

New Environment and New Technical Trends of NEV

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Report Explain

Chinese new energy vehicles industry have developed for ten years. During these years, not only the national strategic positioning and the supports from policies and regulations, but also the layout of market / products and the strategies of OEM around the world, have gone through deep adjustments. Meanwhile, the new changes of internal market and external market have brought the new development of technologies such as battery, electric motor, internet of vehicles and so on .

This report will illustrate these two aspects of new energy vehicle industry (i.e., new environment and new technical trend), and also the strategy of BAIC.

Note: in this report, **the NEV** without special explanations **refers to new energy vehicles** ,including EV and PHEV .

CONTENT

I. New Environment and New Technical Trends of NEV

II. Strategy of BAIC



1. Development Background



The strategies of NEV have become clear

1 Development Background

◆ Environment and Energy Issues

- The conventional vehicles caused the environmental issues and the risks of energy shortage.
- NEV replace conventional vehicles become a trend of automobile industry.

Environmental pollution caused by conventional vehicles



With the increasing popularity of automobiles, sulfide and nitride emissions from gas cause acid rain more and more frequently, causing serious environmental problems.

Acid rain

Of the four major substances that form haze, three are from motor vehicle exhaust emissions: organic hydrocarbons, nitrogen oxides and black carbon; when urban traffic jams are blocked, the engine's idle speed and its black carbon emissions are greater.

Smog



Carbon dioxide in automobile exhaust is the main reason for the aggravation of greenhouse effect, which leads to Glacier melting, climate abnormalities, drought and other environmental problems.

Greenhouse effect

Risk of oil resources supply

1%

Oil reserves

11%

Oil consumption

China is mainly dependent on imports because of its low oil reserves and large oil consumption. China's proven oil reserves account for only about 1% of the world's total, while China's oil consumption accounts for 11% of the world's total in 16 years. The foreign dependence of China's oil resources is too high.

excessive
dependence
on foreign oil
market

Uncertainty
in supply

Chinese oil imports are mainly concentrated in the Gulf States and Africa in the Middle East. The Middle East is rich in oil resources, but it has always been the cause of international oil crisis. The three oil crisis in history proves this point. In addition, Chinese oil transportation route choice space is small, the control of oil trade routes is weak, but also makes it difficult to ensure the safety of China's oil.

1 Development Background

◆ NEV is a long-term enterprise of Chinese automobile industry

- NEV has become a strategic industry, valued by CPC (Central Committee and the State Council) of China.
- The government and companies of China continued to promote the NEV industry from 2017.



Prime Minister Li Keqiang:
“Encourage the use of clean energy vehicles”
——2017 government work report

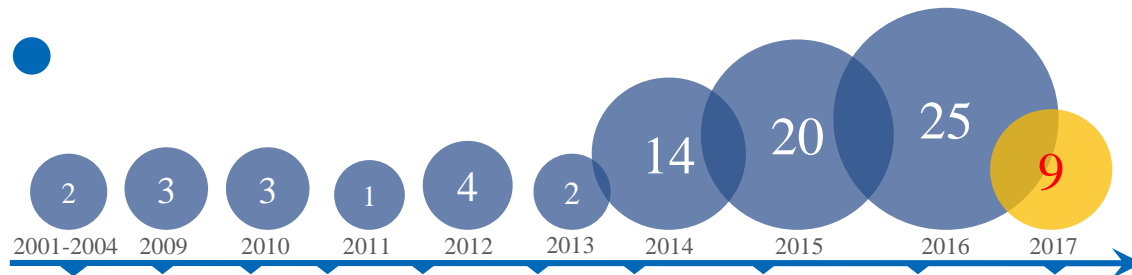


Miao Wei:
“Unswervingly developing the new energy auto industry”
——2017 NPC & CPPCC



Xu Heyi:
“BAIC will launch shared electric vehicles in the second quarter”
——2017 NPC & CPPCC

The number of major new energy vehicle policies in China over the years

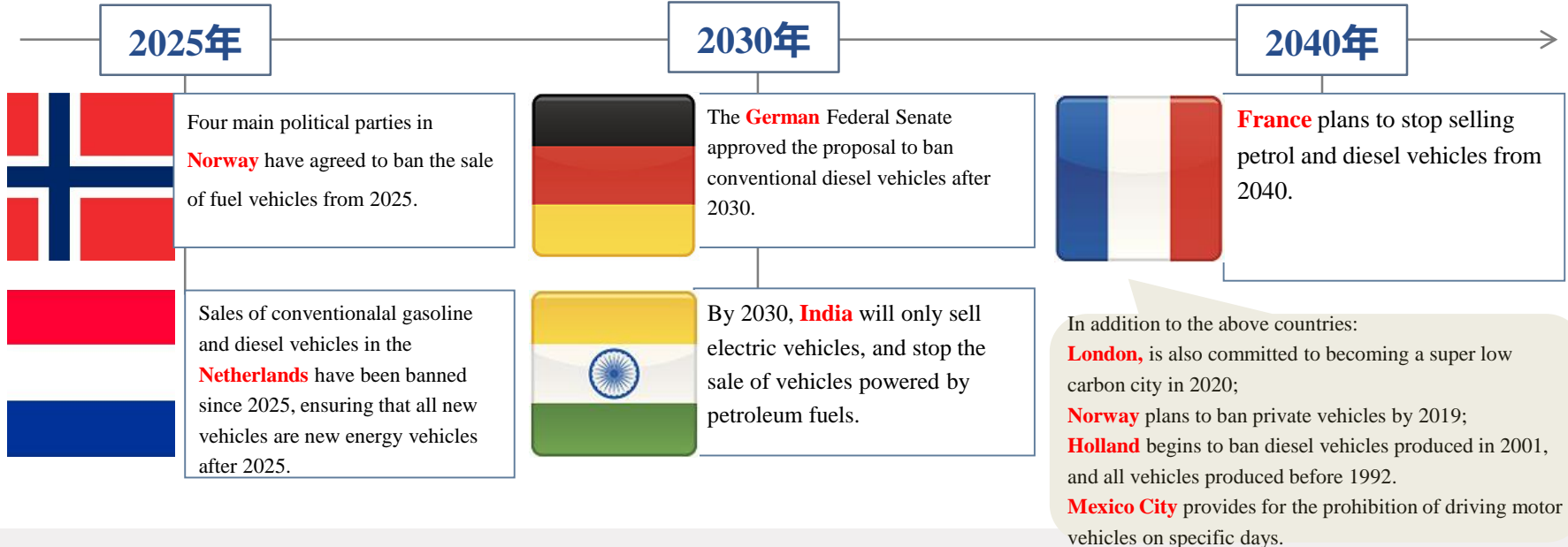


1 Development Background

◆ schedules of ban on conventional vehicles have been announced by many countries.

- France, Germany, Netherlands and have announced the schedules of the ban on conventional vehicles.
- The time dead lines are between 2025 to 2040.

This indicated that new energy vehicle is a mainstream across the world.



