

# **GAST Automotive Industry & Technology Research Report No. 785\_February 28, 2022**

**Subject: Deep Dive into the Latest Hot Issues in China's Auto Industry**

GAST Strategy Consulting, LLC

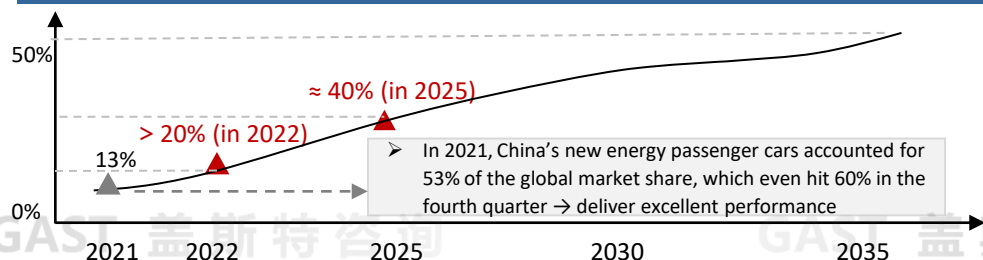
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## NEVs Develop Faster than Expected in China

- With a penetration rate approaching 15% in the Chinese auto market and a proportion of 53% in the global market, NEVs developed faster than expected in China where policies are becoming the key drivers → play a role in driving the sales of NEVs in the world

Forecast of the penetration rate of NEVs in China



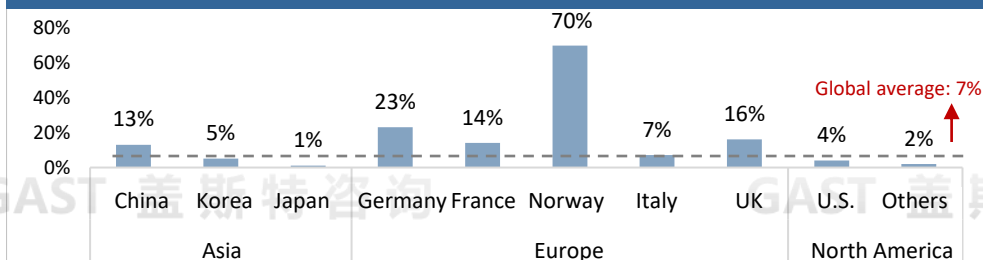
NEVs delivered better-than-expected market performance in China in 2021

- Substantial improvement of product power from the supply side + incentive policies + continuous improvement of relevant infrastructure + chip shortage → drive the penetration rate of NEVs to increase in 2021

Forecast of China's NEV market development in 2022

- The penetration rate of NEVs is expected to continue to increase and exceed 20% by the end of 2022

Penetration rate of NEVs by country in 2021



The penetration rate of NEVs in China: higher than the average but lower than that in major European countries

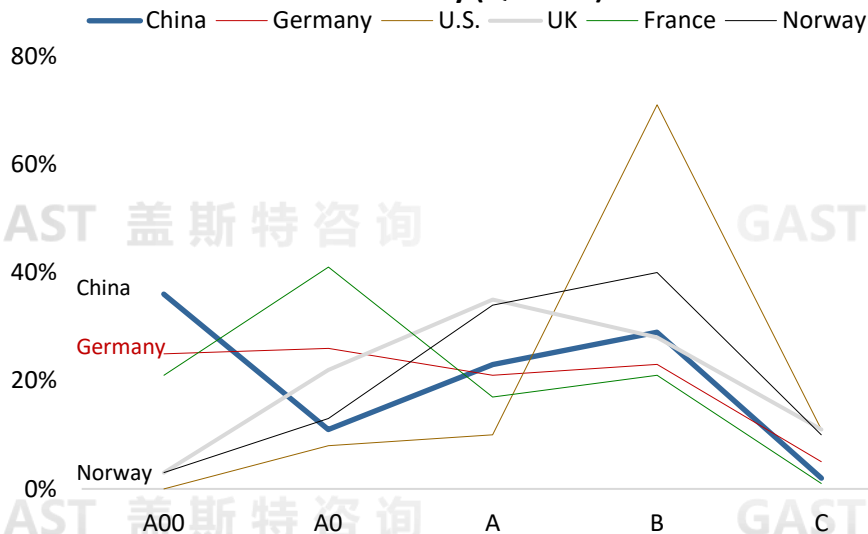
- The penetration rate of NEVs (13%) in China is higher than the global average (7%)
- The penetration rate of NEVs (13%) in China is much lower than that in Norway, as well as Germany, France, and the UK, but is higher than that in Japan, Korea, and the U.S.
- Tightening emission standards + more attention of the government → the penetration rate of NEVs is higher in Europe on the whole than China, while North America comes as the third

