
WITHOUT RAIL
WITHIN CONTROL
中国中车
CRRC
Hunan CRRC Intelligent Transport Technology Co., Ltd.

Content

Leading new urban traffic system

Creating a new convenient travel experience

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中国中车 CRRC

Chapter I

Company profile

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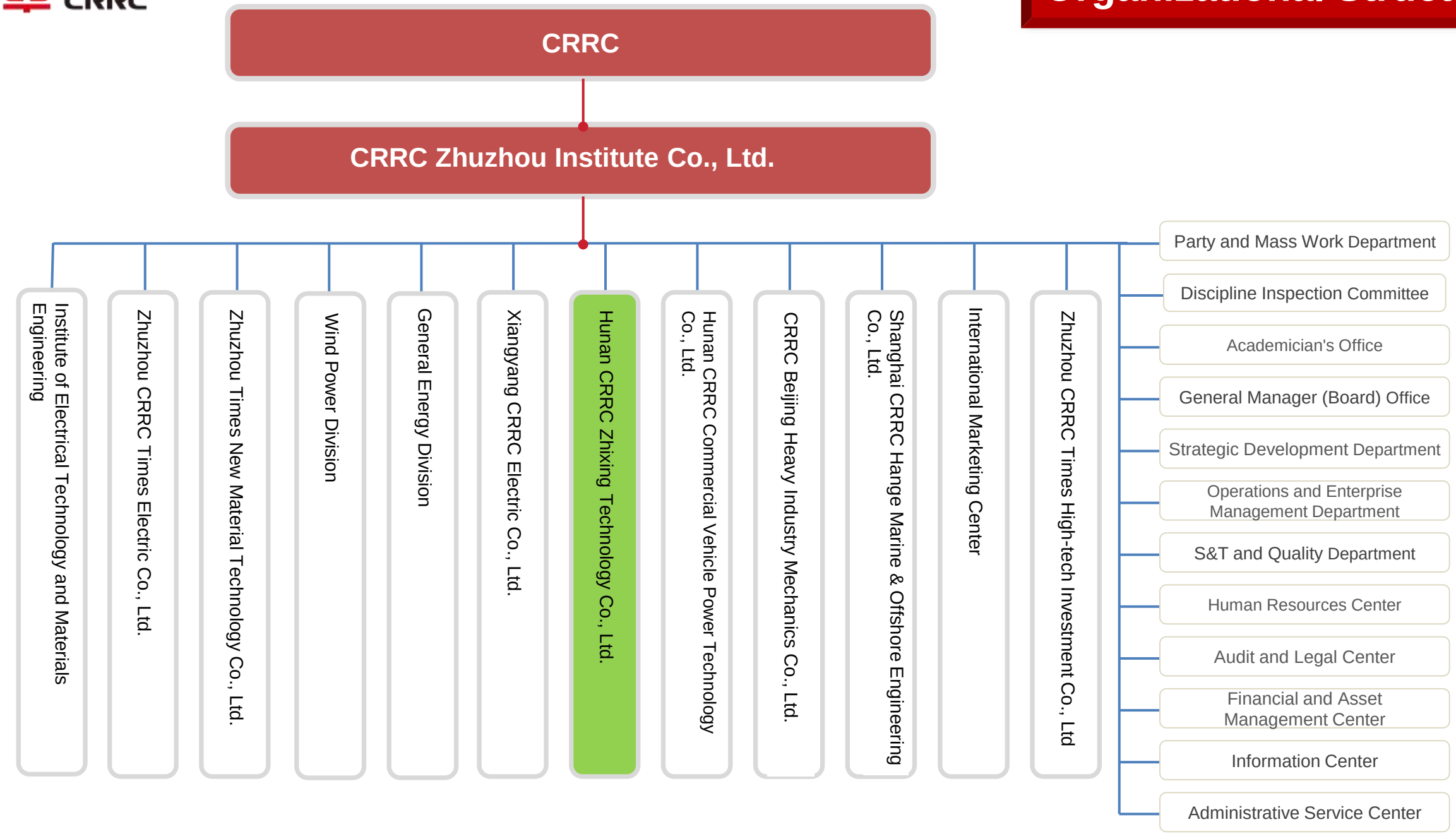
Leading new urban traffic system & Creating a new convenient travel experience

Organizational Structure



Company Profile

CRRC Zhuzhou Electric Locomotive Research Institute Co., Ltd. (CRRC Zhuzhou Institute), formerly known as the Zhuzhou Electrical Locomotive Research Institute affiliated to the Ministry of Railways, was established in 1959 and is currently a subsidiary solely held by the China Railway Rolling Stock Corporation. Comprised of 12 entities, the CRRC Zhuzhou Institute boasts two listed companies, 11 national platforms for scientific research and innovation, and five technology R&D centers overseas. Five institutions affiliated to the CRRC Zhuzhou Institute and specializing in the development of new technologies have been selected for inclusion in the national list of “small giants”.