2. Current Situation of Industry

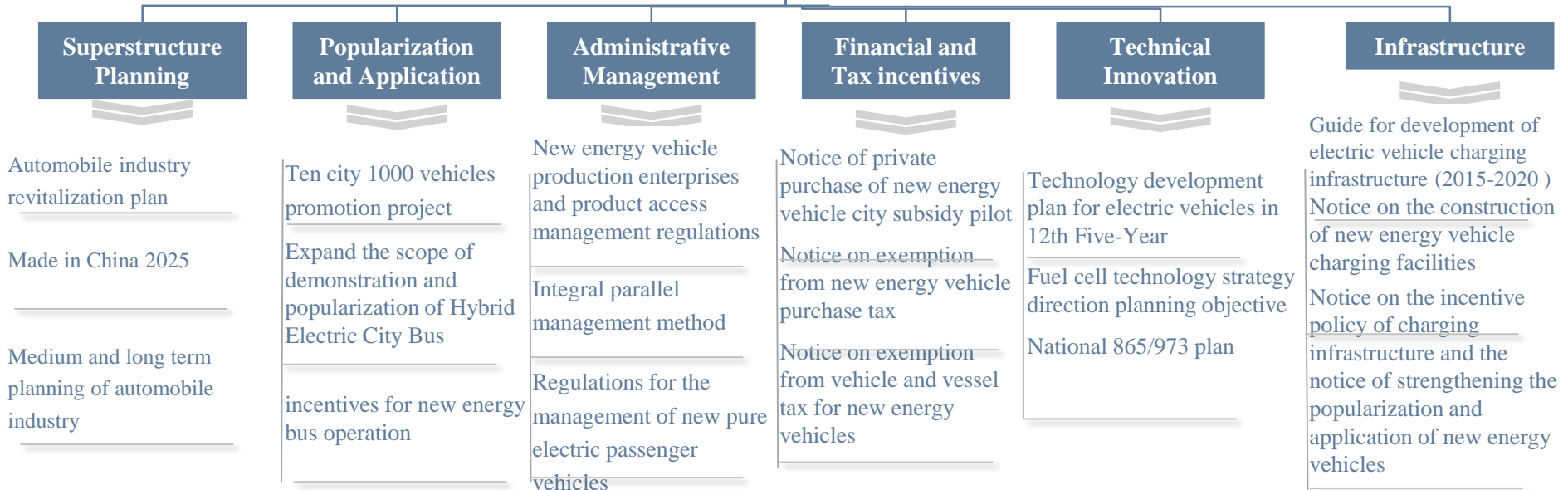


Policy system and industrial chain are improving in China

2 Basic Policy Improving

- China has released more than 60 national policies of NEV on superstructure-plan, finance and infrastructure, etc. from 2009.

Chinese new energy auto industry policy system



2 Rational Policy Step

- The development planning and technical routine are becoming clearer.
- The Policy of Strict access will promote a good development environment.

Direction of development planning

《"13th Five-Year" national strategic emerging industries development plan》

《"13th Five-Year" modern comprehensive transportation system development plan》

《Medium and long term (2025) development plan for China's automobile industry internationalization 》

Strict access to norms

《Revised regulations on new energy vehicle manufacturers and product access management》

《Technical conditions of four wheel low speed electric vehicle》

《 Safety condition of pure electric bus 》



The technical line is clear

《Energy saving and new energy vehicle technology roadmap》

《Energy technology revolution key innovation action Roadmap》

《"13th Five-Year" plan to control greenhouse gas emissions》

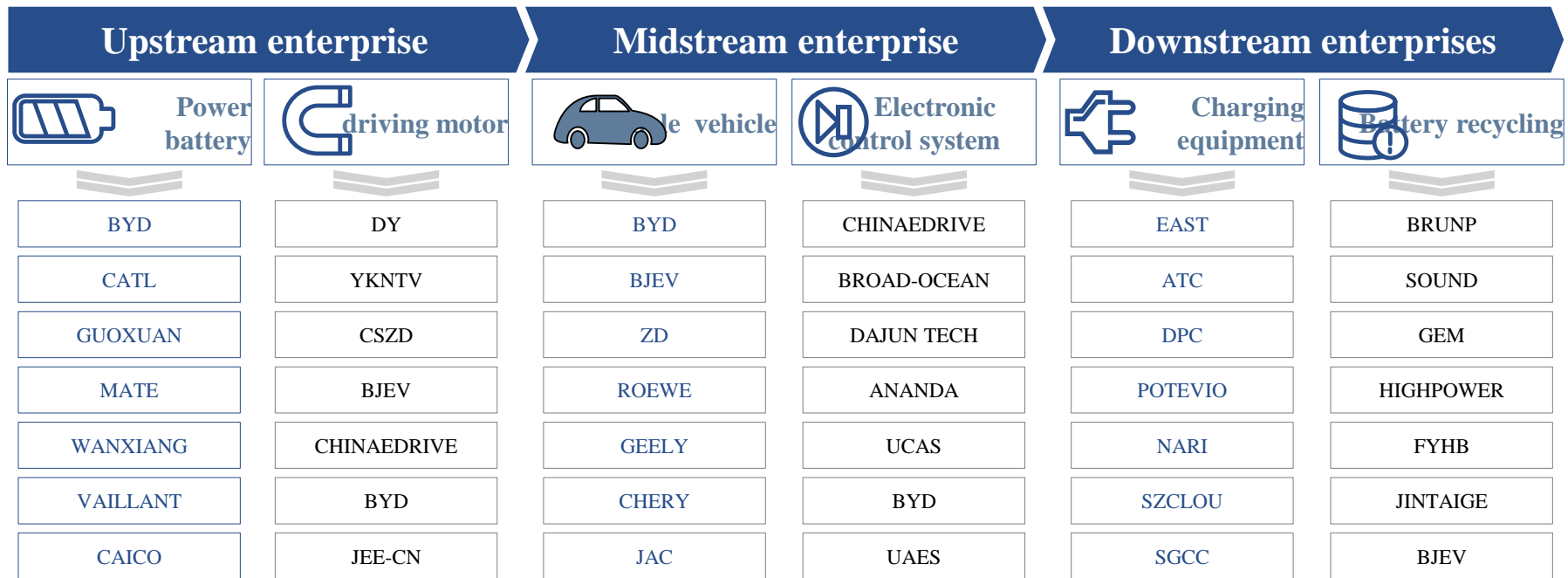
Steady change in financial incentives

《Notice on adjusting the fiscal subsidy policy for the promotion and application of new energy vehicles》

《Interim Measures for the concurrent management of the average fuel consumption of enterprises and the integration of new energy vehicles》 (Draft for comments)

2 Developed Industrial Chain

- Many companies with strong R&D ability has emerged from upstream (battery) industry to downstream (charging equipment and battery recycling) industry



3. Market Environment and Trends of OEMs



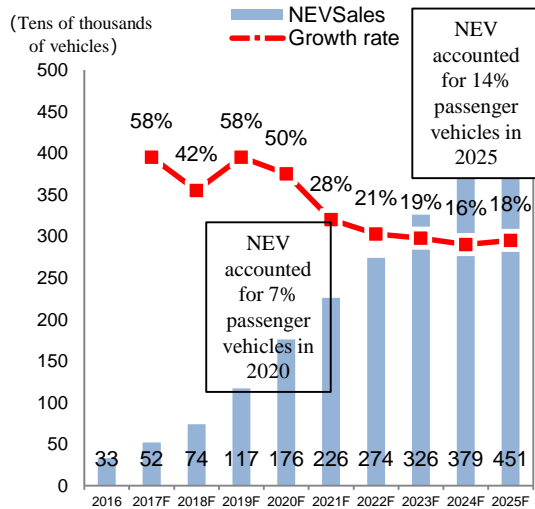
- NEV market shows good prospect, consumption demands, consumer groups will change greatly
- The violent competition of OEMs

3 Market Environment

◆ The sales volume and market share of NEV increase steadily

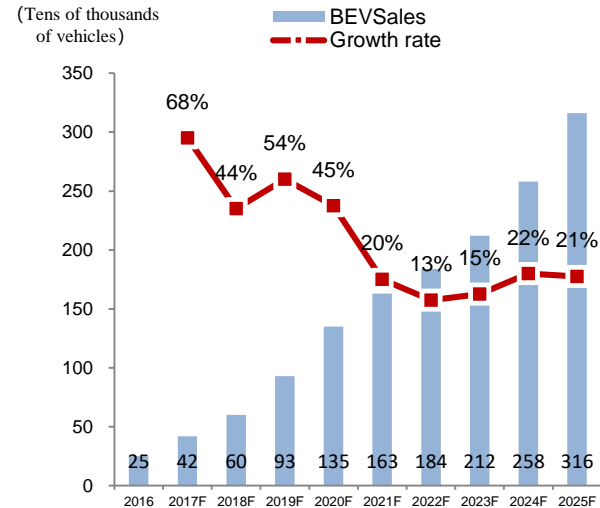
- The enhanced environmental awareness, the government incentives and the purchase restriction policy of vehicles in the city, promote the NEV sales volume to increase.
- NEV share is expected to be 7% in 2020, 14% in 2025.
- Electric Passenger car sales volume is expected to be 1.4 million by 2020, 3.16 million by 2025.