- ❑ Although NEVs develop rapidly in China, there is still a chasm in the penetration rate between China and European countries, especially Norway. Driven by the “30-60 Target”, NEVs will continue to replace fuel vehicles at a faster pace in China

## China's NEV Market Structure Will be Further Optimized

- Among the major battery electric passenger vehicle markets in the world, the European market maintains a good balance in the consumption structure, the Chinese market delivers a trend of polarization, while the U.S. consumers prefer medium and large vehicles

Product structure of battery electric passenger cars by country (Q4 2021)



### Performance of battery electric passenger cars in China

- Micro and midsize EVs are the mainstays in the NEV market in China, where consumers prefer high-end and low-end EV products
- Compared with the global market, A00-segment BEVs occupy the largest market share, while the A0- and A-segment vehicles occupied less market share → there is huge development space

### Forecast of battery electric passenger car market structure in China

#### Consumption upgrade and improved supply-demand structure → consumers shift their focus to higher-level products

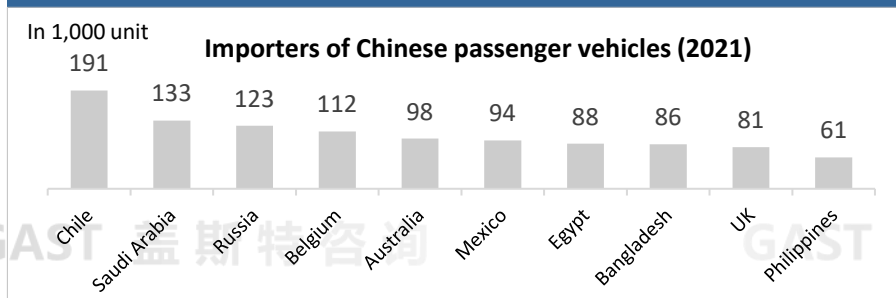
- With the supply of more A00-segment BEVs, the market segment will become gradually saturated and consumers will shift their focus to higher-class products (A0 & A segments)
- A-segment BEVs: see the largest development space; B-segment BEVs: maintain steady growth; Low-end A00-segment BEVs: a certain amount of demands

- Driven by private consumption, the sales of A-segment NEVs increased significantly in China in 2021, which also facilitated the increase of market share in the global market. However, there is still a chasm between China and European countries (Germany, Norway, etc.) → huge potential

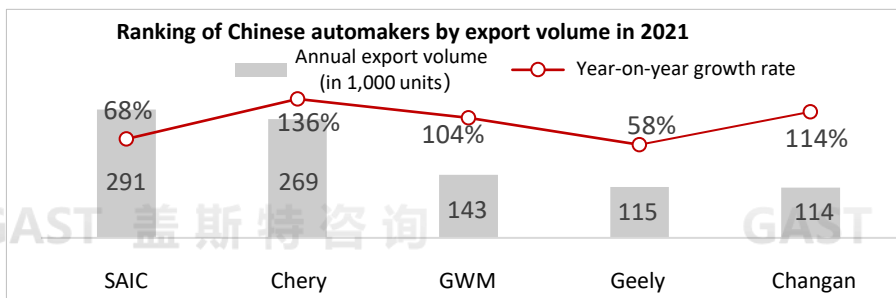
## China's Auto Exports Usher in a New Trend

- With the rising of Chinese homegrown brands, automotive OEMs are actively exploring overseas markets. When traditional OEMs such as SAIC and Chery are ramping up efforts in overseas markets, new automotive players also join the game

### Exports of Chinese passenger vehicles by country



- China's auto exports increased significantly in Europe and became the core growth point**
- The countries that import Chinese passenger vehicles: mainly including Chile, Saudi Arabia, Russia, and Belgium (each imported more than 100,000 units)
  - The suspension of production in foreign countries resulted in an increase in the import of Chinese passenger vehicles: a large increase in Chile, Belgium, Russia, UK, Mexico, etc. + European markets
  - A total of 310,000 NEVs were exported, up by 300% → become a key contributor to China's auto exports + a springboard for Chinese automakers to make inroads into markets in the developed countries



