



中国中车  
CRRC



# China HST Technology Development and Innovation

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1

HST development achievements

2

HST development history

3

HST innovation outlook



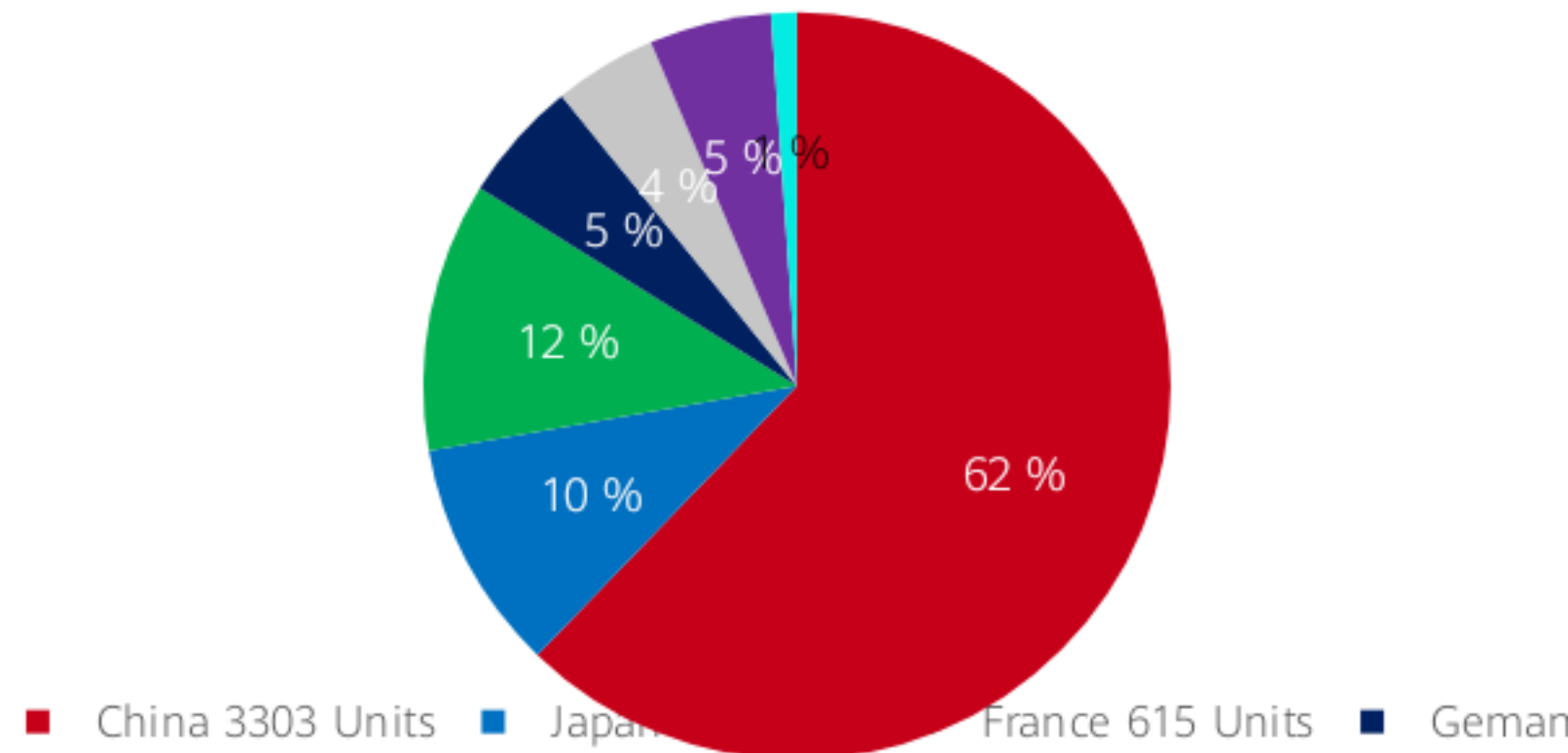


# HST development achievements

## 1. Operating scale No. 1 in the world

- Daily operation of 2,250 pairs.  
Beijing-Shanghai daily 353 train sets,  
tracking interval 5 minutes
- Operating on "four vertical and four  
horizontal" mainline network and aiming  
for larger "eight vertical and eight  
horizontal" network.
- Covering all provinces except for Tibet, inner Mongolia and Ningxia, and connecting most of the million population cities.

Inventory estimation of high-speed EMU worldwide





China accounts for more than 60% of the world high-speed EMU market inventory

# HST development achievements

## 2. The richest product family in the world

35 CRH train models, speed range 160~350km/h, applied on existing speed raising, intercity and passenger railway lines, covering different application environment, vehicle arrangements and purposes.

### China high-speed EMU product family

200~250km/h		300~350km/h		Comprehensive monitoring train		Intercity EMU	
CRH1A/B/E		CRH2C-1/2		CRH2J		CRH6A	
CRH1A-A/E revised		CRH3C/L		CRH5J		CRH6F	
CRH2A/B/E		CRH380A/AL/magnet		CRH380AJ		CJ2	
CRH2G/E revised		CRH380B/C RH380BL/CL CRH380BG		CRH380BJ		CJ3	
CRH3A		CRH380D		CRH380BJ-A(high cold)		CJ5	
CRH3G		CR400AF		CRH380AM		CJ6	
CRH5A/G/E		CR400BF					



# HST development achievements

## 3. Operation experiences in complicated environment

Through years' innovation and practice, the adaptability problems have been solved for various harsh environment, building the capability to challenge complicated application conditions worldwide.

