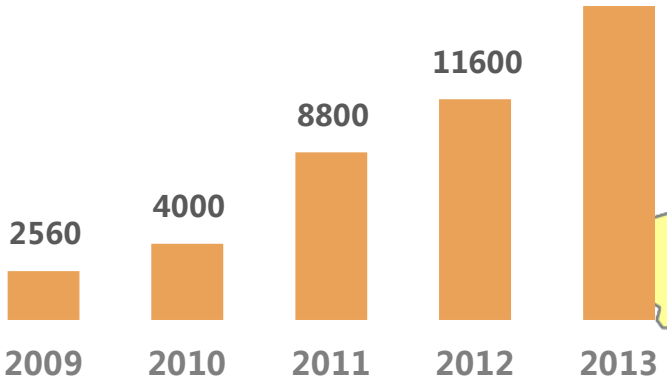
Market progress (focus on public fleets)

Incentive policy (Vehicle & infrastructure)

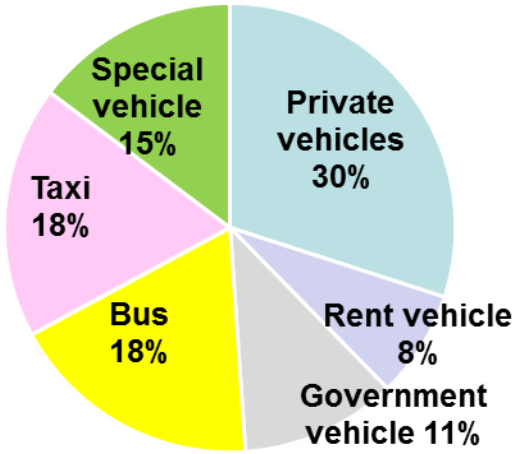
CERC-CVC Next step (China side project)

NEVs Deployment and subsidies (phase I & II)

Phase I deployed (45k NEVs,2009-13) in 25 cities



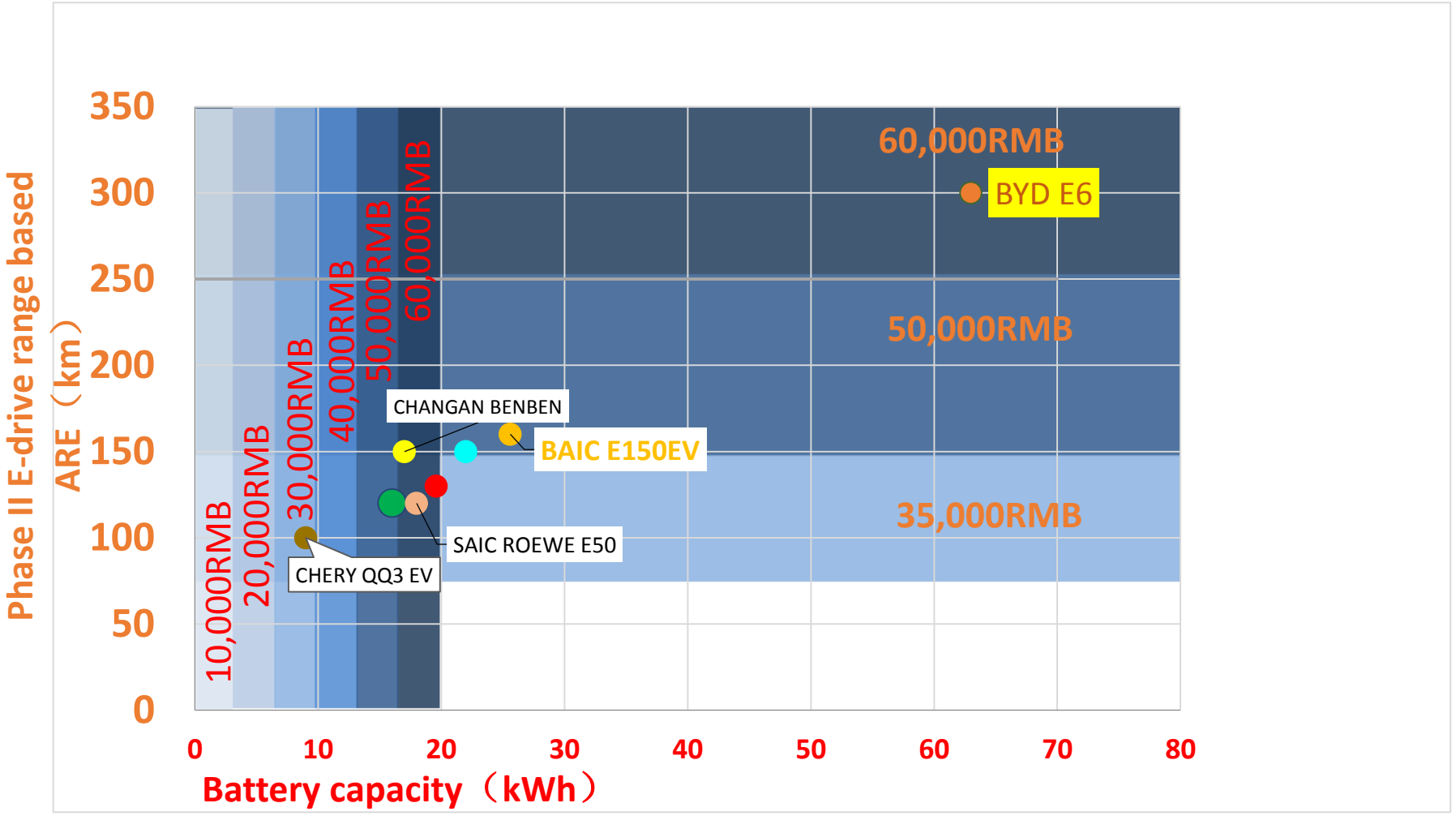
Phase II plan (330k NEVs,2013-15) in 88 cities