### SAIC topped the ranking of Chinese passenger vehicle exporters and Chery grew at the fastest speed

- MG brand is the major contributor to SAIC's passenger vehicle export, including ZS, HS, and MG5. More than 50,000 ZS (a small-sized SUV) were exported, which is popular in Thailand
- Having been making efforts in overseas markets for 20 years, Chery exports vehicles (mainly including ARRIZO 5, TIGGO 5x, and TIGGO 7) to 80 countries in the Middle East, South America, and Africa. The sales in overseas markets continued to increase
- The rapid expansion of the global EV market creates opportunities for China's NEV exports. New players such as NIO and XPeng are accelerating the deployment in overseas markets

- ❑ **China is paying more attention to building its national strength in the automotive industry than scaling up the sector. Riding the wave of NEV development, China's auto export will embrace a momentum of explosive growth**

## Removing the Cap on Foreign Ownership in Joint Ventures Creates New Situations in the Auto Market

- Since the cap on foreign ownership in joint ventures was removed, the market competition has become more flexible and free and some automakers attempt new joint venture partnerships

	Typical cases	GAST's analysis
Exit from joint ventures	<ul style="list-style-type: none"> <li>✓ Dongfeng exited from Dongfeng Yueda KIA</li> <li>✓ Mitsubishi Motors withdrew from Southeast Motor</li> </ul>	<ul style="list-style-type: none"> <li>✓ The joint venture is not operating well. Exiting from the joint venture, Dongfeng can collect funds to promote the R&amp;D of core products and enhance strength</li> </ul>
One side of the joint venture increases its shareholding	<ul style="list-style-type: none"> <li>✓ BMW increased its shareholding in BMW Brilliance</li> <li>✓ Volkswagen increased its shareholding in JAC Volkswagen</li> </ul>	<ul style="list-style-type: none"> <li>✓ Define the right to control of the joint venture, expand the investment layout in China, and obtain greater profits</li> </ul>
Acquire affiliated companies	<ul style="list-style-type: none"> <li>✓ GAC Honda acquired Honda China</li> <li>✓ Volvo acquired Daqing Volvo Car Manufacturing and Shanghai Volvo Car R&amp;D Center</li> </ul>	<ul style="list-style-type: none"> <li>✓ Integrate capacity and continue good market performance of popular vehicle models</li> <li>✓ Buying out the equity of the joint venture to pave the way for going list as a standalone entity</li> </ul>
Merge affiliated companies	<ul style="list-style-type: none"> <li>✓ Fold FAW Mazda's relevant business into Changan Mazda</li> </ul>	<ul style="list-style-type: none"> <li>✓ Deliver poor performance in product updates and sales as a secondary brand. The merger will facilitate the introduction, production, and sales of new vehicles models, thus increasing the overall profit</li> </ul>
Build additional joint ventures	<ul style="list-style-type: none"> <li>✓ JMC and Ford set up a joint venture</li> </ul>	<ul style="list-style-type: none"> <li>✓ Establishing new joint ventures can enable both sides to share products and technologies, thus accelerating the business expansion of passenger vehicles</li> </ul>

- Removing the cap on foreign ownership will allow Chinese and foreign automakers to develop more diversified cooperation modes, promote the development of Chinese brands, and drive the localization of foreign brands. However, such a move will bring certain pressure on traditional vehicles, but less impact on NEVs**

## Automotive Chip Crunch Will Continue to Vex Stakeholders in 2022

- The chip crunch was directly triggered by the COVID-19 + the imbalance between supply and demand in the industry → influencing factors are disappearing + market sentiment is improving → a silver lining

### Direct influencing factors of the chip crunch are dissipating

- **Damaged capacity is gradually recovering**
  - ✓ Improved epidemic response mechanisms + dissipated impact of the pandemic → the idle factories are getting back to business
- **The supply and demand sides are making active response**
  - ✓ Automakers: remove some configurations temporarily and improve product mixes; chipmakers: tap the potential capacity
- **Reduce the crowding-out effect of production capacity**
  - ✓ Global economic recession → the demand for electronic products decreased → chipmakers shift the focus to automotive business

### Divided in market views, optimists are more well-founded

- **Optimists: chip crunch will get mitigated in the second half of 2022**
  - ✓ Major OEMs: take General Motors for example → actively seek solutions, face up to risks and make accurate decisions
  - ✓ New automotive chipmakers: like Qualcomm → focus on products that adopt high-performance chips or use a smaller number of chips → less impacted by the chip crunch
- **Pessimists: chip crunch will last longer (2022~)**
  - ✓ Traditional automotive chip vendors: such as Infineon → focus on producing low- and medium-end chips → heavily hit by the chip crunch (likely to overstate the shortage of chips for the purpose of raising product prices)