RMB 52 billion
Operating Revenues in 2023

12
Entities

2
Listed Companies

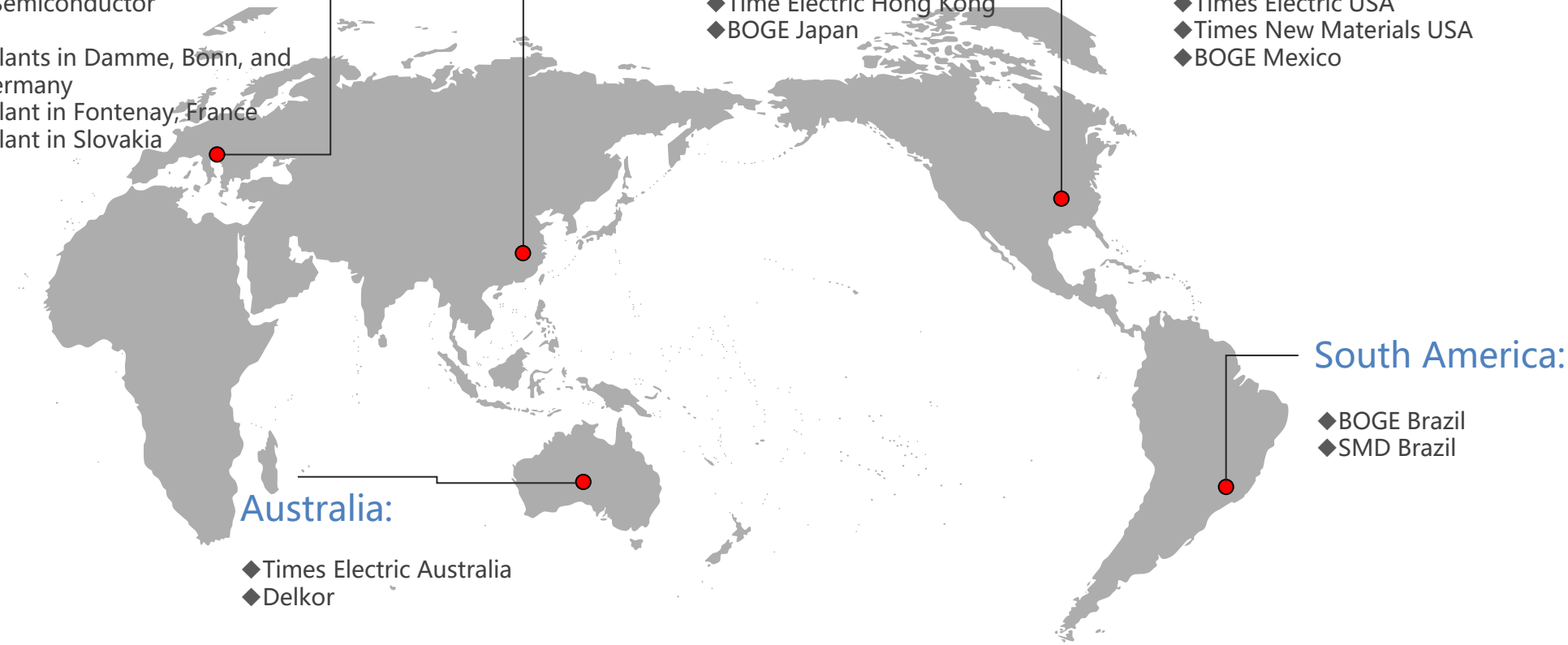
5
National “Small Giants” Specializing in Development of New Technologies

5
Overseas R&D Centers

11
National Platforms for Scientific Research and Innovation

Overseas Operation

By following its strategic plan for overseas operations, the CRRC Zhuzhou Institute has adhered to the transnational business model of "**independent sales + leverage of external forces + overseas M&As**". Now it has overseas assets valued nearly **8 billion RMB** and overseas revenues exceeding **8 billion RMB**.



Diversification

Encompassing **technology** and **market**, the CRRC Zhuzhou Institute has developed a complete technology chain and industrial chain integrating **components - assemblies – units** and three major industrial clusters, i.e. **rail transit, new energy equipment, and automobile and industry** in the markets of **transportation** and **energy**.

