国家电网公司
STATE GRID

Chinese EV Market Overview and Technical Enablers

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NARI Group Coporation

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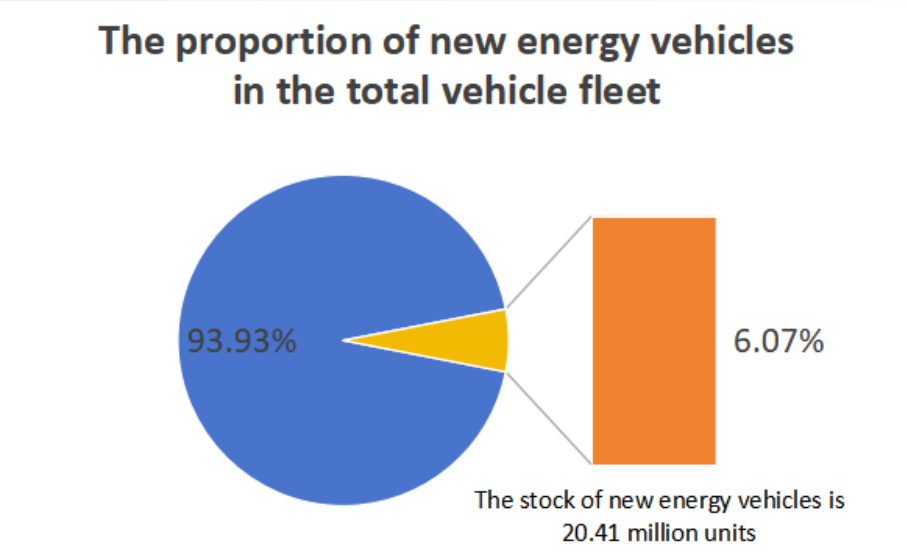
- Typical Energy Supply Technologies
- Emerging Technologies
- Next Generation DC charging technology-ChaoJi
- Standardization

Overview

Overview

- As of the end of 2023, the total number of new energy vehicles in the country reached **20.41 million**, accounting for **6.07%** of the total number of automobiles. Among them, the number of pure electric vehicles amounted to **15.52 million**, constituting **76.04%** of the total new energy vehicle fleet.



- By the end of November 2023, China had built **8.264 million** charging stations, reflecting a significant **67%** increase compared to the previous year. Notably, the top ten regions contributing to charging infrastructure construction accounted for an impressive **71.1%** of public charging stations.

Development History

2009-2013: Continuously refining the strategy through practical implementation. (Practice)

2018 to present: The new energy vehicle market is maturing and entering a phase of high-quality development.(Outstanding)

Before 2009: Pioneering a strategy that explores and leads global automotive industry development. (Initialization)

2013-2017: The rise of the new energy vehicle market. (Booming)

Infrastructure Policies

Charging Infrastructure Policy Advancement System

Planning	Financial Subsidies	Industry Regulation	Technological Innovation	Charging Prices	Macro Integration
Guided by central policies, provinces have issued local plans for charging facilities.	Construction subsidies, Operation subsidies, Platform subsidies.	Planning and construction, operation and maintenance, supportive policies, division of responsibilities.	 EVSE+Internet	Implementing supportive electricity pricing policies for the charging infrastructure industry	New Energy Vehicle Industry Development Plan (2021-2035)