**In a short term: vehicle models under production will be less impacted by the chip crunch in the second half of 2022**

**In the long term: the increase in chip demand triggered by intelligence and electrification will outpace the increase in production capacity → there will always be pressure on securing the chip supply**

#### Supply

- ✓ It takes a long time to build and verify chip production lines + a plant will not realize the maximum capacity until several years later after the construction
- ✓ Affected by international trade disputes, global chip resource cooperation and circulation will continue to be curbed

#### Demand

- ✓ Electrification and intelligence result in a rapid increase in the demand for power management chips, display chips, MCUs, and so on. The chips required by an intelligent vehicle are far more than that of a traditional vehicle

- ❑ **In the long run, it is the increase in the demand for chips caused by intelligence and electrification that may contribute to chip shortage in the future → the stakeholders should have a correct understanding and make active responses**

## Structural Shortage of Power Batteries Drives Enterprises to Improve Layout

- The substantial increase in the demand of downstream players in the industrial chain has driven the prices of raw materials of power batteries to rise sharply, and related enterprises start to seize upstream resources and explore new battery technologies and systems

Global reserves of upstream resources are sufficient to support the development of EVs until 2030

- ✓ Core materials such as lithium and manganese: there will be no shortage for quite a long time
- ✓ Cobalt resources: meet the demand in the short and medium term, but may be in short supply after 2030

Enterprises master key mineral resources for the sake of operational safety and market competition

- ✓ Cost control: with limited resources and rising costs, holding upstream raw materials in their hands will make it easier for enterprises to gain cost advantages
- ✓ Supply security: secure the supply of resources and prevent competitors from limiting production capacity by controlling upstream resources

Resource constraints will persist, requiring diversified solutions for improvement

Establish a resource recovery and recycling system  
Lithium, manganese, cobalt and many other resources can be recycled after recovery

Explore new battery technologies + build new systems  
Reduce the application of precious metals with insufficient resource abundance and breadth

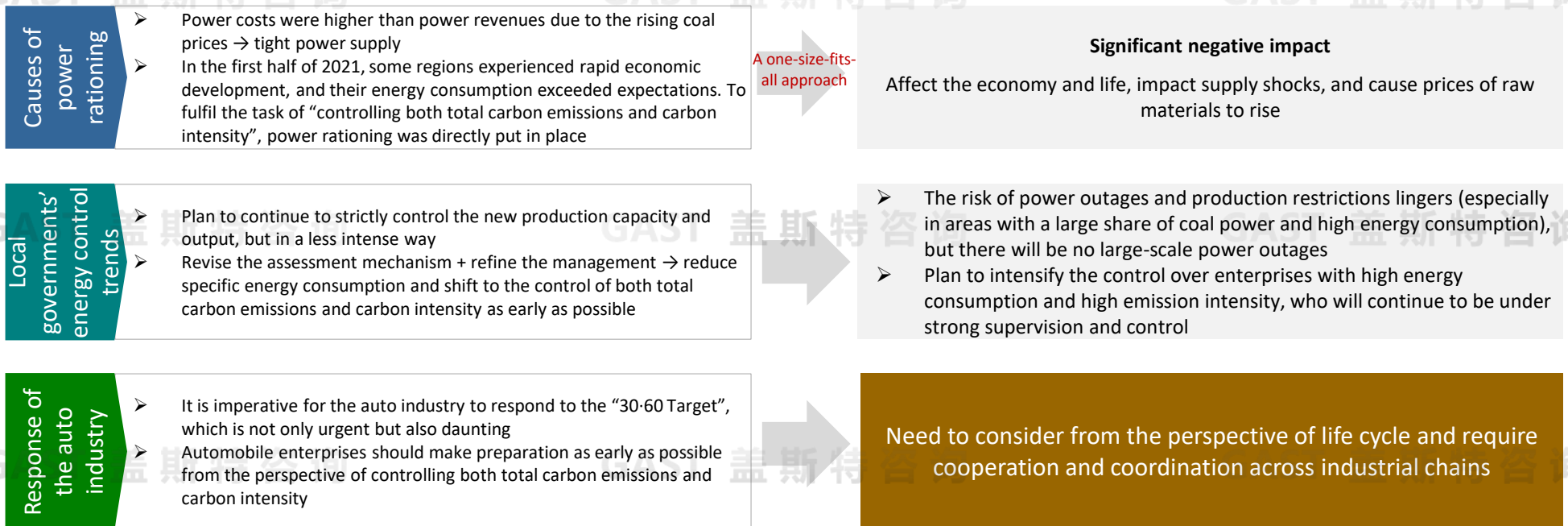
Develop intelligent and digital processes  
Reduce the waste of resources in the production process and improve the efficiency of resource utilization