	New energy equipment cluster	Rail transit cluster	Automobile and industrial cluster
Complete units	 Wind power and energy storage	 Intelligent rail and rail construction machinery	 Deep sea equipment
Assemblies	 New energy equipment for wind and solar power to hydrogen storage	 Core assemblies for rail transit equipment	 Automobile electric drive and industrial drive
Components	 Sensors	 Semiconductors	 New materials

Chapter II

Introduction to ART

Leading new urban traffic system & Creating a new convenient travel experience

ART technology is originated from high speed train. **As a new kind of City transit, it balances the traffic capacity and construction cost which adapt to many areas in China and abroad.**

ART Train

Virtual track

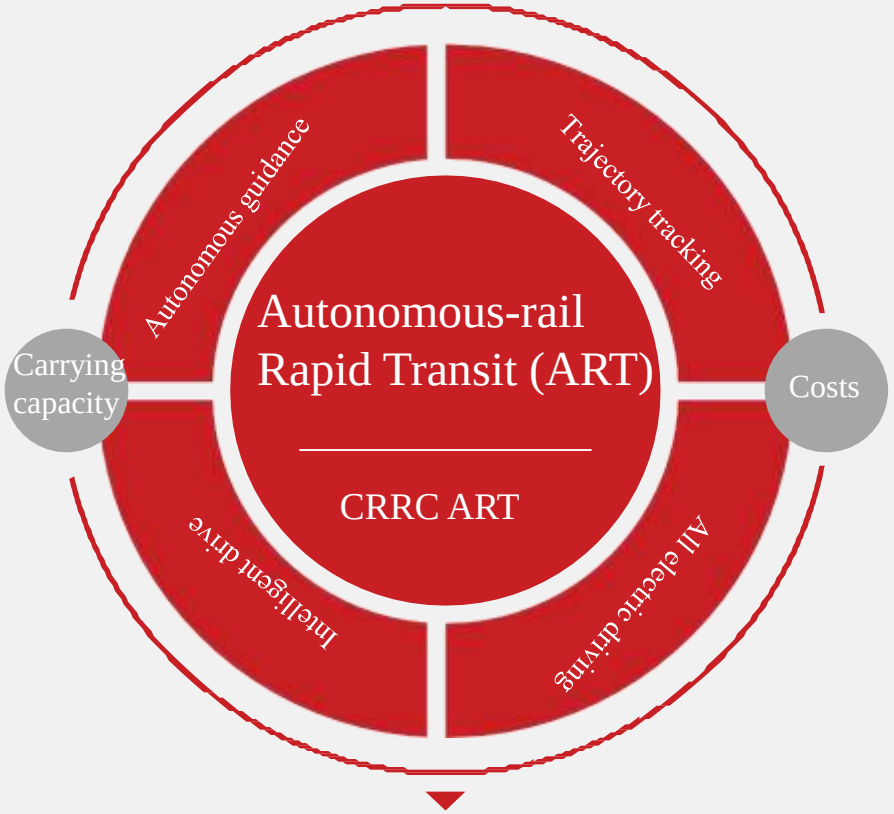
Stations

Power Supply

Control Center

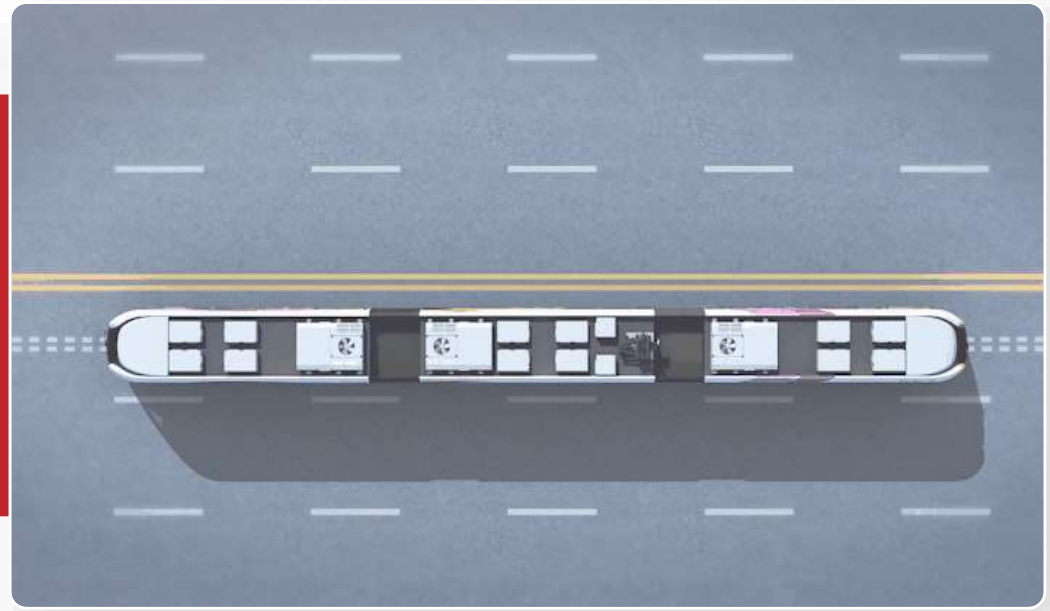
Depot

New solution of urban rail transit system with medium transport volume

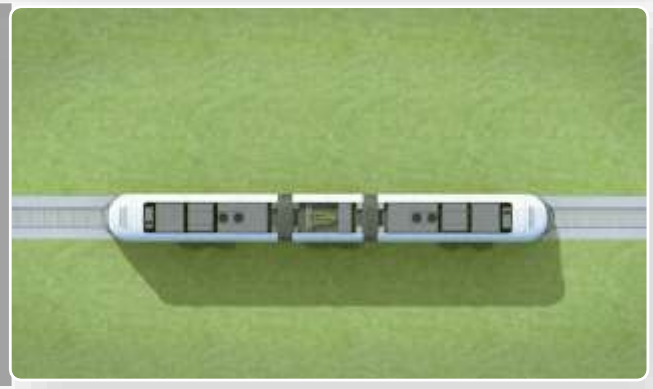


Independently developed by CRRC Zhuzhou Institute

Rubber wheel+ virtual track



Steel wheel+ double track



INTRODUCTION TO ART

2014
Conceptual proto

2016
2nd proto released

May 2018
Zhuzhou A1 trial run

July 2019
Qatar thermal test

July 2022
Kuching bidding won

2010-2013
Concept &model

2015
1st proto released

June 2017
Global debut

Jan 2019
Harbin cold test

Dec 2019
Yibin T1 commercial run

Nov 2022
Abu Dhabi trial run

PARAMETERS OF ART VEHICLE

Three-module ART vehicle (basic parameters)		
Product platform	**Aspiration**	**Mission**