Subsides in Phase I & II for different vehicles

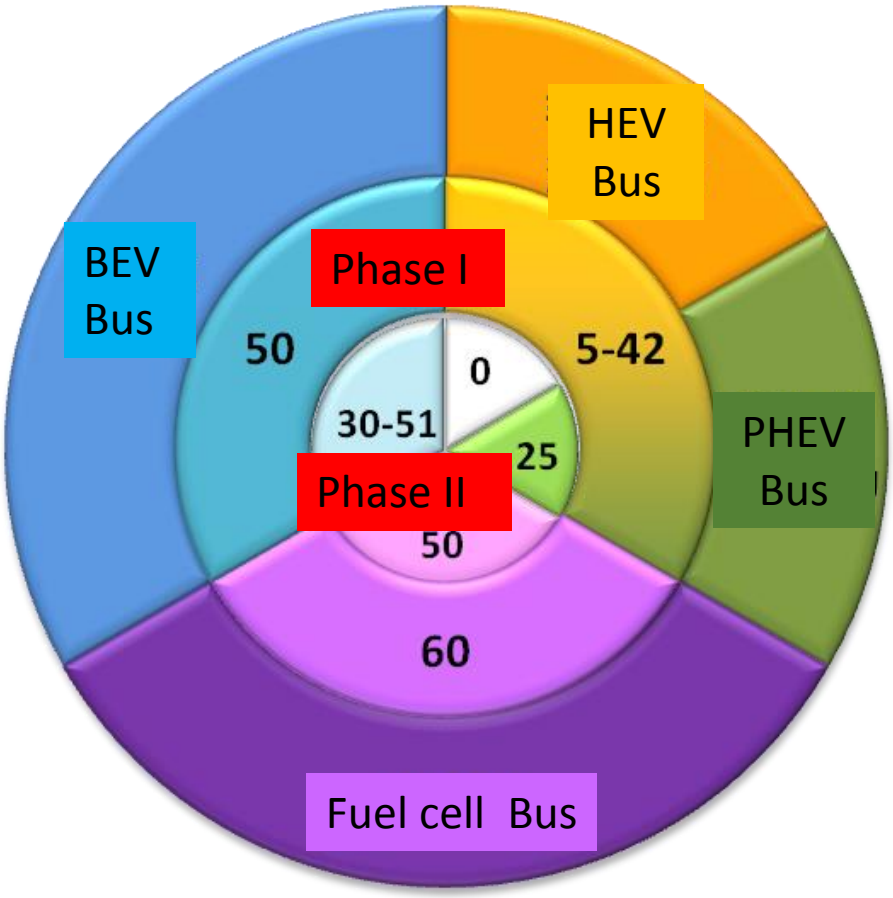
			Phase I [a]		Phase II
Target market			Public	Private [b]	Public and private
Subsidy duration			2009-2012	2010-2012	2013-2015
Subsidy scope			HEV, PHEV, BEV, FCEV	PHEV, BEV	PHEV, BEV, FCEV
Subsidy standard	HEV	PV	Up to ¥50,000		
		Bus	Up to ¥420,000 (L≥10)		
	PHEV	PV	Up to ¥50,000	¥3,000/kWh [f]	¥35,000 (R≥50)
		Bus	Up to ¥420,000 (L≥10)		¥250,000 (L≥10)
	BEV	PV	¥60,000	¥3,000/kWh [g]	¥35,000 (80≤R<150) ¥50,000 (150≤R<250) ¥60,000 (R≥250)
		Bus	¥500,000 (L≥10)		¥300,000 (6≤L<8) ¥400,000 (8≤L<10) ¥500,000 (L≥10) [c]
		SPV			¥2000/kWh [h]
	FCEV	PV	¥250,000		¥200,000
		Bus	¥600,000 (L≥10)		¥500,000
Phase-out mechanism			Not mentioned	Mentioned but not specified	5% reduction in 2014 10% reduction in 2015 [d]
Pilot cities			25 cities [e]	6 cities	40 cities and regions