- ❑ **From the capital and technology perspectives, it is necessary for automakers to make deployment of power batteries as a core component of NEVs, but they should ease the burden of batteries as a kind of heavy assets**



# Power Rationing Rings the Alarm Bell for the Auto Industry to Respond to the “30-60 Target”

- Power rationing in many parts of China have led to crises in many supply chains, sounding an alarm to China’s auto industry



- Automakers should make preparation as early as possible to respond to the “30-60 Target”, which will help them avoid risks on the horizon, peak carbon emissions, and go carbon neutral



## Battery Swapping for NEVs Embraces Windows of Opportunity in China

- As an efficient way to replenish energy, battery swap has stark advantages in some scenarios. There will be business opportunities, but the market potential should not be overstated

NEVs develop better than expected + the government continues to issue incentive policies → the battery swap model gains great attention in the market

- In 2021, the development of the NEV market exceeded expectations, and the penetration rate of NEVs came at an inflection point, stimulating the battery swap market
- Policy regulations (product subsidies, product certification, etc.) + industry standards (technical safety, shared battery swap, etc.) continued to be introduced, advancing the battery swap model

- In January, the new policy on subsidizing the promotion of NEVs clarified that vehicles which support battery swap are not subject to the threshold of 300,000 CNY selling price
- In March, the government work report again stressed the construction of infrastructure such as battery swapping stations
- In October, the MIIT officially launched pilot projects for battery swapping service, including piloting the comprehensive application in eight cities including Beijing and the application to heavy-duty trucks in Yibin and other two cities
- In November, the first national standard *Safety Requirements of Battery Swap for Electric Vehicles* officially came into force
- In December, the first group standard *Specification for the Construction of Shared Battery Swapping Stations for Electric Passenger Vehicles* was officially released

### There are challenges in promoting the battery swap model on all fronts

- OEMs compete to have the dominance → difficult to orchestrate various battery standards
- High cost and low utilization of battery swapping stations → hard to break even in a short term
- Charging infrastructure is increasingly accessible → the problem of difficult charging is gradually addressed

### Forecast of development trends

- ✓ Enterprises **should not be blindly optimistic** about the battery swap. In terms of encouraging battery swap, China mainly aims at solving the problem of slow and difficult charging, thus promoting the development of BEVs
- ✓ It is difficult to formulate an **industry-wide unified** standard for battery swap → the battery swap model may have a promising future for business customers, while only a handful of individual users are willing to have a try

- ❑ **With time-consuming charging and inconvenient access, the battery swap model can be suitable for some use cases, whose potential should not be overstated. In addition, it should also not be regarded as the major mode in the future**

## Autonomous Driving in China Moves into a New Era

- Volume production and large-scale adoption of LiDAR products + robotaxi craze → indicate steady development of advanced autonomous driving in China

### Challenges & bottlenecks for commercializing AD technology

- **No returns on investment for a long time:** stalled commercialization of AD technology
- **Slow technology advance:** stranded in the stage of address long-tail problems by accumulating data
- **Frequent AD-related traffic accidents:** increasing doubts of the public about AD technology

### Strong support from the government

- Actively promote the construction of smart cities + introduce numerous AD projects + encourage pilot application, running, and pilot operation of autonomous vehicles
- Define the technology pathways + accelerate the formulation of regulations & standards and the construction of infrastructure

### Persisting R&D efforts of enterprises

- Build a closed loop of data to continuously improve algorithms
- Automakers forge cooperation with tech companies and startups on ecosystems and leverage each other's strengths to facilitate product development

### In 2022: accumulation of quantitative changes → explosive growth

- **Large-scale adoption of LiDAR sensors:** Xpeng P5, WEY-branded Mocha, and AcrFox Alpha S have been delivered to users, with more than ten vehicle models armed with LiDAR sensors to hit the market in 2022
- **Launch trial operations of robotaxi:** Pony.ai, Baidu, and SAIC Mobility launched robotaxi service projects in Beijing, Shanghai, etc.