NEV Sales and growth forecast



BEV sales

BEV Sales and growth forecast



3 Market Environment

- ◆ **NEV consumption will be on a new stage during the next decade.**
- NEV with intelligent devices will show a big demand and become a common usage.

1.0 demonstration pilot 2009-2013

**2013Sales: eight
thousands of vehicles**
Personal purchase 10%

Low acceptance of private
users (2013) :
BEV: 1% | PHEV: 4%



2.0 Purchase and consumption 2014-2016

**2016Sales: 33
thousands of vehicles**
Personal purchase > 30%

Increasing acceptance of
private users (2016) :
BEV: 14% | PHEV: 22%



3.0 National consumption 2017-2025

**2025 (F) : 388
thousands of vehicles**
Personal purchase > 80 (F)

BEV convert the demand for low-
speed vehicles and fuel vehicles to
electric vehicles from the restricted
cities to the whole country.



4.0 Smart consumption 2026-2030

**2030 (F) : 727 thousands of
vehicles**
L1-L4 Market share of autopilot:
60%-70%

Demand for high-end,
personalized and intelligent
transfer

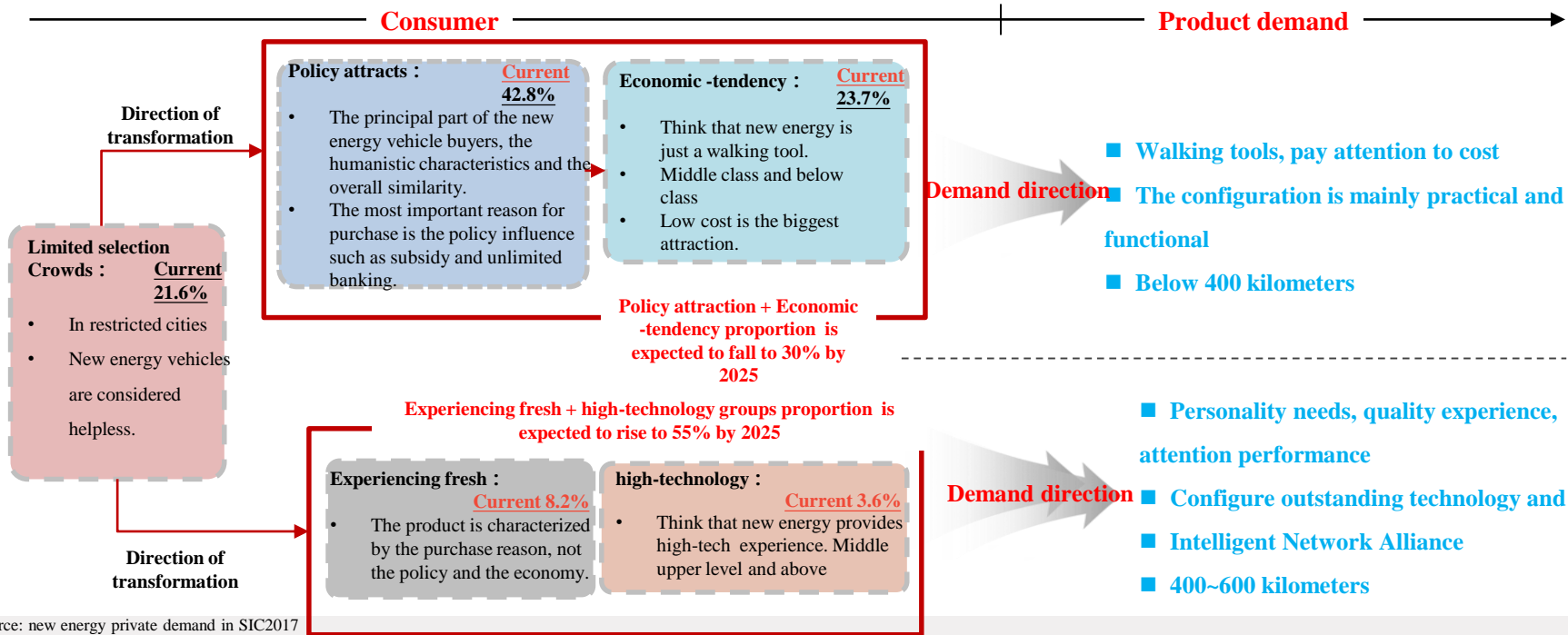


Sources: Nielsen White Paper on New Energy Consumption, BAIC New Energy Market Forecast, JPMorgan Chase Intelligent Network Development Forecast

3 Market Environment

◆ NEV custom group will change

- Policy attracts and Economic –tendency groups proportion will fall to 30% by 2025
- Experiencing fresh and high-technology groups proportion will rise to 55% .



◆ Electrification becomes mainstream strategies of OEMs, and the competition becomes more violent.

- Electrification has already become the main strategy of OEMs.
- Almost all OEMs put forward new energy strategies successively.

self-owned brand



长安汽车

"Project Shangri-la"

EV 21 models, PHEV 12 models, realized the entire pedigree product electrification by 2025.



比亚迪汽车

"Motorized future strategy"

In the next 3-5 years, the "three engine four-wheel drive dual-mode" car will be promoted in more than 200 cities across the country.



上海汽车

"New four modernizations strategy"

Planning to invest more than 20 billion yuan in the field of new energy and launch more than 30 new products, including EV 13 models and PHEV 17 models.



奇瑞汽车

"Independent and technological research and development"

22 models new energy vehicles were launched to achieve 220 thousand sales, and the EXEED high-end brand was released in 5 years.



吉利汽车

"2020 strategy"

By 2020, Geely's new energy sales will account for more than 90% of the total; Link & Geely's dual-brand 10 models of EV.

Joint venture brand



"Roadmap E" Motorized strategy

The whole group of products will be electrified in 2030.



"Global electrification" strategy

Mass production of electric vehicles in 2020



"Drive The Future" strategy

8 models of EV will be launched before 2022



"Innovation 2020" strategy

8 models of EV will be launched before 2022



"EV strategy"

8 models of EV will be launched before 2020



"Evnness" strategy

Fully motorized in 2025



"Ascending blue upward"

4 models of ev will be launched in 2021

luxury brand



"CSAE" strategy

Electrification of all models in 2022



The first strategy

12 models of EV will be launched before 2025



Global electrification

More than 20 models of EV will be launched before 2025, including more than ten electric vehicles.



Motorized strategy

Electrification of all models in 2020



Full range of electric strategy

Electrification of all models in 2019

◆ High-tech and Internet companies join NEV industry to produce smart electric vehicles

- overseas R&D + domestic production
- Two companies announced launch plan of EV in 2018.

SINGULATO

【OEM Cooperation】

The production base of SINGULATO Intelligent New Energy Automobile Industry Park will be located in Tongling, Anhui Province, and a cooperative production agreement has been reached with a domestic main engine factory, with a capacity of 200,000 vehicles per year.



【Three-power technology】

The SINGULATO has been cooperating with GLM, an electric super car company in Japan, to introduce three-power technology from GLM.