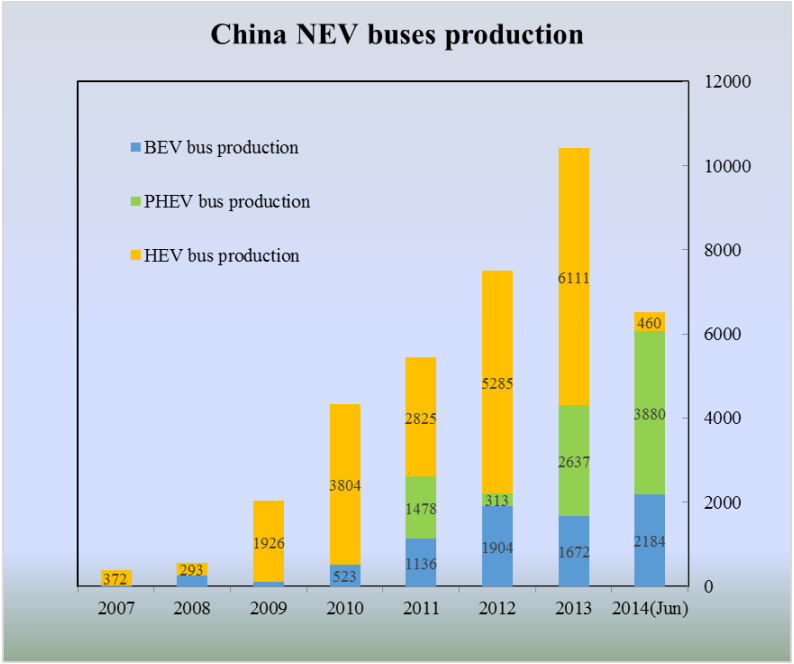
Central subsidy for electric car(Phase I & II)



(Phase I Battery capacity based 3,000RMB/kwh)

Central subsidy for electric bus





HEV market reduce to near zero during phase II

1) Subsidy reduced by about 20% in phase II for FCV
2) HEV no subsidy and PHEV reduced by 40% in phase II
3) More catalogue for BEVs