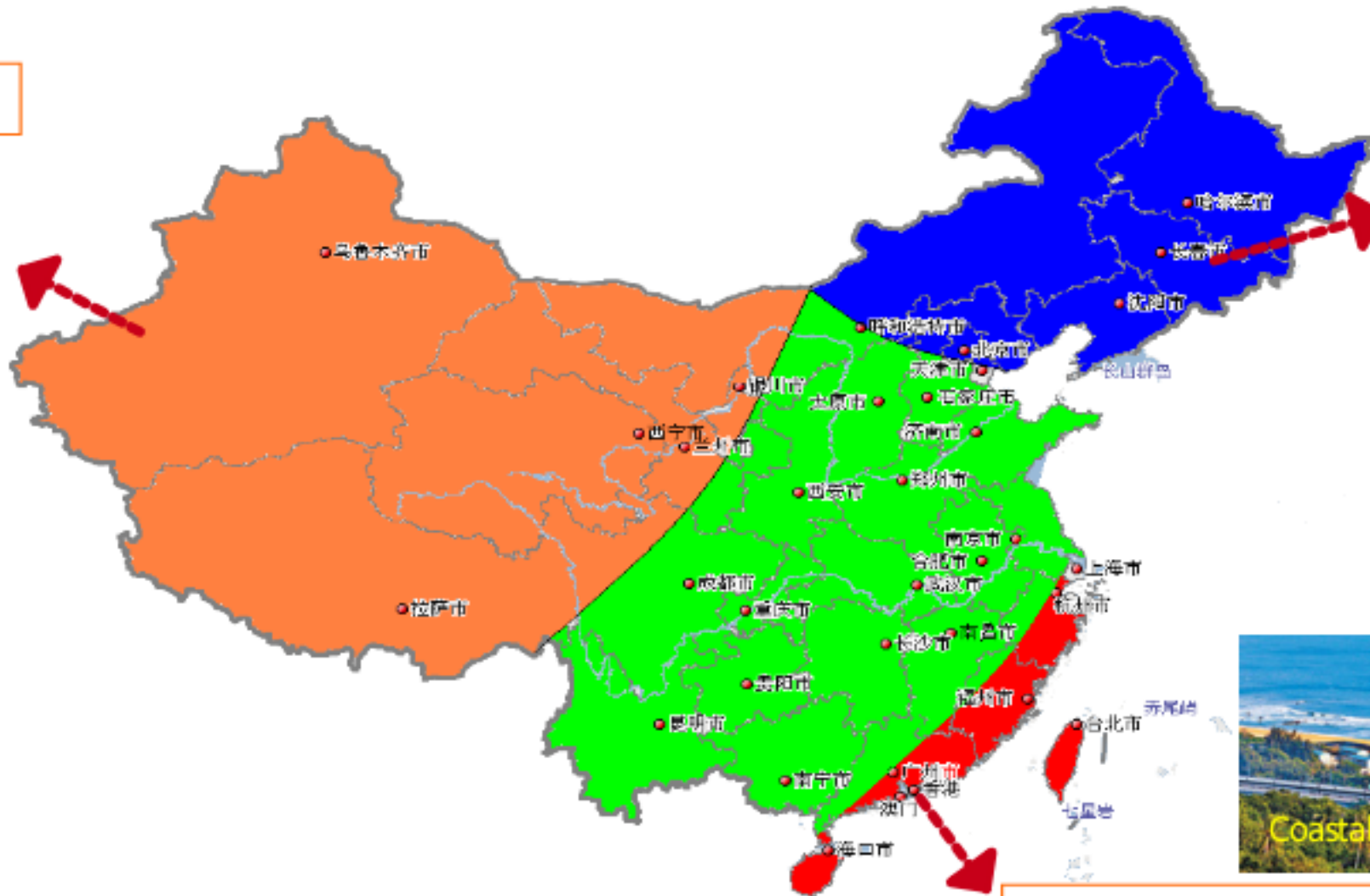
Windy area



High cold area



High temperature, high humidity, high corrosion area



# HST development achievements

## 4. World top level comprehensive specifications

Operation speed, comprehensive comfortability, reliability, safety, energy-saving, environmental protection and other comprehensive indexes are excellent. Some indexes are international advanced and created several world records.



2010.12.03



2016.07.15

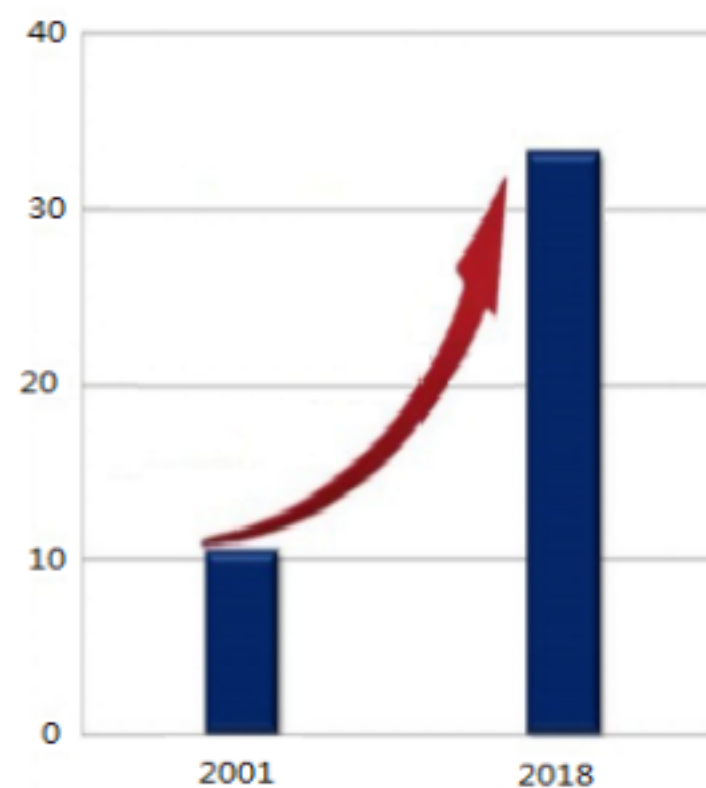


Challenge impossible program



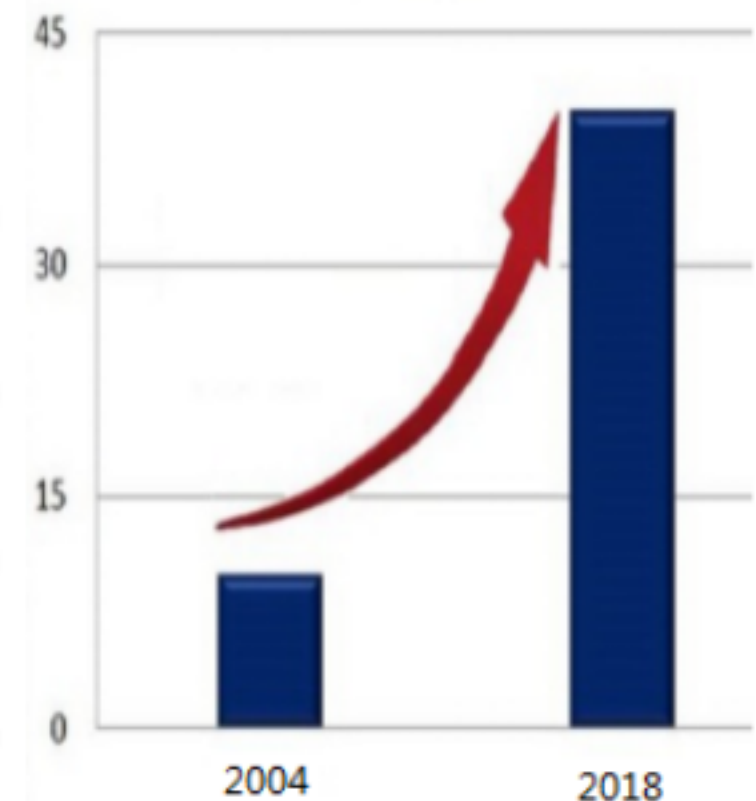
# HST development achievements

## 5. Huge social and economic benefits



2018年铁路输送旅客达33.7亿人次，较2001年增加3.5倍，动车组占60.4%

In 2018, railway passenger volume reached 33.7 billion, increased 3.5 times than in the year 2001, CRH train accounting for 60.4%.