Production plan



NEXT EV



【OEM Cooperation】

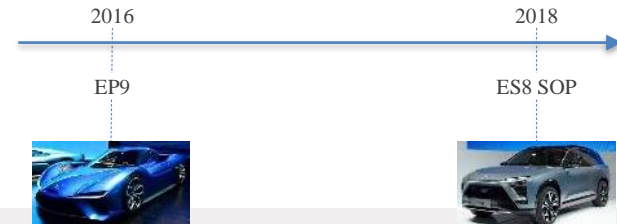
In May 2016, NEXT EV and JAC Automobile signed the *Framework Agreement on Manufacturer Cooperation*, and JAC Automobile established a production line of 50,000 vehicles for NEXT EV with a cooperation scale of about 10 billion yuan.

NEXTEV 【Created a new brand】
蔚来汽车

JAC 江淮汽车
V 长安汽车

In April 2017, NEXT EV and Chang'an signed a strategic cooperation agreement. Both intend to establish joint venture company to carry out R&D, production, sales and service cooperation.

Production plan



Summary

- The environmental issues and the risks of energy storage made NEV to become the mainstream of automobile industry cross the world.
- Long-term policies of China remain positive and stable, the policy measures return to be rational, the whole industry chain of NEV grows rapidly.
- The incentives of government reduced, The access policy became stricter from 2017.
- NEV market shows good prospect, consumption demands and custom group will change greatly.
- OEMs focus on the NEV industry, and the competition among OEMs will be more violent in the future.

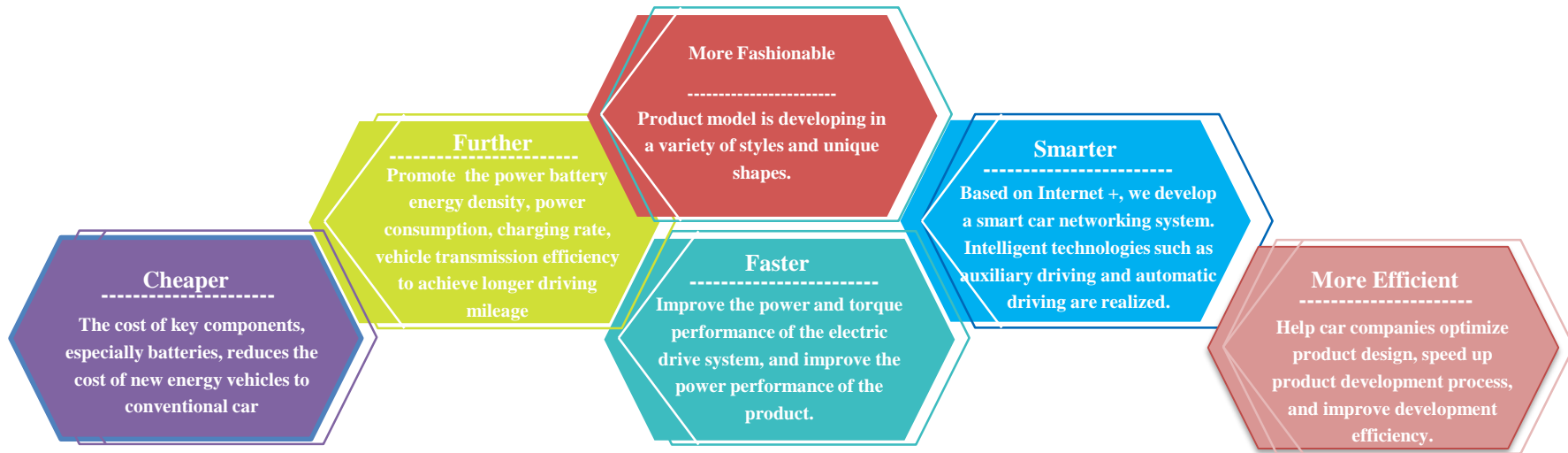
4. Technical Development Trends



Future requirements of NEV : cheaper、 faster、 further、 smarter、 more fashionable、 more efficient

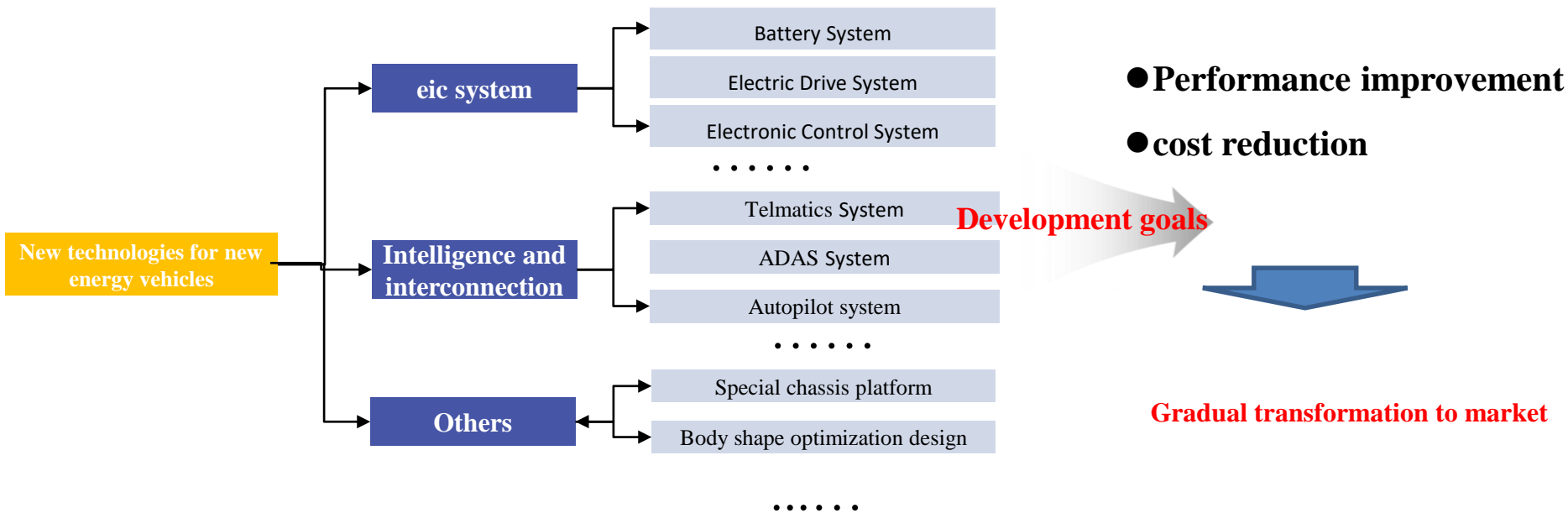
4 Future Requirements of NEV

- The costs will become “cheaper”
- The performance will become “faster, further and smarter”
- The appearance will become “more fashionable”
- The development of products will become “more efficient”



4 New Technological Trends of NEV

- NEV industry will focus on technology upgrading and cost reduction
- Based on the “national planning 2025”, new technologies involve 5 areas such as battery system, electric drive system, electronic control system, Intelligence and interconnection and chassis platform.



4 Battery System

Electric Vehicle driving range – “further” by 2020

Range of EV above 500km, Energy density above 300Wh/kg, cycle life more than 2000 times.

NCM and NCA will be more suitable for NEV.