Tax-free policy of EV

Owner Tax

- Free from Jan. 2012.
- Passenger car $50-$100 per year

Purchase Tax

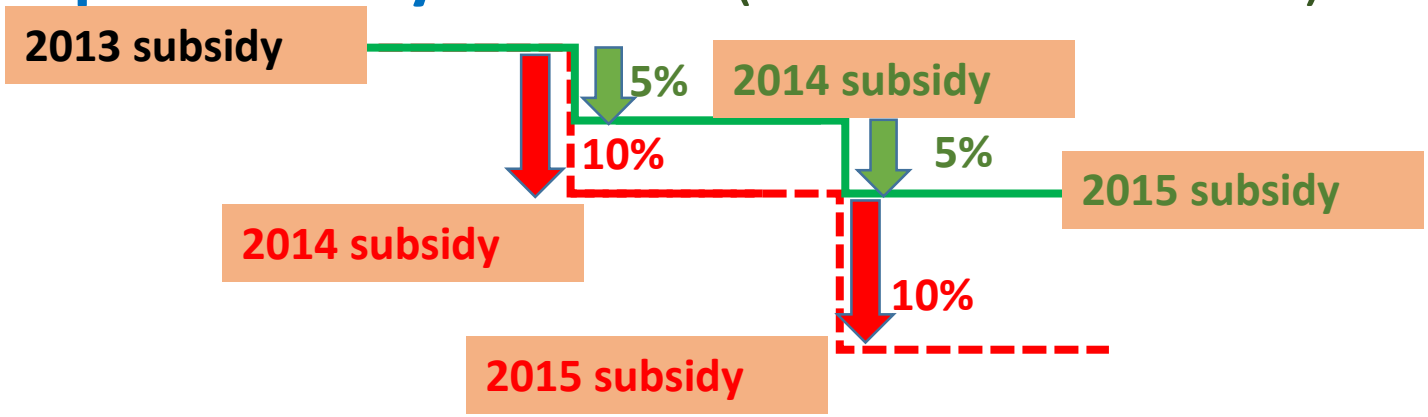
- Free sept. 2014-Dec.2017
- About 10% of the price
- Both domestic &imported
- Incl. BEV, PHEV, FCV

Plate

- Free in Shanghai (value $14,000).
- ~100% bingo in Beijing (1% for ICE)

More aggressive policies

- Smaller step in subsidy decrease(revised Jan. 2014)



- Replacement ratio of official vehicle targets
  - 2014: >10%

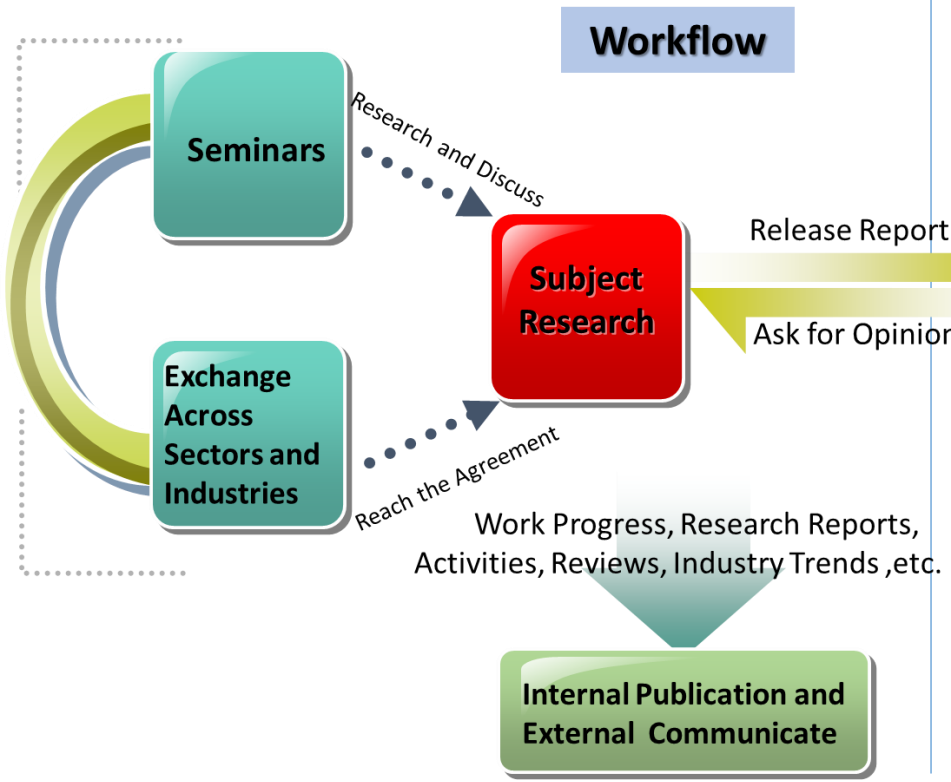
    Beijing-Tianjin-Hebei, Yangtze river & Pearl river deltas: >15%
  - 2015: >20%
  - 2016: >30%