客货分离，2018年铁路货运约40亿吨，是2004年的4倍

After separation of passenger coach and freight wagon, the railway freight volume reached 4 billion tons in the year 2018, is 4 times larger than in the year 2004.

中国高铁正在改变人们出行理念、生活方式和社会结构，成为**中国新名片**。

China HST is changing people's travel concept, lifestyle and social structure, and becomes a new **business card of China**.



1

HST development achievements

2

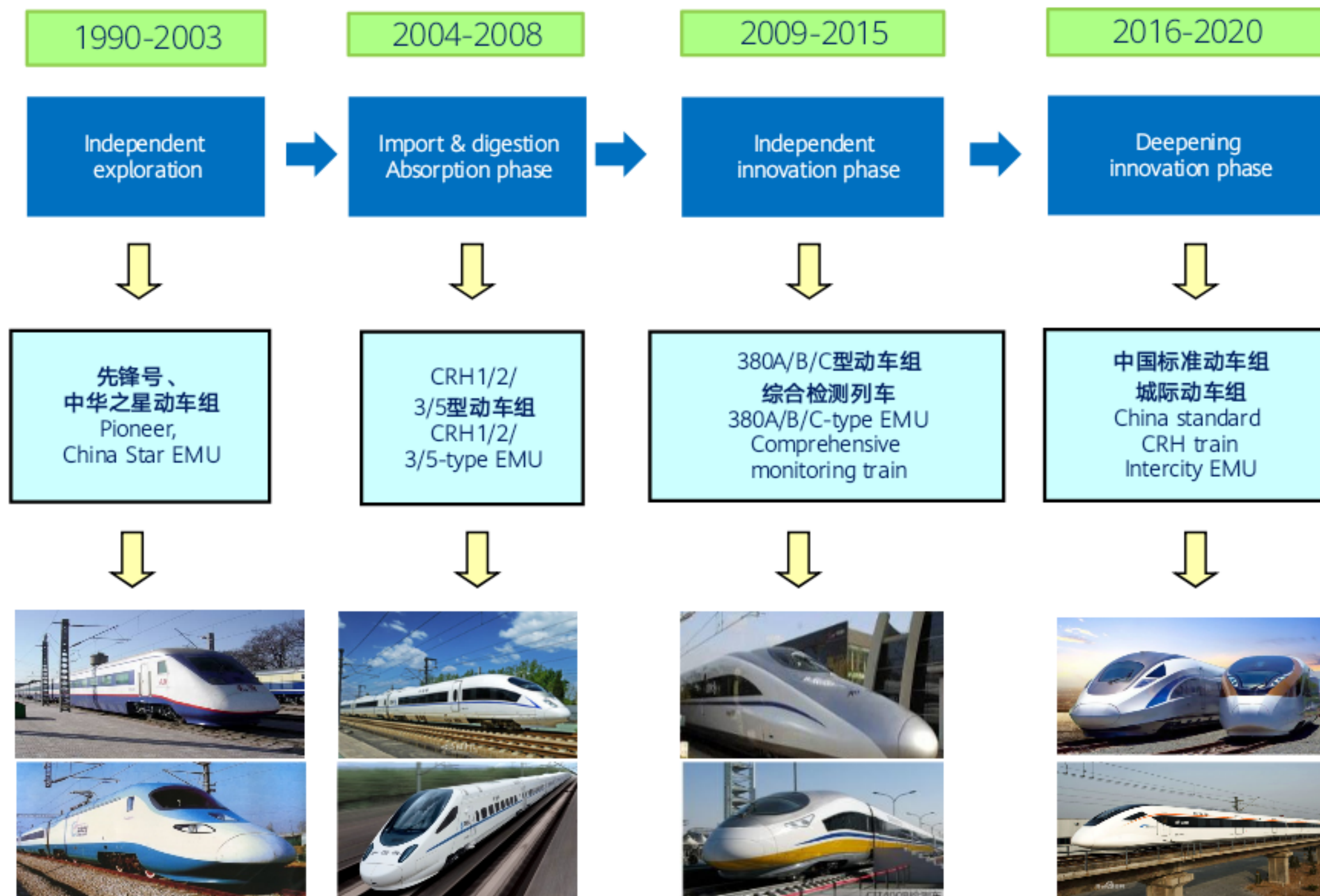
HST development history

3

HST innovation outlook



# HST development history



# HST development history - Independent exploration

## Roadmap

1990 → 1994 → 1998 → 2003

MOR completed "the Report on the project conception of Beijing-Shanghai high-speed railway line"

the State Council approved the pre-feasibility research of Beijing-Shanghai high-speed railway line

the trial speed on Zhengzhou-Wuhan line reached up to 240 km/h

Qinhuangdao-Shenyang passenger line with design speed of 200km/h and total length of 405km started official operation and became the first fast passenger special line

## Train

1996 → 1999 → 2000 → 2001 → 2002

leased X2000 train for Guangzhou-Shenzhen line

developed 200 km/h "Shark" EMU

"Blue Arrow" EMU running on Guangzhou-Shenzhen line

developed 200 km/h "Pioneer" EMU

developed 270 km/h "China Star" power concentration EMU



Shark 223.2km/h



Blue Arrow 235.6km/h



Pioneer 292.8km/h



China Star 321.5km/h



# 高速列车发展历程-引进消化

HST development history - Import and digestion



Regina  
(Bombardier)



CRH1 EMU  
(Sifang-Bombardier)



E2-1000  
(Kawasaki)



CRH2 EMU  
(Sifang)



Velaro-E  
(Siemens)



CRH3 EMU  
(Tangshan)



SM3  
(Alstom)



CRH5 EMU  
(Changchun)



# 高速列车发展历程-引进消化

## HST development history - Import and digestion

在前期运营阶段，中国**积累**了大量宝贵的经验与技术，为后续的高速列车**自主创新**打下了坚实基础。

In the early operation stage, China **has accumulated** rich and valuable experience and technologies, laying a solid **foundation** for the later **independent innovation** in HST.