- **As the top key role, the Chinese government plays a basic role in boosting the rapid development of autonomous driving**

## Tap Regional Advantages and Local Ecosystems to Develop AD Technology

- Chinese enterprises need to gradually build up confidence in the autonomous driving technology pathway → truly become pioneering leaders in the game

Smart vehicles of tomorrow will definitely be regional products based on use cases and data → need to feel for technology pathways via practice

### Only use cameras (like Tesla)

- ✓ **Cost performance:** cameras will have lower costs than LiDAR sensors, regardless of technology advance
- ✓ **R&D capability:** Tesla's in-house developed chips are better matched with visual perception technology, enabling software and hardware to better work in a coordinated manner
- ✓ **Regional characteristics:** the road conditions in the United States are much simpler + using cameras can basically meet all needs

Chinese automakers  
find it hard to respond  
to complex road  
conditions in China  
only via cameras

### Adopt LiDAR sensors (like some Chinese automakers)

- ✓ **Cost performance:** with slightly higher costs, LiDAR sensors can deliver marked performance
- ✓ **R&D capability:** Chinese automakers have forged good partnerships with local tech companies, closely integrating technological capabilities with resources
- ✓ **Regional characteristics:** products driven by foreign data may not be suitable for China; it is necessary to develop technologies in China

Chinese automakers' trial of new technologies manifested their capabilities to develop new technologies and products, as well as advantages in local ecosystem resources

Chinese automakers should not fear the technologies or products developed by foreign rivals and have faith in the regional characteristics and local R&D advantages for developing smart vehicles

- **Rely on local uses cases, data, and ecosystem resources to develop autonomous driving products that can meet needs of local users → Chinese automakers have great potential and opportunities to lead the pack in the field of smart vehicles**

## China Should be More Inclusive to Autonomous Driving

- Becoming a leader in the innovation of autonomous driving necessitates some risks and costs → the Chinese government ought to accelerate the formulation and improvement of relevant regulations to promote AD technology advance

**Germany was the first to release a license for L3 autonomous driving, which not only indicated technology advance, but also progress in government governance**

- **Mercedes-Benz & Honda:** have strong faith in their L3 autonomous driving technologies + dare to undertake any potential business risks and brand risks

- **Germany:** bold to undertake risks and take the lead when others are confused about challenges from L3 autonomous driving

**Many Chinese automakers now face regulatory roadblocks**

- ✓ Some players have developed L3 autonomous driving technologies, which can only be used as L2.9 at present → hard to accumulate data via real-world road testing, let alone creating value → unfavorable for business benefits and technology development

**China should be bold to take a step to allow L3 AVs to run on roads**

- ✓ There will always be long-tail problems of autonomous driving, which can only be reduced by continuous testing and improvement → **if the Chinese government continues to hesitate, it may lag behind other countries in terms of technology advance**

- ❑ **The advance in autonomous driving technology represents the development of productivity. Becoming more inclusive to formulate policies and regulations, the Chinese government aims to address the problems of productive relations that may hinder the development of productivity**



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## Company Profile

Setting its foothold in China automotive industry, GAST Strategy Consulting, LLC is oriented to the globe to focus on the ecosystem of the whole automotive industry and starts from three dimensions (industry, enterprise and technology) to carry out in-depth study on strategy design, business positioning, management improvement, system building, business process reengineering, product planning, technology choices and business models. It is dedicated to providing governments at all levels with decision-making support and implementation advice and enterprises in the automotive industry chain and relevant industries with all-dimensional high-level professional consulting services in strategies, management and technologies. Since the establishment, GAST is dedicated to becoming a world top auto think tank as the vision and sharing wisdom as the mission. Adhering to creating value for clients and focusing on actual effects, GAST commits itself to forging long-term partnership and providing guidance service. It has fostered strategic partnership with and is providing services for nearly 100 domestic and international enterprises, organizations in the automotive industry and governments at all levels by virtue of comprehensive, systematic, advanced and pragmatic consulting methods.

## Range of Service

Provide diversified and open services and flexible ways of cooperation for customers, including but not limited to:

- Executive-oriented strategy, management and technology consulting services
- All-round and customized special project research: covering macro strategy, industrial development, interpretation of policies and regulations, the internet, business models, corporate strategy and management, auto market, product research, product design methodology, research on auto shows, interpretation of forums, energy conservation and emission reduction, new energy vehicles, intelligent vehicles and comprehensive automotive technologies
- Serve as reliable resource that can win customers' long-term dependence and provide open cooperation that can meet customers' specific requirements at any time
- Provide a high-end sharing platform (CAIT) for industrial communication, exchange and in-depth research
- The company provides nearly 1,000 research reports in Chinese, English and Japanese at present

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