- Charging pole & NEV ratio: >1:1

China Association for Electric Vehicles (100 Members)

Vision： Accelerating Electric vehicle development and its widespread deployment in China

The Founding Conference



China EV100 中国电动汽车百人会

Mission： Opening platform to boost cooperation from government, academic, industry, & stakeholder.

China Association for Electric Vehicles (100 Members)

Government
(Including 10 Ministers)

Business
(Including Vehicles, Energy, Etc.)


Academia
(Including 14 Academicians)

China Association for Electric Vehicles (100 Members)

1. Economic/Environment/Energy Assessment of Electric Bus and its Deployment Business Models
2. Regulation/Standards/market for Micro EVs
3. Acceptance/Penetration/Incentive for Private Passenger Electric Cars(PHEV/BEV)

4.Review/Lessons/Innovation of EV Policies in Nationals and Regionals

5.Issues about Power Battery

6. Pathways Analysis of Energy Saving and New Energy Vehicles

7.Research of Electrify Transportation and Intellectualization in China

8.Survey and Analysis of the Status and Trend of EV Industry Both in China and Abroad

9. Relevant Issues about Charging Infrastructure

Content

Technology pathway (dedicated on PEV)

Market progress (focus on public fleets)

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CERC-CVC Next step (China side project)

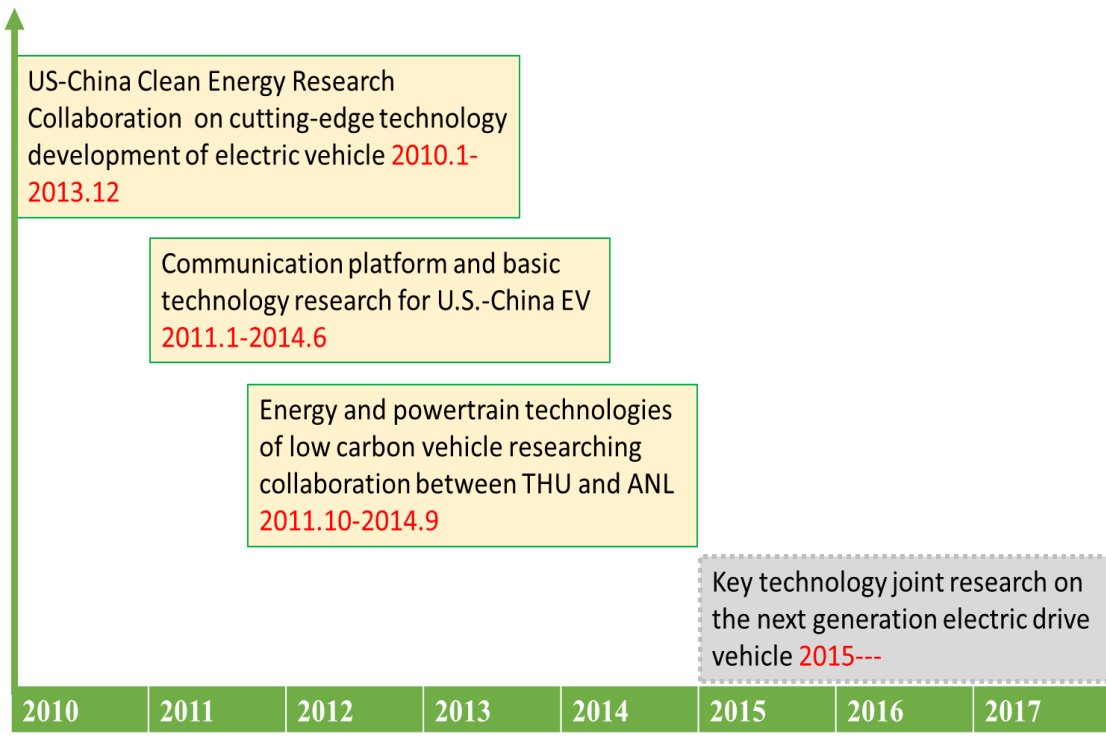
CERC-CVC Funding Summary

DOE Funding: $2.5M/year for 5 years

- Approx. 25 research project tasks; more than 20 faculty and 20 graduate students at UM and partner schools and national labs