### 京津城际运营

#### Beijing-Tianjin intercity operation

线路全长120公里，通过运营维护和故障处理，初步建立了运维技术体系，同时进一步掌握了高速动车组的设计原理。

Total Length of 120km. The technology system of operation and maintenance was preliminarily established through operation maintenance and fault processing, which also contribute to mastering the design principles of high-speed EMU.



### 武广、郑西客专运营

#### Wuhan-Guangzhou, Zhengzhou-Xi'an passenger line operation

武广客专线路全长1069公里，共有隧道226座，通过列车的服役性能研究，验证了复杂环境列车的运营性能；郑西客专线路全长505公里，验证了湿陷性黄土区等特殊环境列车的运营性能。

The Wuhan-Guangzhou passenger line is 1,069km long including 226 tunnels. The train service performance study has verified the train operation performance under complex environment. The Zhengzhou-Xi'an passenger line has a total length of 505km, whose operation has verified the train operation performance under special environment including collapse loss area.





# 高速列车发展历程-自主创新

HST development history - Independent innovation

形成了我国高速列车技术体系及产品系列

China's high-speed train technology system and product series



CRH380AL



CRH380BL



CRH380CL



综合检测列车  
Comprehensive  
monitoring train



CRH380A/B/BG



综合检测列车  
Comprehensive  
monitoring train

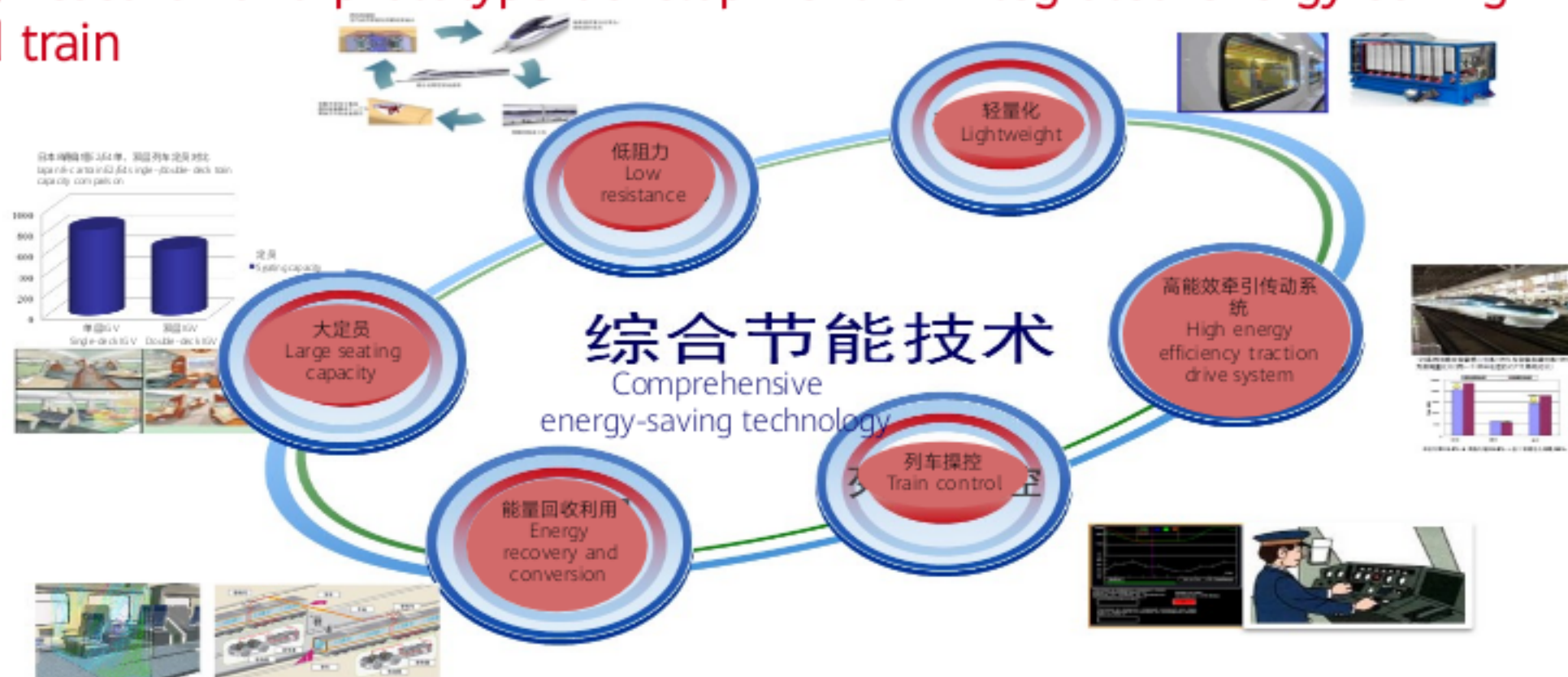


# 高速列车发展历程-深化创新

HST development history - Deepening innovation

## 综合节能高速列车技术研究和样车研制

Technology research and prototype development of integrated energy-saving high-speed train



研制了时速500公里试验列车，为探索更高速度条件下高速列车的安全性、舒适性、经济性、节能环保等性能研究创造了条件。

Developed 500km/h test train, created conditions for the security, comfortability, economical efficiency, energy-saving and environmental protection performance research of high-speed trains under even higher speed.