Vehicle length	31.64m	30.2m
Vehicle width	2.65m	
Full load vehicle weight	≤54Ton	
Maximum number of passengers	307 people	302 people
Max. speed	70km/h	100 km/h
Max. gradeability	13%	
Min. curve radius negotiable	15m	
Floor structure	100% low floor	

ADVANTAGES OF ART

Two “low”
Two “fast”

Low investment
Low investment cost

Low subsidies
Low operation subsidies

Fast project approval
Fast project establishment approval

Fast construction
Short construction duration

Chapter III

TECHNOLOGICAL INNOVATION AND APPLICATION

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VIRTUAL TRACK

Original guidance technology of ART realizes trajectory tracking and control through multi-axis steering system, to guarantee driving of vehicle along virtual track marks on road surface.

Route perception

- Multi-dimensional perception technology

Image identification	Electronic map
Laser detection	Inertial/satellite navigation

- **Distinguish, detect and identify marks on route**
- **Extract feature points of route to perform data fitting**
- **Perceive virtual trajectory**

Automatic tracking

Through tracking control, the vehicle head could stably track route perceived, so that the head drives along perceived route.

AUTOMATIC DRIVE

Independent research and development

Autonomous guidance

Trajectory tracking

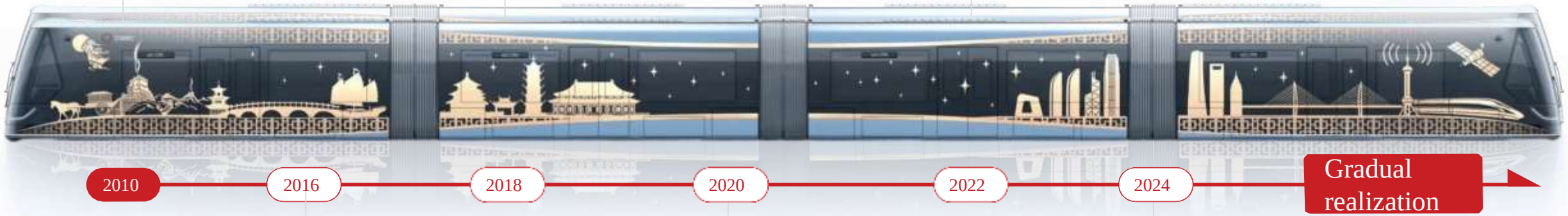
Electronic mirror

Automatic drive L1

- Automatic tracking (multi-sensor)
- 360° surround view
- Side collision warning
- Fatigue driving detection