Figure: Technology Roadmap - power battery energy density target

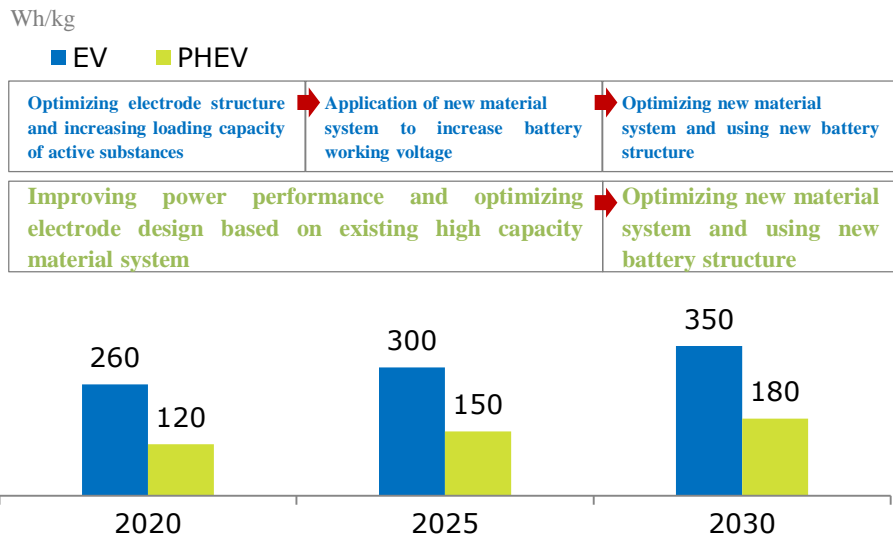
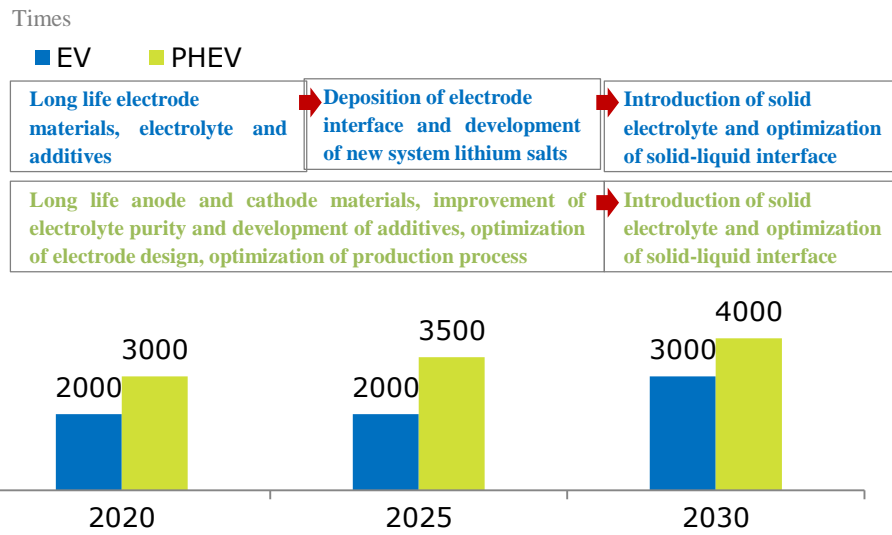


Figure: Technology Roadmap - battery cycle life development goals



4 Battery System

- The safety of battery system is the most important core technology of NEV.
- Safety performance will increase significantly by 2030 with the improvement of battery material system.

Figure: battery system level security measures

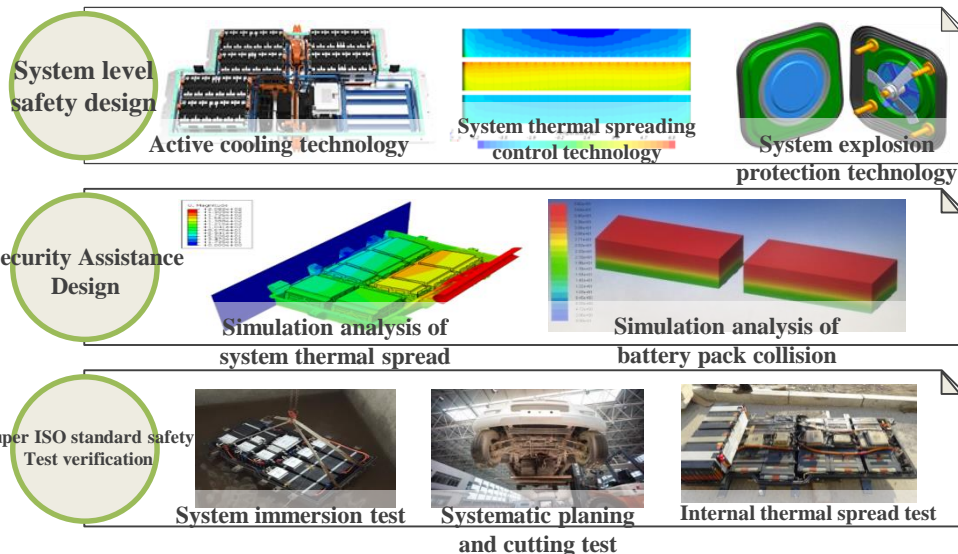


Figure: Trend of battery material system in the future

2020: Existing system of ternary battery

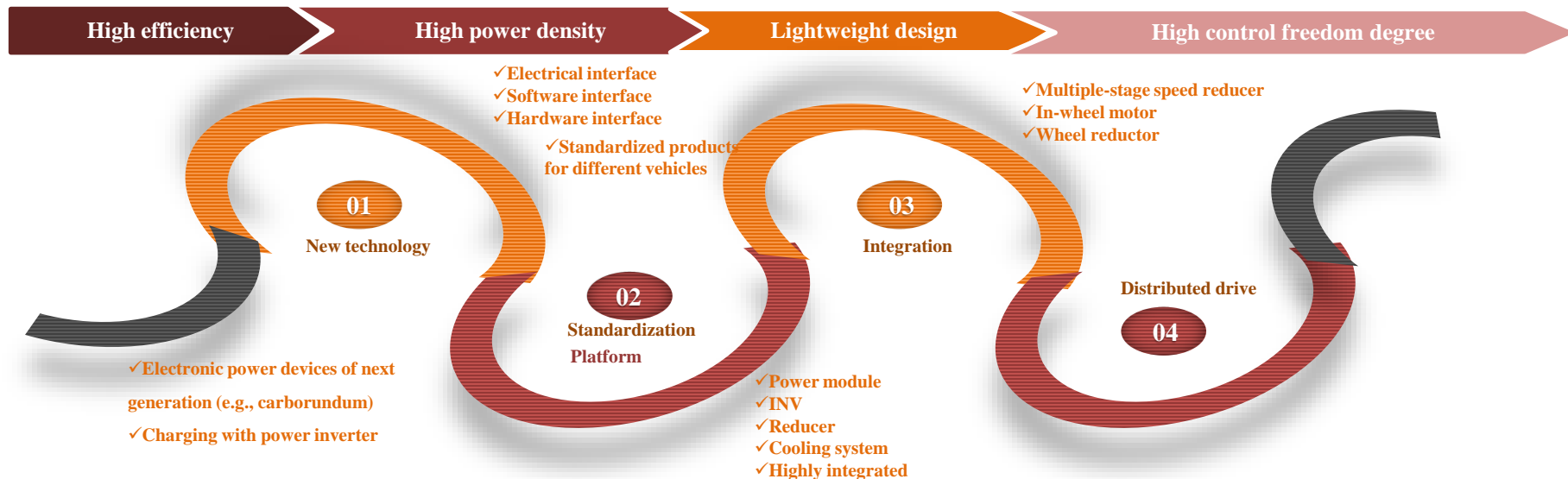
- ⇒ Organic solvent electrolyte
- ⇒ Polymer diaphragm
- ⇒ Lithium deposition on negative electrode surface
- ⇒ Security issues can not be solved in essence.

2030: New system of solid state battery

- ⇒ solid electrolyte
- ⇒ Electrolyte instead of diaphragm
- ⇒ Core safety is expected to improve in essence.

4 Electric Power System

- **Trends** : higher efficient, higher power density, lighter and have higher control freedom degree.
- **Methods**: new technology, standardization platform, integration, distribute drive.