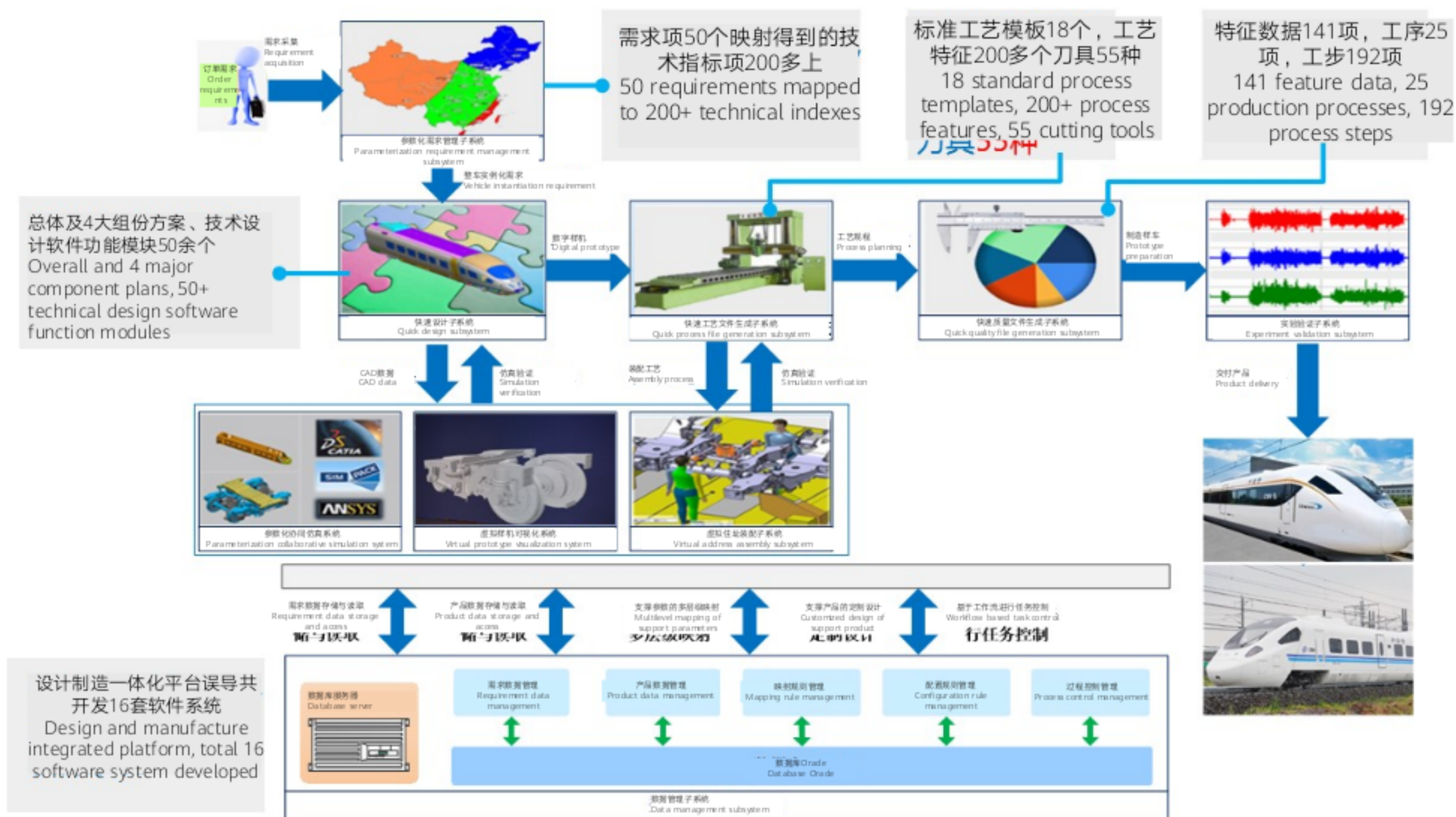


# 高速列车发展历程-深化创新

## HST development history - Deepening innovation

### 谱系化高速列车技术研究和样车研制

### Technology research and prototype development of high-speed train in serialized form





# 高速列车发展历程-深化创新

## HST development history - Deepening innovation

### 运营时速350公里中国标准动车组

### China standard EMU with operating speed of 350km/h

中国国家铁路集团有限公司牵头中车等相关企业，研制运营时速350公里中国标准动车组，深化自主创新力度，实现简统化及互联互通，完善中国高速动车组标准体系。

China National Railway Group Co. Ltd. leading CRRC and related enterprises developed China standard EMU with operating speed of 350km/h, which has deepened the independent innovation extent, realized simple and unified standard and interconnection and interworking, and consummated China EMU standard system.





1

HST development achievements

2

HST development history

3

HST innovation outlook



## HST innovation outlook - Technology development trend

$$\begin{array}{c} \text{Public transport} \\ \text{applicability index} \end{array} = \frac{\begin{array}{c} \text{Safety} + \text{Capacity} + \text{Humanity} + \dots \end{array}}{\begin{array}{c} \text{Time} + \text{Emission} + \text{Cost} + \dots \end{array}}$$

装备与城市公  
共交通适用性  
的性能要素  
Performance  
factors of  
equipment and  
urban public  
transport  
applicability

安全= $f$  (导向, 结构强度, 智能安全, ...)

Safety =  $f$  (steering, structural strength, intelligent security, ...)

运量= $f$  (定员, 轴荷, 间隔时间, ...)

Capacity =  $f$  (seats, axle load, interval, ...)

人文= $f$  (旅客界面, 城市景观, ...)

Humanity =  $f$  (passenger interface, city view, ...)

时间= $f$  (旅行速度, 停靠时间, ...)

Time =  $f$  (travel speed, stopping time, ...)

排放= $f$  (废弃物, 噪声, ...)