Automatic drive L3

- Complete autonomous horizontal and vertical control
- Automatic emergency brake



2010 — 2016 — 2018 — 2020 — 2022 — 2024 — Gradual realization

- Warning for deviation from lane
- Automatic tracking (visual)
- Automatic speech recognition

Automatic drive L0

- Active protection
- Forward collision warning
- Complete autonomous horizontal control

Automatic drive L2

- Manned autopilot

Automatic drive L4

HYDROGEN BATTERY

Long endurance mileage

Endurance mileage with pure electric at full power under full load

≥100km

Endurance mileage with stored hydrogen (70MPa) at full power under full load*

≥390km

Endurance mileage with stored hydrogen (35MPa) at full power under full load*

≥230km

*Note: Prolong endurance mileage by adding hydrogen cylinders

High safety level

Hydrogen leakage detection function of hydrogen storage system

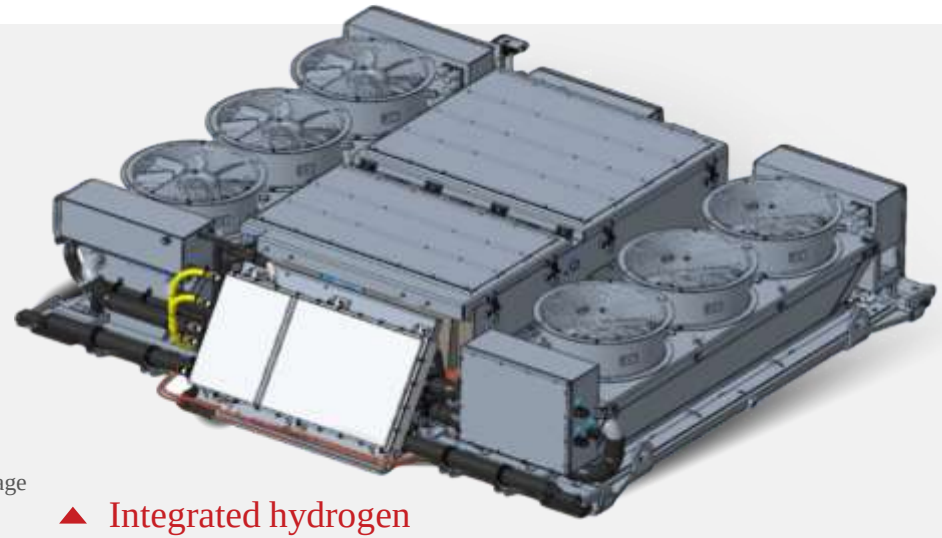
SIL 4

Hydrogen leakage detection function of hydrogen cell system

SIL 2

Failure protection function of hydrogen cell system upon hydrogen leakage

SI

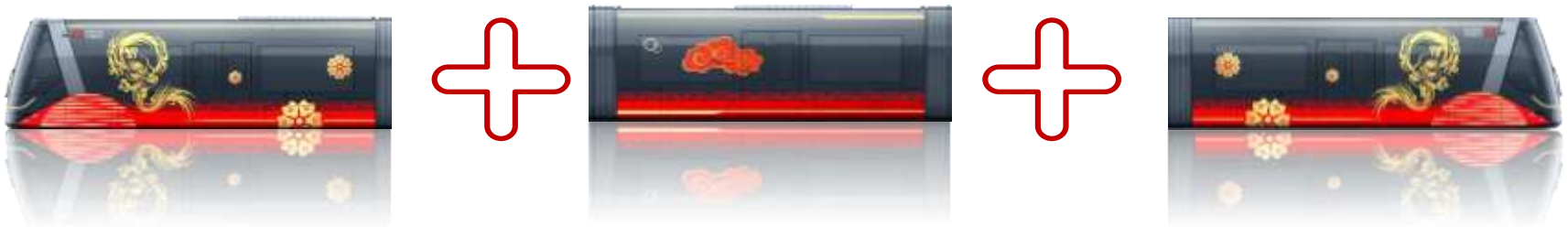


▲ Integrated hydrogen power system

Flexible formation adjustment

Modular design, which is not limited by formation, can realize 2 to 5 carding in a short time, achieving a maximum transport capacity of 189 to 506 persons/car, can cooperate with the phased development and the actual traffic needs of different periods.