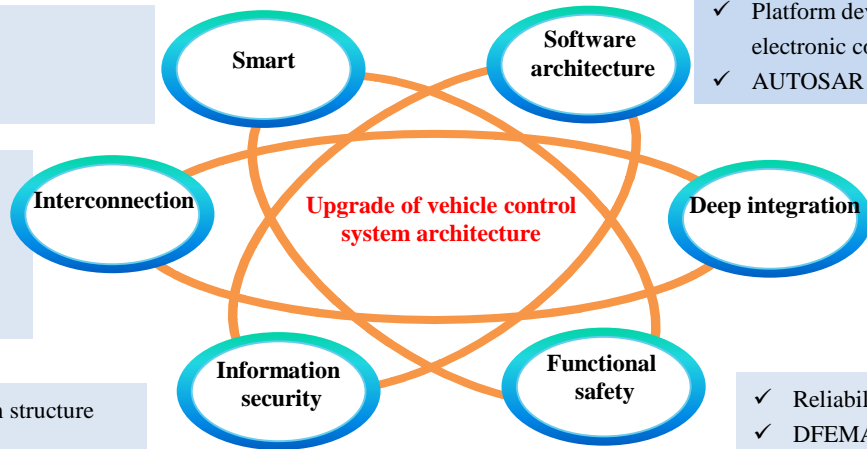
4 Electronic Control System

- **Integration**
- **Standards: AUTOSAR software architectures**
- **Safety: such as ISO26262**
- **Intelligent Functions will change the communication system.**

- ✓ Ambient intelligence
- ✓ Vehicle-mounted smart terminals
- ✓ Integrated control

- ✓ Human-vehicle interaction control
- ✓ V2V connection control
- ✓ Remote software update
- ✓ Remote control for user experience improvement

- ✓ New in-vehicle communication system structure
- ✓ Multi-gateway design



- ✓ Platform development and modularization of vehicle electronic control devices
- ✓ AUTOSAR software architecture

- ✓ Integration of battery, electric motor and electronic control
- ✓ Deep integration of vehicle control devices
- ✓ Improvement of EMC requirements

- ✓ Reliability and safety of coupling control system
- ✓ DFEMA and FTA analysis
- ✓ ISO26262 functional safety analysis

4 Intelligence and Interconnection

◆ The most innovative and potential technological trends

- The four stages : partial automatic driving (L2) , conditional automatic driving (L3) , highly automatic driving (L4) , fully automatic driving (L5)

	2017 Partial automatic driving (L2)	2020 Conditional automatic driving (L3)	2025 Highly automatic driving (L4)	2025+ Fully automatic driving (L5)
Intelligent development direction	ADAS Related configuration <ul style="list-style-type: none"> - Collision warning - Adaptive cruise - Automatic parking - Panoramic image - automatic emergency braking - Lane Departure Warning - Pedestrian collision warning 	Advanced driver assistance function <ul style="list-style-type: none"> - High speed Driving assistance -Automatic driving at low speed congested roads - intelligent optical path adjustment 	Automatic driving on specific sections <ul style="list-style-type: none"> -automatic driving at high speed sections -full automatic driving at low speed congested roads - Automatic valet parking. - automatic driving in closed Parks 	Fully automatic driving under different conditions <ul style="list-style-type: none"> - full road coverage of automatic driving capability

Interconnection and interoperability

Interior ecology

Peripheral perception

Smart city



Current

- large screen, HD display.
- Screen support multi touch and gesture control.
- Storage medium: vehicular hard disk
- 4G networking
- Mobile Internet
- Personality Mart
- remote charging and control
- natural speech recognition (local + cloud)



2018-2019

- one machine multi screen, dual system.
- HD display AVB and 3D images.
- Mobile Internet (carlife)
- remote upgrade (OTA)
- Dynamic Navigation
- intelligent peripheral hardware
- Vehicle interior and exterior photography
- Personalized customization service



2020-2025

- Gesture recognition technology
- 5GLTE communication technology
- Personal Assistant
- V2X function
- smart home, health and rescue
- Smart wearable based on Cloud Computing
- Cell phone call, automatic parking.
- front windscreen enhanced projection



2025+

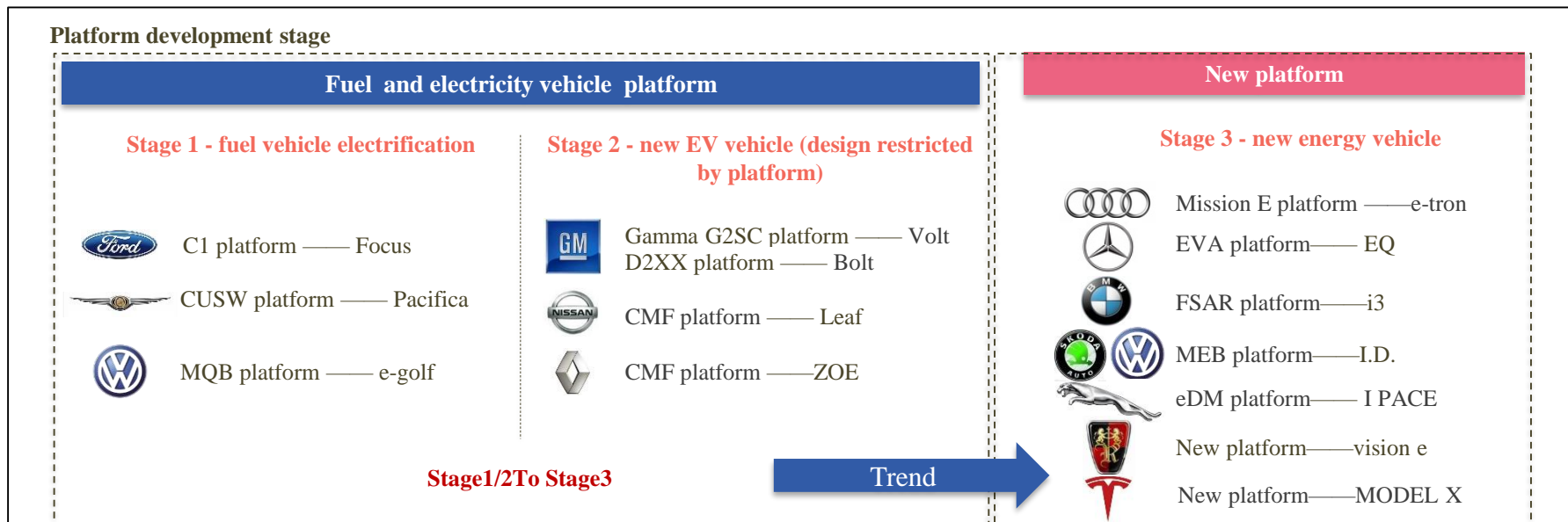
- Virtual Cockpit
- artificial intelligence cockpit
- Windscreen holographic projection
- AR enhanced display technology
- Intelligent interconnection safety cockpit
- value added services based on APP ecosystem

Development direction of interconnection

4 Specialized platform for EV

◆ New platform for NEV is a certain trend

- Platform can improve OEM product design level and increase their product development efficiency.



4 Styling diversification

- The appearance of NEV is developing to be diverse styles and unique shape, which makes the market segment to be further divided.