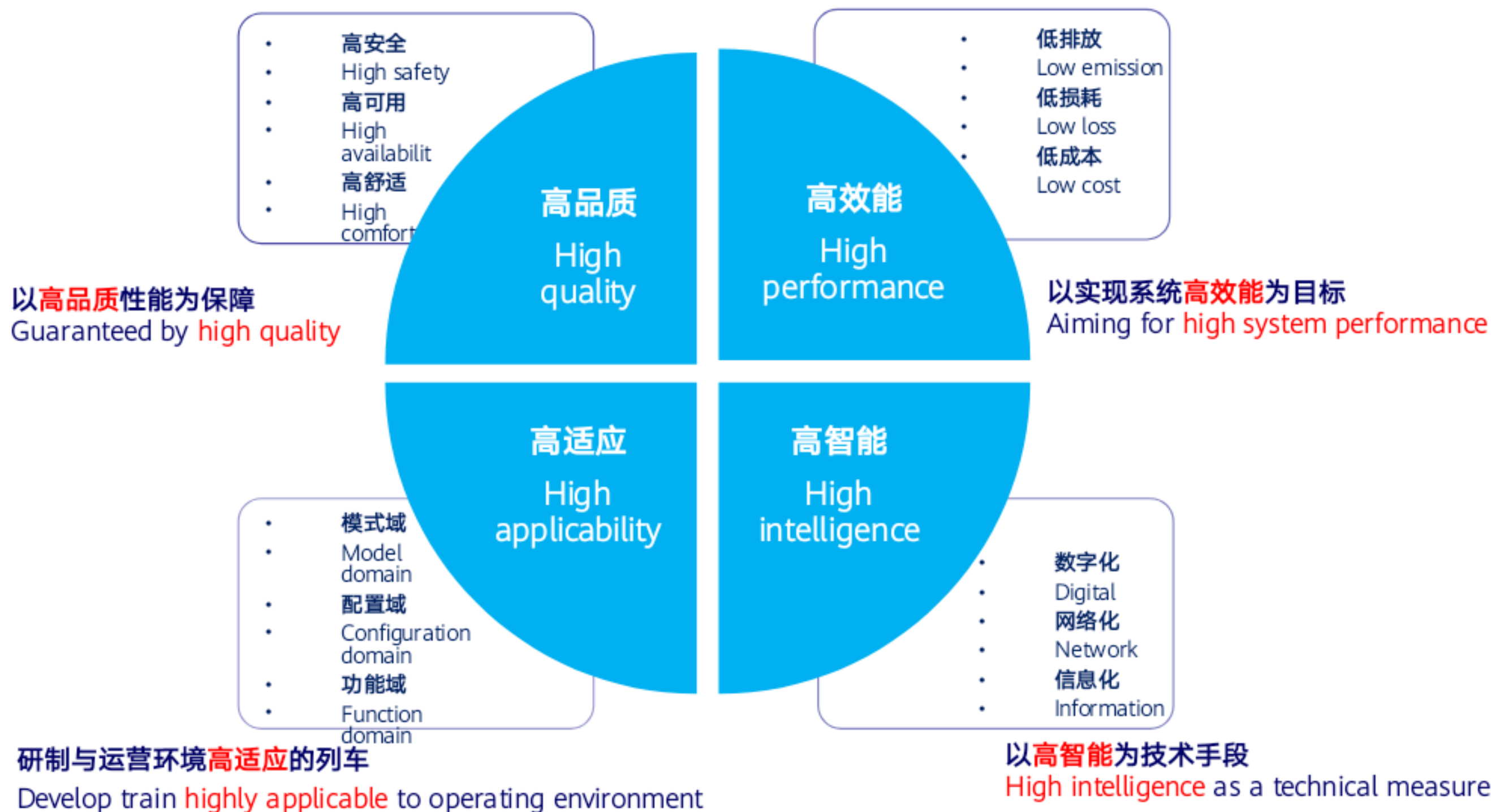
Emission =  $f$  (waste, noise, ...)

成本= $f$  (购置成本, 运行能耗, 维护成本, ...)

Cost =  $f$  (purchase cost, operating energy cost, maintenance cost, ...)



# HST innovation outlook - Technology development trend



# HST innovation outlook - Industry technology development trend



日本  
Japan

- 低轴重、低运行阻力  
Low axle load, low running resistance
- 地震预警系统  
Earthquake warning system
- 500km/h高速磁浮  
500km/h high-speed maglev
- ...



欧盟  
EU

- 模块化、灵活编组  
Modular, flexible organization
- 轨道交通互联互通认证  
Rail transport interconnection certification
- 提升材料回收利用率  
Increase material recovery rate
- 大幅降低人均能耗  
Reduce significantly per capita energy cost
- ...



北美  
North America

- 超级高铁  
Hyperloop
- ECO 4技术节能近50%  
ECO 4 technology saves energy by nearly 50%
- 产品平台化  
Product platform
- ...



高 效  
High efficiency

互联互通  
Interconnection

低生命周期成本  
Low life cycle cost

高智能  
High intelligence

绿色环保  
Environmental

系统安全  
System security

...