Working condition	Remarks	2 cars	3 cars	4 cars	5 cars
Seat only (AW1)	Total number of seats	32	44	60	76
Rated capacity (AW2)	Total seating capacity +6 people / ㎡ passengers	146	234	316	398
Maximum capacity (AW3)	Total seating capacity +8 people / ㎡ passengers	189	302	402	506



SIL Level 4 self-guided system

Modular design, distributed power

Traction, braking, steering collaborative control technology

Chapter IV

MARKETING & APPLICATION

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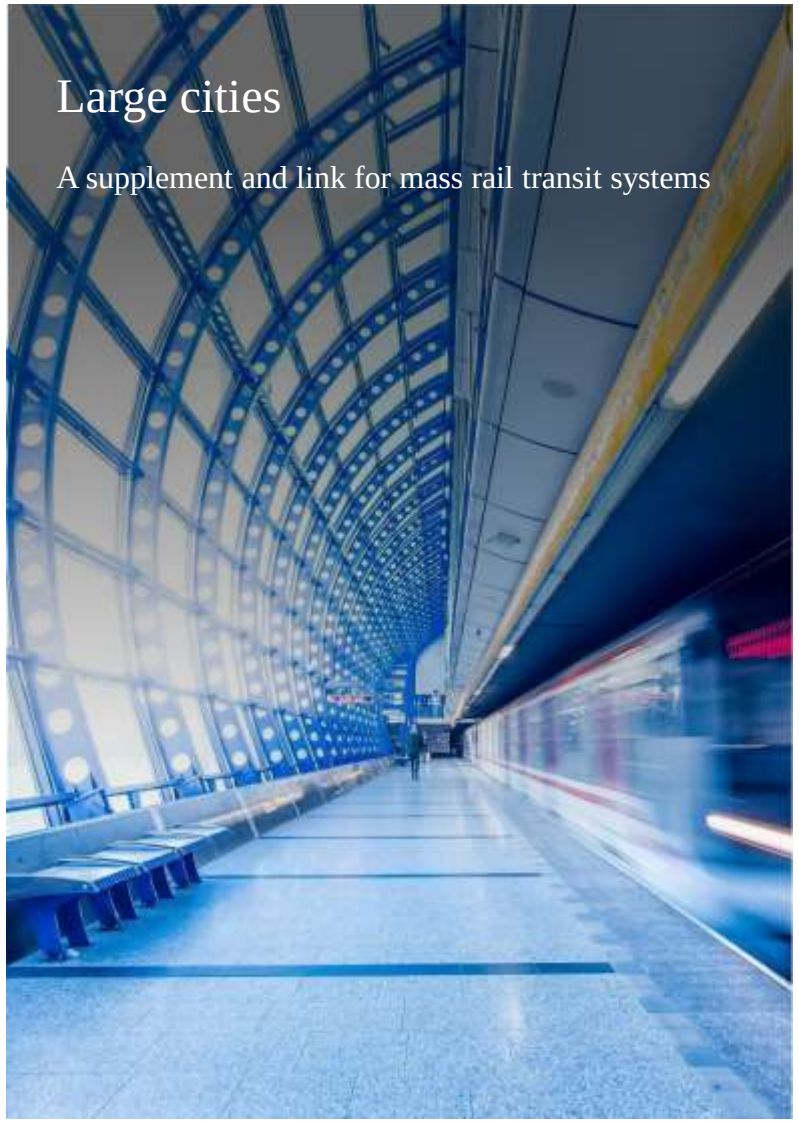
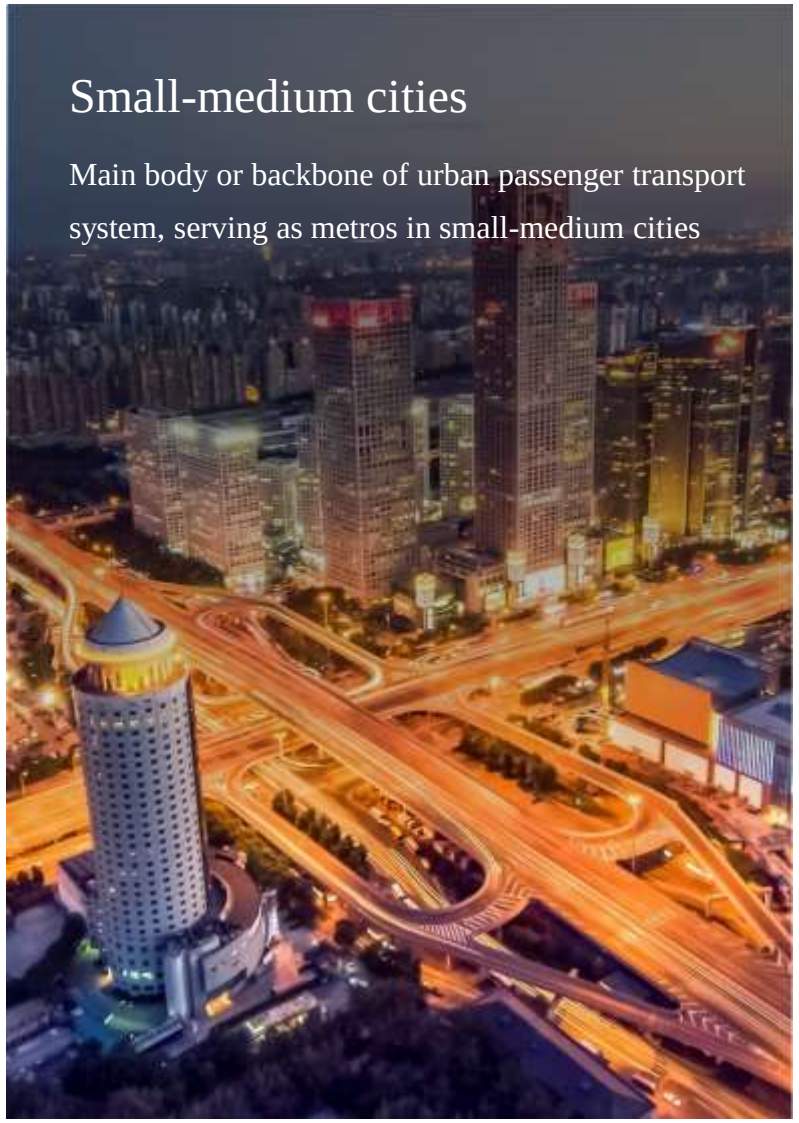
APPLICABLE SCENARIOS