University + Industry Funding: >$2.5M/year for 5 years

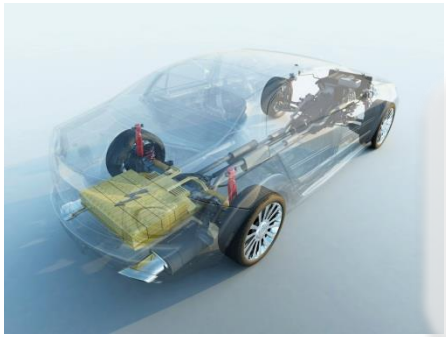
- Additional research projects
- In-kind support for CERC-CVC test beds
- Support for center administration and collaboration
  - Full time manager
    - Full-time consortium manager & administrative support
    - Travel for consortium members to enhance collaboration with Chinese partners



CERC-CVC Thrust Areas

1. Advanced Batteries System

2. Advanced Biofuels, Clean Combustion and APU



3. Vehicle Electrification

4. Lightweight Structures

5. Vehicle-Grid Integration

6. Energy Systems Analysis, Technology Roadmaps and Policies

Consortium Overview

Academic & National Lab Partners

U.S.

China

Consortium Overview

Industrial Partners

U.S.

Ford DELPHI DENSO EATON

TOYOTA HONDA pjm TE connectivity Aramco Services Company

China

SAIC GEELY JAC CAERI CATARC 上汽通用五菱 SGMW

LISHEN Potevio JJE ECTEK KeyPower 科易动力

Focus of the next 18 months

Industrial Collaboration Through "Implementation Projects"

DELPHI — Diagnosis of electrified powertrain

Ford — F-150 power split hybrid design

EATON — Drivetrain lightweight structure simulation

DENSO — Wireless charging prototype

WANXIANG GROUP — Battery management and safety protection system

JJE driving the future — Electric powertrain with dual motor design

GM 上汽通用五菱 BAOJUN — Micro EV light weight structure design

Potevio 中国普天 — Demonstration and evaluation of electric vehicle charging and infrastructure technologies

2015 and beyond

New Li-ion battery & BMS

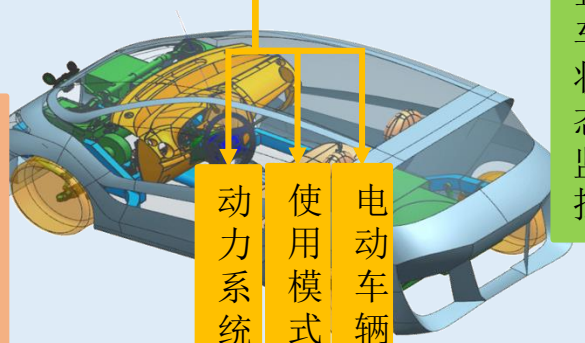
- 高容量锂离子电池材料
- 极端状况下反应与产物
- 电池组热失控及抑制
- 体系匹配设计及制造