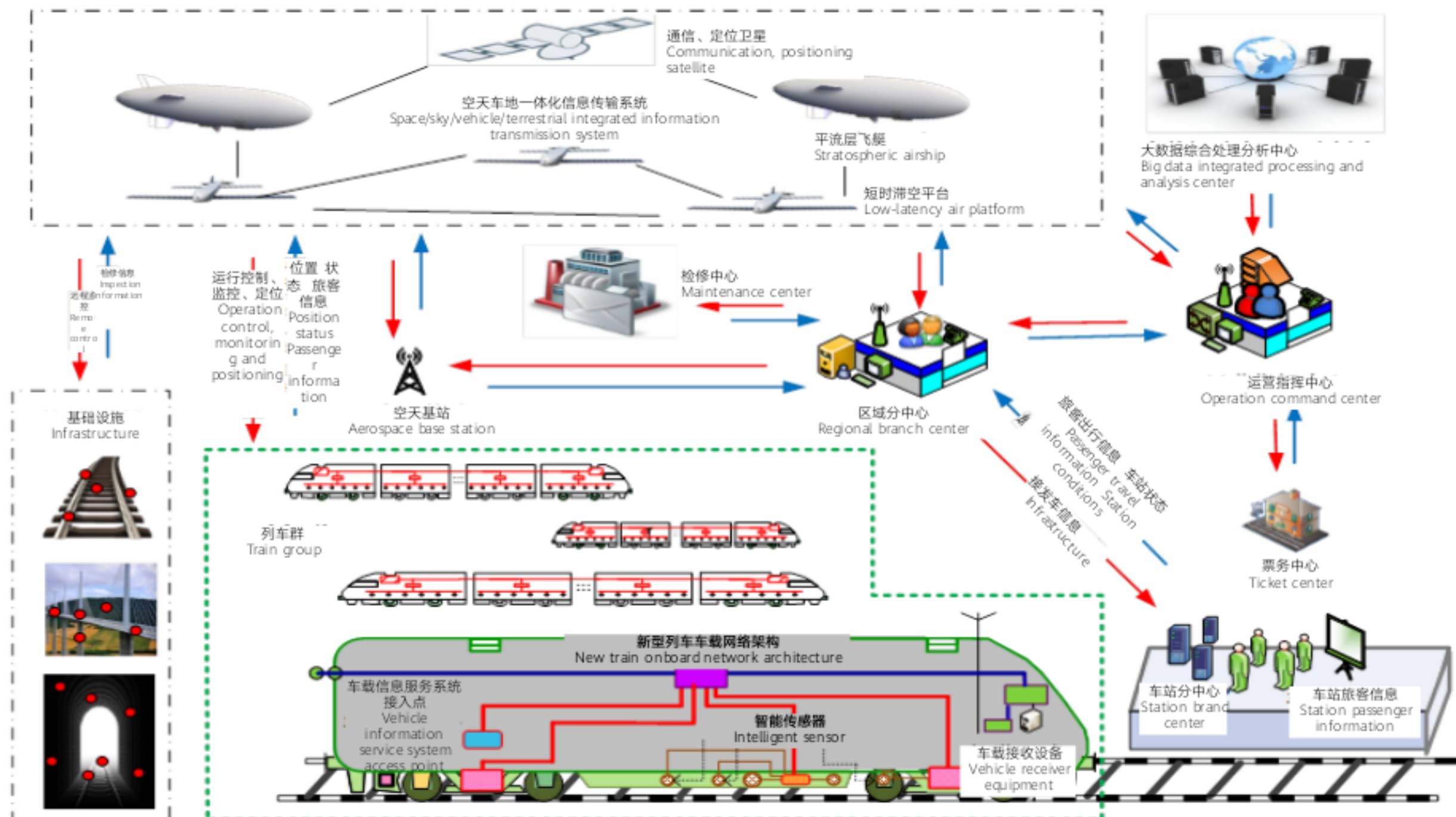


# 高速列车创新展望-技术创新

## HST innovation outlook - Technology innovation

以智能感知、数据传输、大数据分析、人工智能等为技术支撑，实现列车群管理，为用户和旅客提供**安全预测、运行管理、智能维保、智慧旅服**等服务，支撑智能化轨道交通体系。

With intelligent perception, data transmission, big data analysis and artificial intelligent as the technology support, provide users and passengers with such services as **safety forecast, operation management, intelligent maintenance and servicing and wisdom tour service**, and support the intelligent rail transit system.