Large cities

A supplement and link for mass rail transit systems



Small-medium cities

Main body or backbone of urban passenger transport system, serving as metros in small-medium cities

Specific functional areas

Backbone of passenger transport system for urban specific functional areas or specific corridors

Scenic areas

Sightseeing-type public transit system configured in scenic areas or specific parks

Application and promotion domestically

8 ART lines in operation

More than **120**km accumulative mileage

15 million km accumulative safe running on the opened lines

35 million accumulated passengers carried

24,500 tons energy saving and carbon dioxide-emission reduction (CO_2)

Zhuzhou ART Line A2

The first ART demonstration line in the world

Line length	14.55km
Time of starting operation	May 2018

Yibin ART Line T1 and its branch lines

The first commercial operation ART line in the world

Length of main line	16.1km
Length of branch line	5.3km
Time of starting operation	December 2019

Harbin ART Line T1

The first ART line in operation at a provincial capital in north
The first ART line operating in alpine region

Line length	18.2km
Time of starting operation	February 2021

Shuzhou ART Line T1

Shuttle for tourist metro at Tongli ancient town

Line length	5.2km
Time of starting operation	November 2021

Shaanxi ART Line T1

Shuttle for tourist metro at Kunming Lake

Line length	11.9km
Time of starting operation	March 2023

Yibin ART Line T4 and its branch lines

The longest commercial operation ART line in the world

Length of main line	29.6 km
Length of branch line	17 km
Line length	June 2023

PROJECT IN PROGRESS IN CHINA

With good demonstration effect after commercial operation of Yibin ART Line T1 and successive approval of ART in Zhuzhou, Suzhou, Harbin, etc., a good achievement was obtained in marketing and market share expansion was realized.

9 lines in progress in China

140+ km length in total

S/N	Description	Category	Length
1	Yibin ART Line T2	Commuter line for small-medium cities	9.58km
2	Xi'an Kunming Lake Tourist Line	Tourist line in scenic areas	11.9km
3	Xi'an ART Line 1	Commuter line for large-medium cities	11.6km
3	Jinghe New City ART Line	Commuter line for large-medium cities	30.8km
4	Changsha ART Line T1	Commuter line for large-medium cities	18.0km
6	Changsha ART Line T2	Commuter line in specific functional areas	9.4km
7	Dezhou ART demonstration line	Commuter line for small-medium cities	17.2km
8	Lhasa ART Demonstration Line	Commuter line for small-medium cities	15km
9	Dali ART Line T1	Tourist line in scenic areas	26.35km

PROJECT IN PROGRESS OVERSEAS

ART of CRRC will be launched at overseas markets along “the Belt and Road” representing high-end manufacturing of China.
In November 2022, our ART made a stage pose in FIA Formula 1 World Championship in ABU Dhabi, UAE and the phase I of ART line was proceeded. Meanwhile, we also won the bid for Kuching ART Project in Malaysia with 38 vehicles in total