Lightweight & crash safety

- 轻量化材料压铸与热交换
- 轻量化材料焊接工艺与性能
- 电池碰撞安全性与准则
- 车身轻量化设计与集成

Energy system & Driving pattern

- 动力系统能量管理
- 使用模式与出行特征
- 电动车辆出行规划



Intelligent charging & V2G

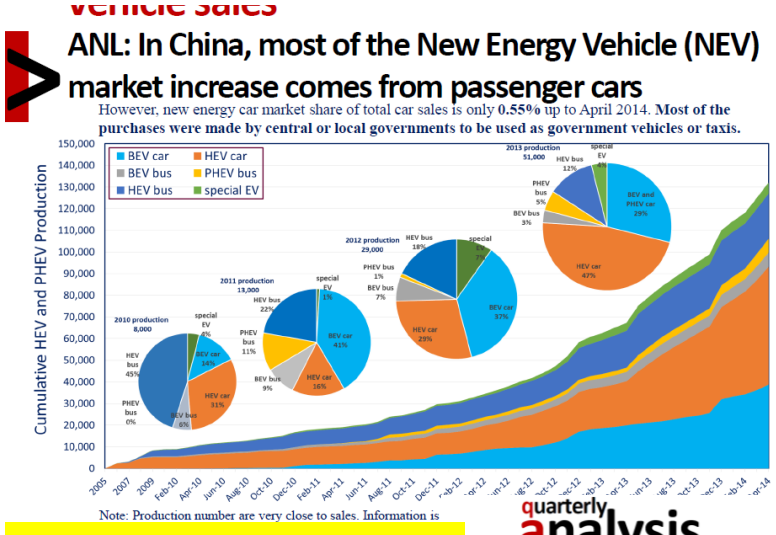
- 电动车辆整车状态监控
- 车联网的电动车辆生态驾驶
- 无线充电智能停车引导系统
- 中等功率无线智能充电系统

Powertrain optimization & VCU

- 锂离子动力电池管理系统
- 复合储能系统构型优化
- 永磁无刷轮毂电机最优控制
- 变速箱优化和多目标控制
- 分布驱动的网络迟滞与控制

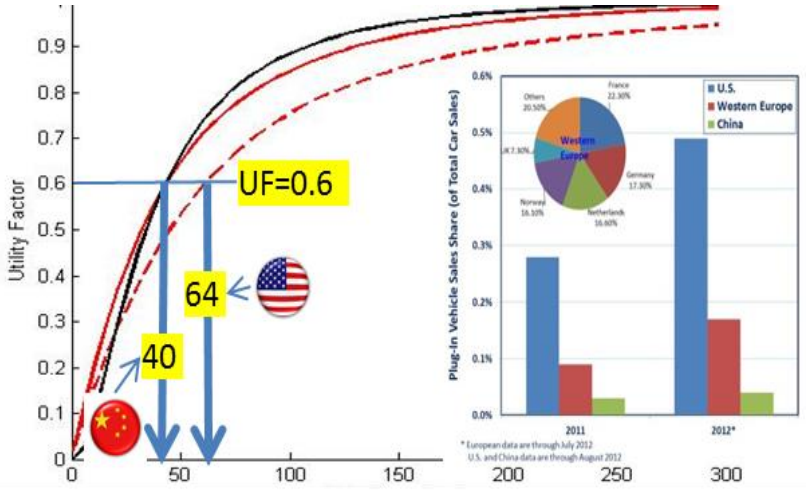
Conclusions

- NEV Technology dedicated in PEVs (PHEV\BEV\FCV)
- Market successful in public field, just startup in private sector
- Incentive policies both in vehicle (domestic & imported) & infrastructure
  - CERC-CVC collaboration valuable for both governments



Cited in DOE report

quarterly analysis review 14.1&2



Reporting to two Ministers (DOE and MOST)

Thank you for your attentions !