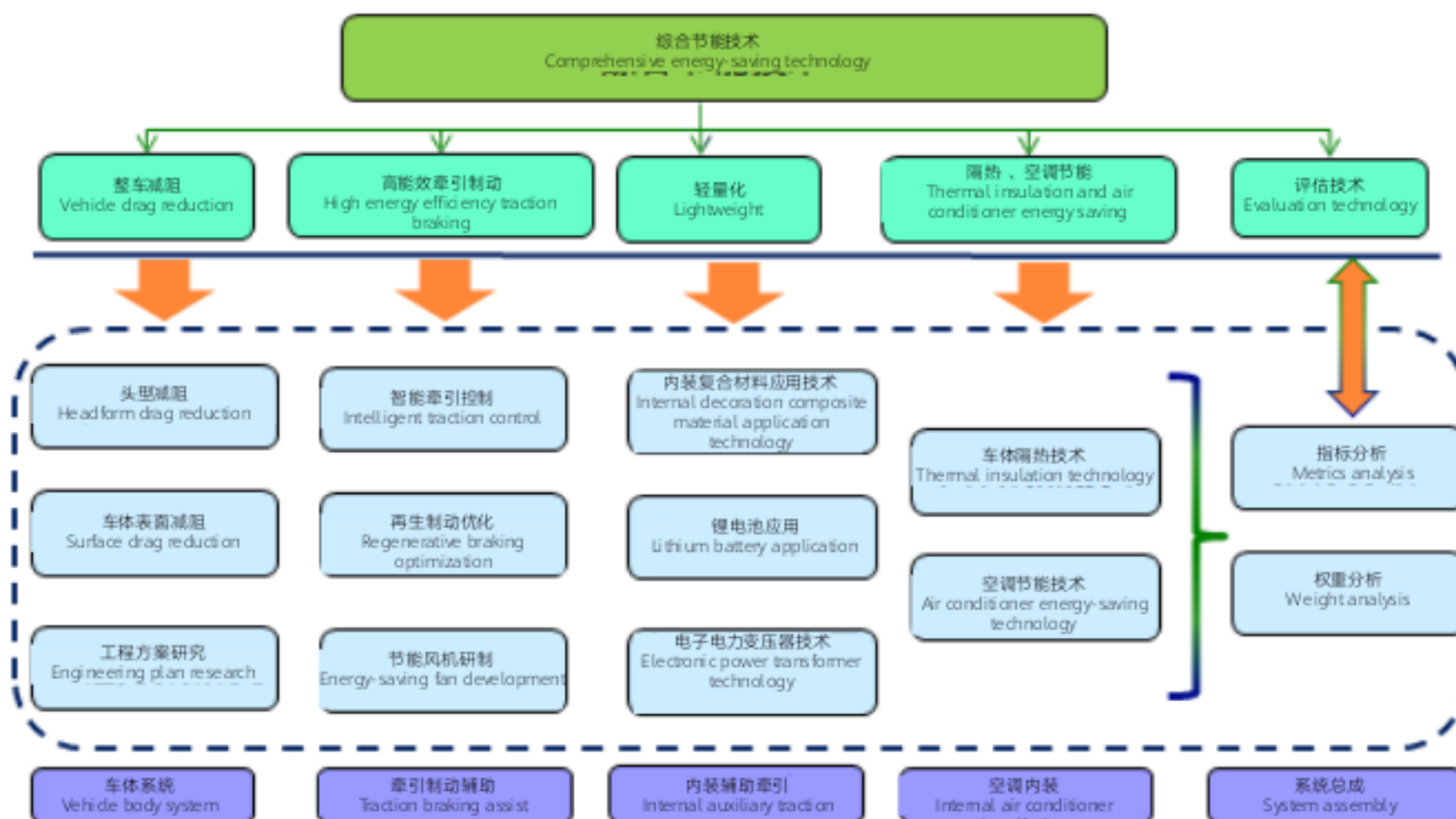


# 高速列车创新展望-技术创新

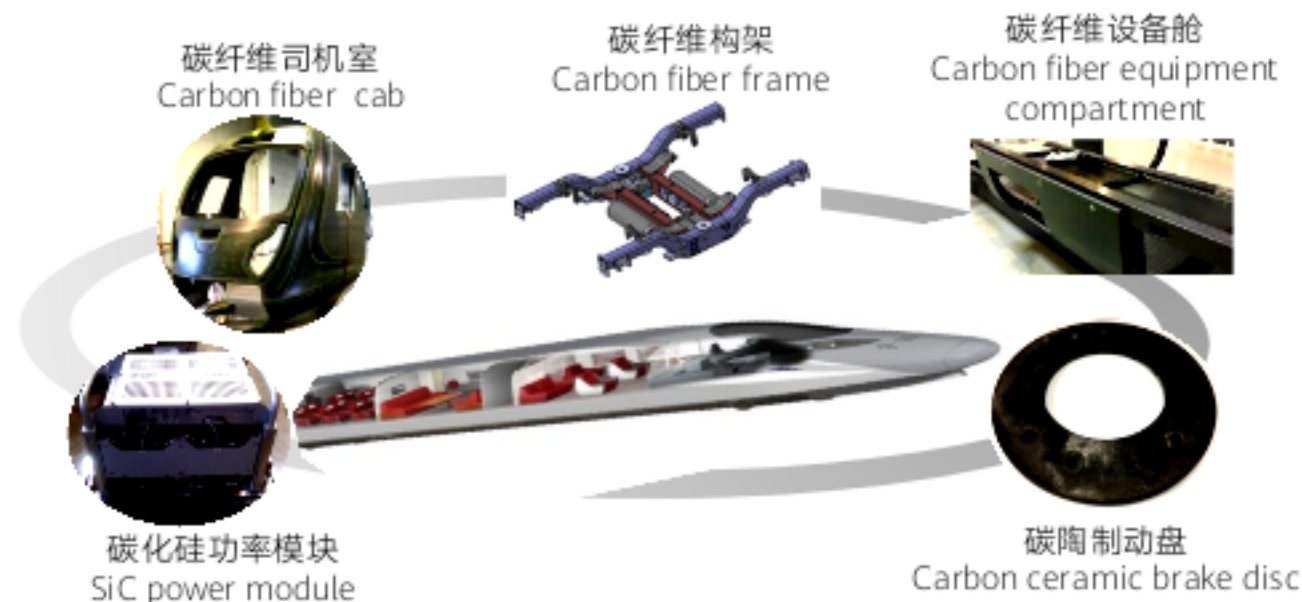
## HST innovation outlook - Technology innovation

### 综合节能及新材料应用

### Comprehensive energy-saving and new material application



综合节能技术  
Comprehensive energy-saving technology



新材料应用技术  
New material application technology



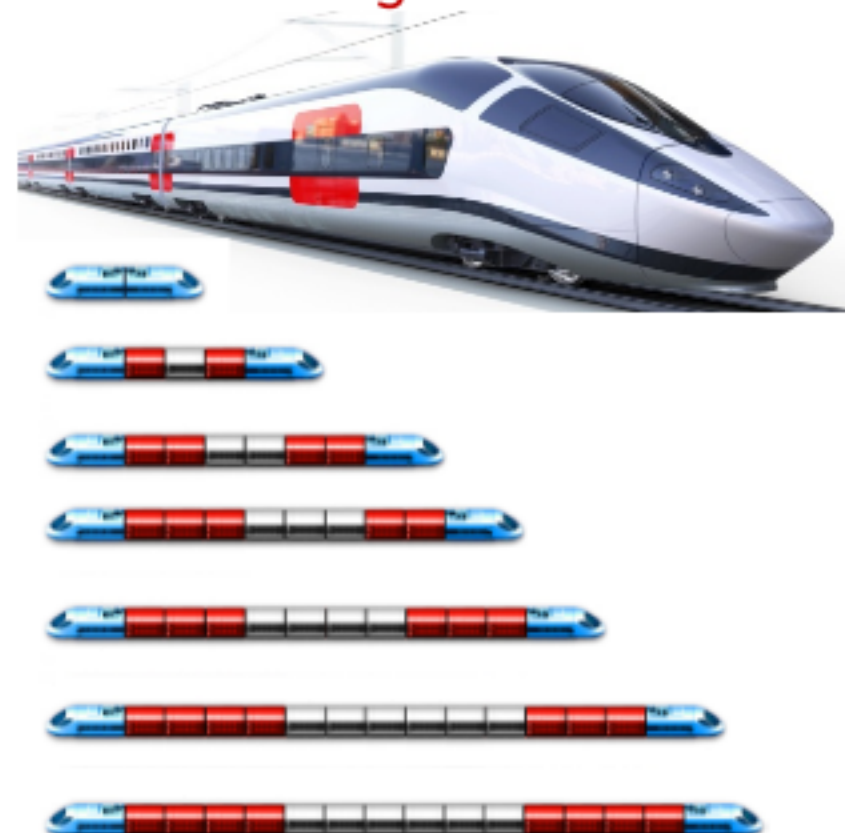
# 高速列车创新展望-产品创新

HST innovation outlook - Product innovation

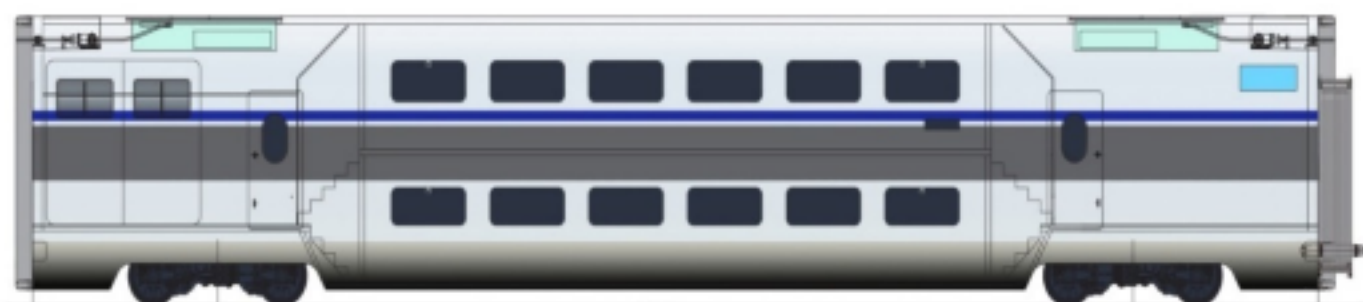
时速350公里卧铺动车组  
350km/h sleeper EMU



灵活编组动车组  
Flexible organization EMU



双层动车组  
Double-deck EMU



智慧动车组  
Intelligent EMU



# 高速列车创新展望-创新平台

## HST innovation outlook - Innovation platform



- **国家级：**面向全球、先行先试的高速列车创新平台。
- **Nation level:** Global-oriented, leading and exploratory HST innovation platform
- **开 放：**汇集全球创新资源。**无**行业、领域、地域**限制**。
- **Open:** Assembly of global innovation resources **No limit** of industry, domain or region
- **共 赢：**以各成员价值共创与共享为目标。
- **Win-win:** Value co-creating and sharing among members
- **协 同：**创新体制机制，实现各链条间高效运转。
- **Synergy:** Innovating system and mechanism and enabling efficient operation in chains
- **可持续：**通过人才、科技、金融、产业有效联动，实现可持续发展。
- **Sustainability:** Linkage of talents, technology, finance and industry for sustainable development



[ Thanks! ]