Crossover + **Sport moving** + **Large wheelbase** + **Short front and back suspension**



Sketch map - innovation : Benz f 015 luxury in motion
Concept Car

Sketch map - innovation : BMW vision next 100
Concept Car

Sketch map - Brand new model : ID CROZZ

Sedan car + Hatchback car + SUV + MPV



Conventional Sedan car + Conventional Hatchback car + Conventional MPV
+ **Cross car** + **Coupe Hatchback car** + **Cross Wagon** + **other Transboundary**

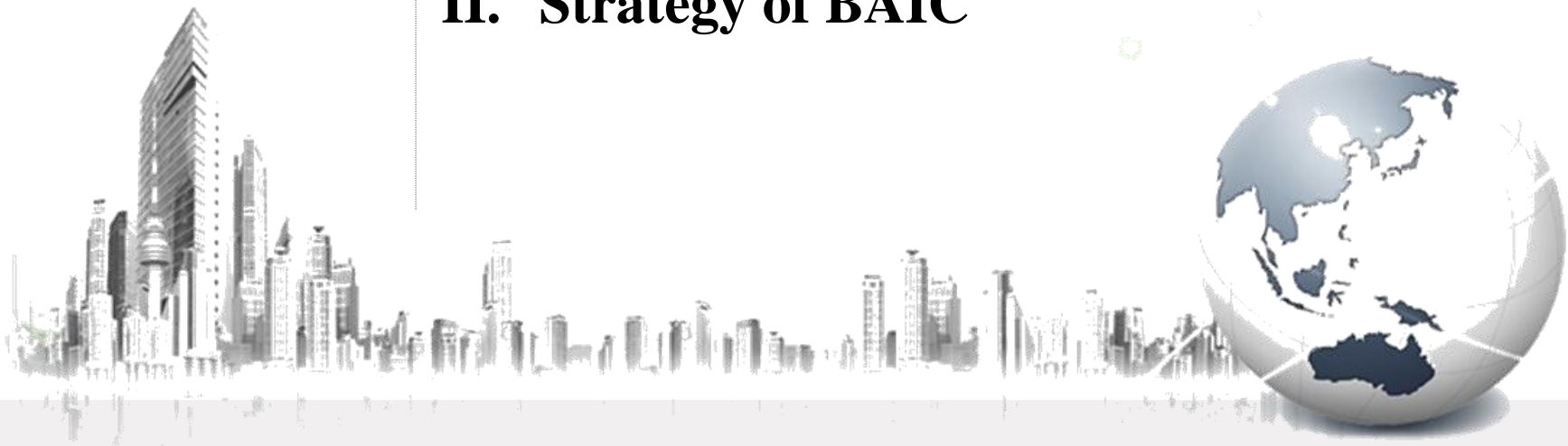
Summary

- The improvement of battery energy density and cycle life enable NEV to run “further”
- NCM and NCA will be more suitable for EV.
- With the improvement of system power and torque performance, NEV will be “faster”
- The electronic control system of the vehicles is becoming to be more integrated, smarter and more networked
- Intelligence and interconnection are the most innovative and potential technological trends.
- The Specialized platform of chassis for EV becomes a trend.
- The appearance of NEV is developing to be diverse styles and unique shape, which makes the market segment to be further divided.

CONTENT

I. New Environment and Technical Trends of NEV

II. Strategy of BAIC



◆ Overall new energy : product technology /product chain /service ecology

Product technology overall new energy	EV+PHEV+FCEV three-line simultaneous transformation.
Product chain overall new energy	Build a strong product chain of new energy vehicles, auto parts and service trade for BAIC.
Service ecology overall new energy	Green intelligent travel solution of "product + service + charging + operation“.

Strategic Decision- “2025 Strategy ” of BAIC

◆ “2025 strategy ” of BAIC: achieve a goal, create two world-top levels, and achieve three leaders

- **A goal:** BAIC becomes a domestic lead, world-top level company. The sales volume of NEV reaches China first and world's top three.
- **Build two world-top levels :** build a world-class new energy vehicle science and technology innovation center and a world-class new energy vehicle company.
- **Achieve three leaders**

Market leader

1 million 500 thousand vehicles

Technical leader

Three core technologies: battery, motor and electronic control, intelligence and interconnection, light-weight .

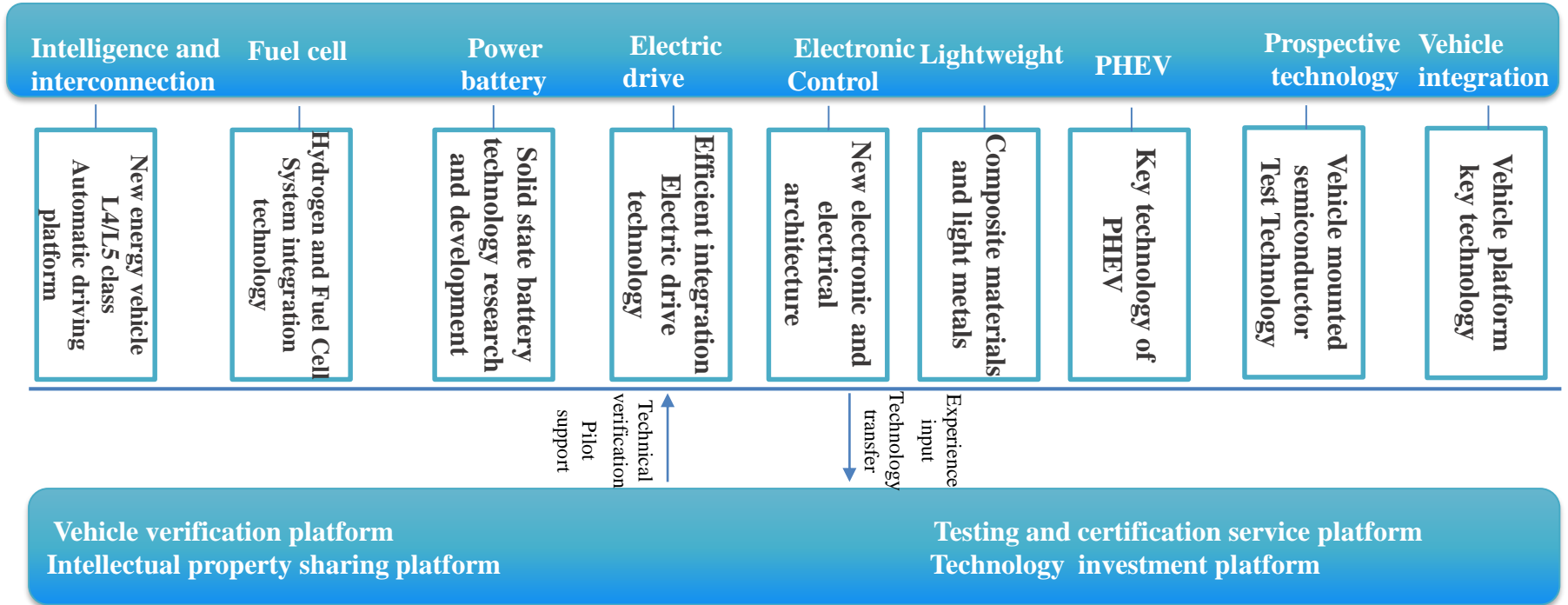
System leader

Green intelligent travel solution of "product + service + charging + operation"