5 Lines in progress overseas

Nearly 120 km mileage in total

Demonstration line in ABU Dhabi, UAE

Urban ART lines	26.8km
Yas island ART line	17km

Kuching ART in Malaysia

Blue LIne	27.6km
Red Line	12.3km
Green Line	30km

Chapter V

SOCIAL HONOR & VALUE

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HONORS OF ART

3 national and provincial science and technology projects

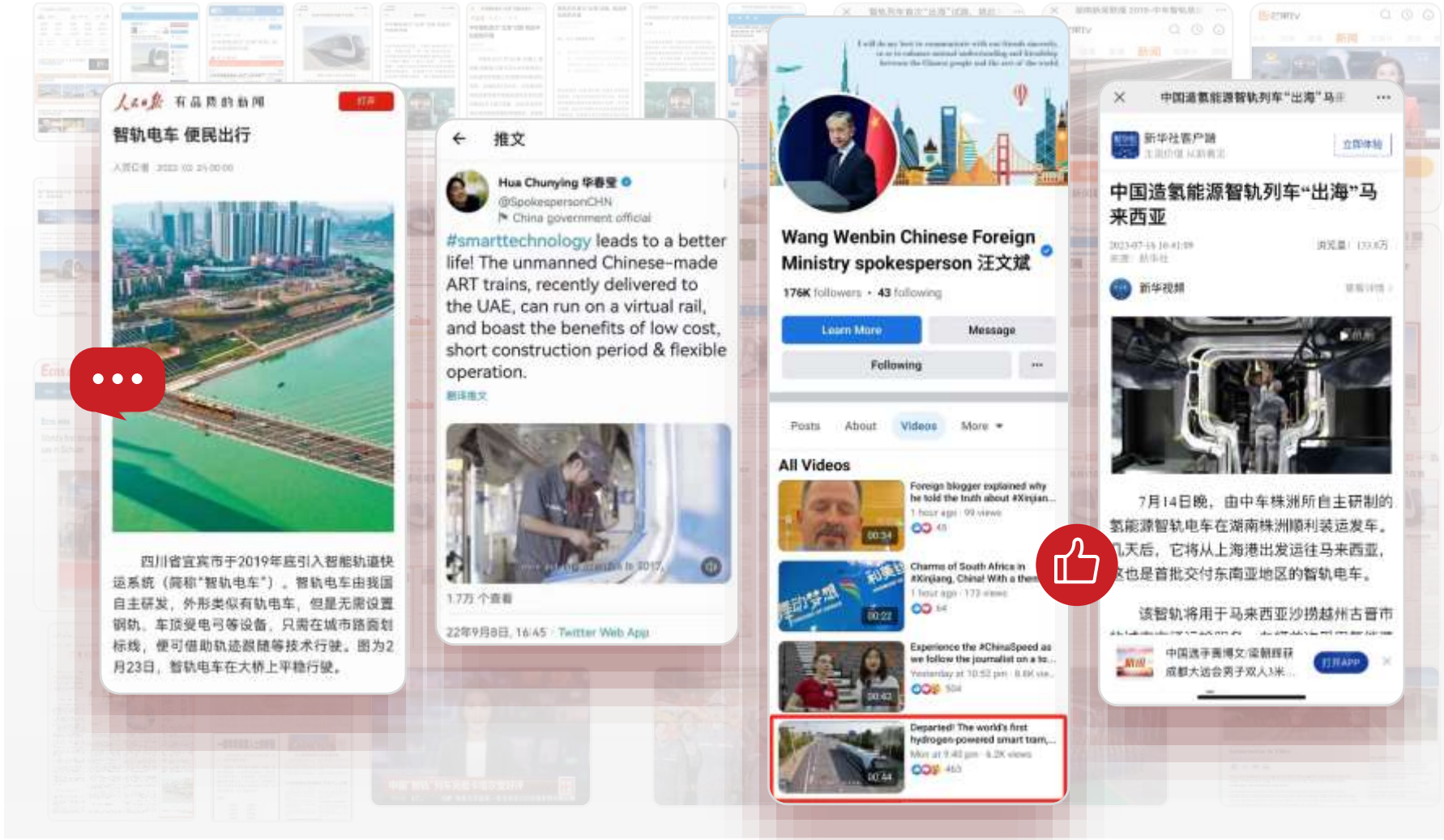
8 national and provincial awards

300+ patents

10 software copyrights

3 platforms of science and technology innovation at provincial and municipal levels

NEWS REPORT PICTURES



Upon the release of ART, official authoritative has reported it continuously.

Travel with ART

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