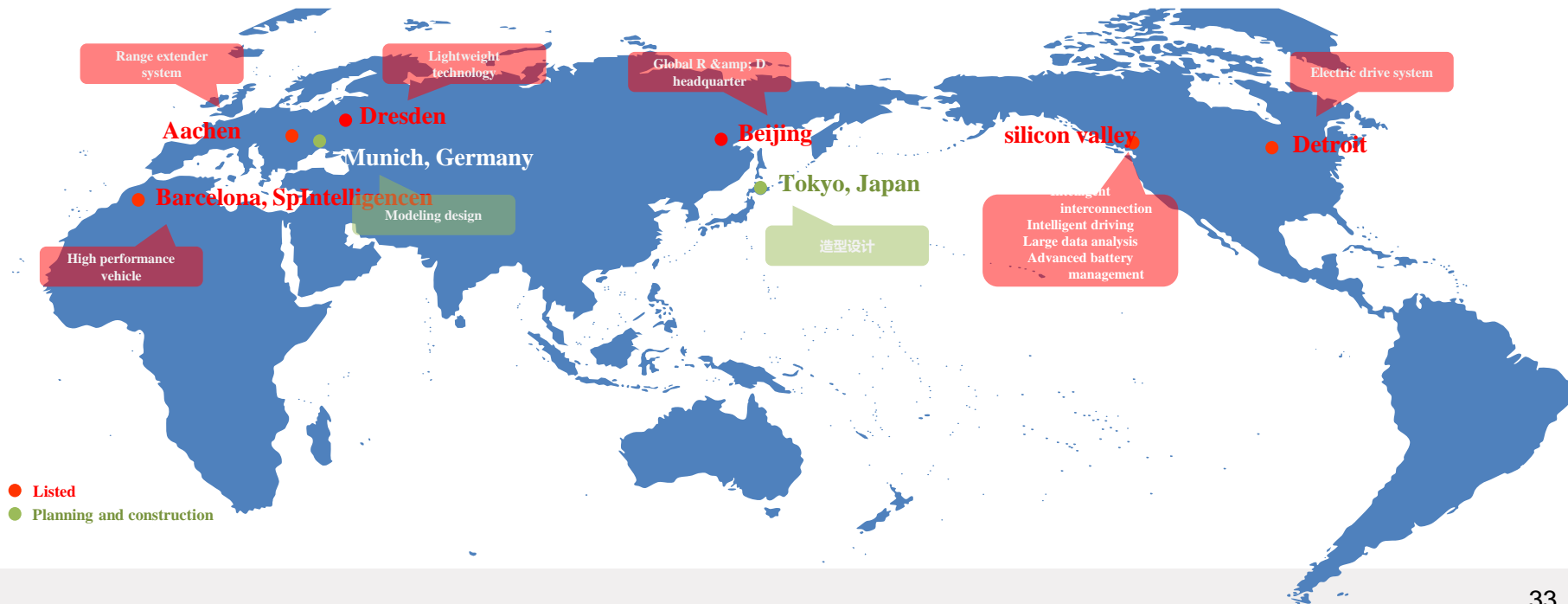
Strategic Plan- Domestic R & D Centers

◆ Planning and establishing 9 core R & D centers and 4 platforms



Strategic Plan-Overseas R & D Centers

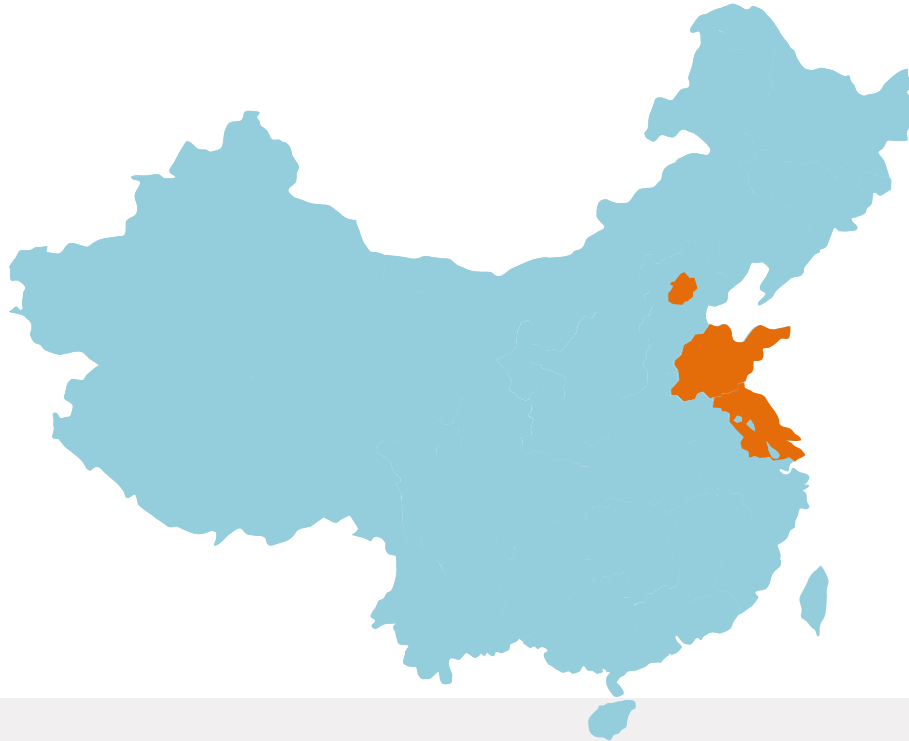
- ◆ Planning to set up 7 overseas R & D centers around the world
- Integrate global high-quality resources in battery, motor, vehicle development and design, and create a global leading new energy vehicle value chain.



2 Strategic Plan- Production

◆ Complete the "1+3+I+P" Plan

- The annual production capacity exceeds 800 thousand vehicles



$$1+3+I+P>80$$

1: Beijing headquarter Base

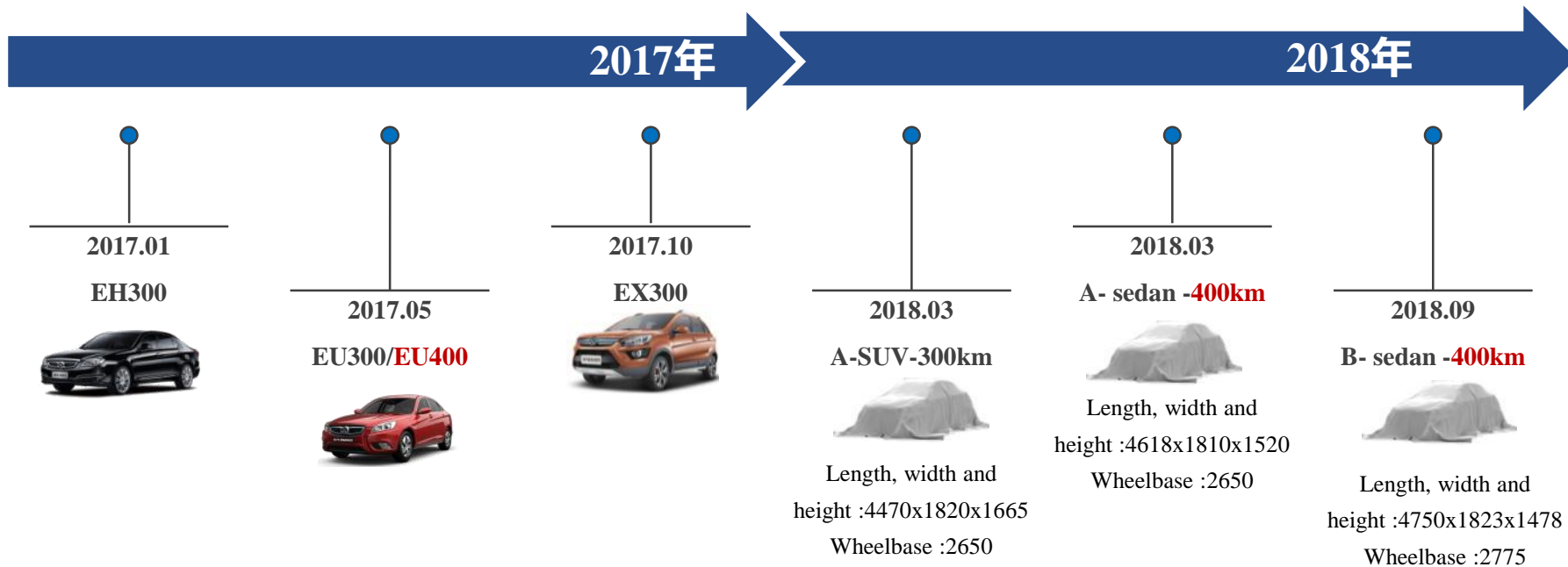
3: Domestic Base: Changzhou, Qingdao, Kunming

I: Internal production base from convention vehicle factory.

P: Partner resources such as Magna

2 Strategic Plan- Product Plan

◆ BAIC launched some more competitive new product by 2018.





THANK YOU!