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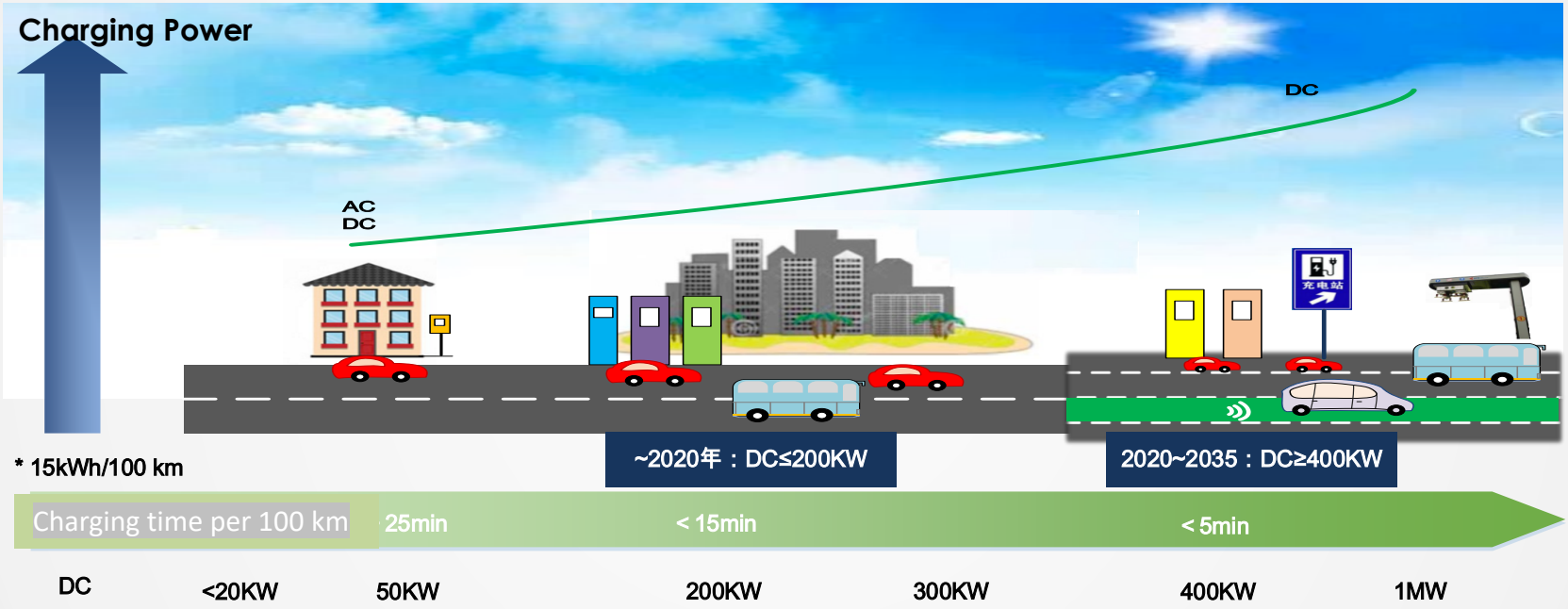
Typical Energy Supply Technologies

Typical energy supply technologies

Conductive Charging



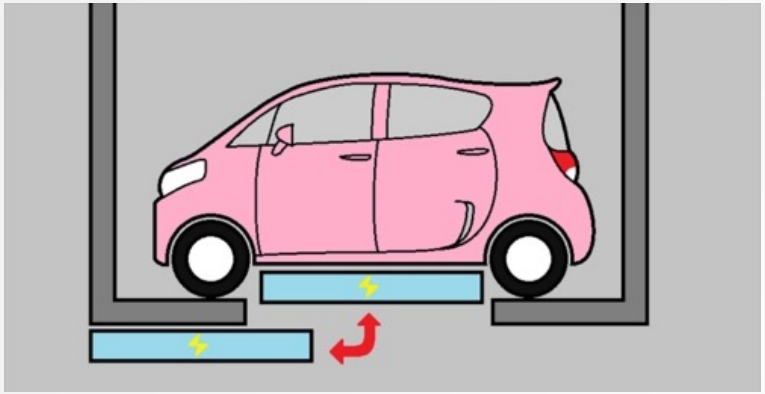
Low Power DC
(Single/Three-phase charging with power less than 20kW)

High-power DC
(Charging current exceeding 250A)

Ultra-high-power DC
(Charging power exceeding 1MW)

Typical energy supply technologies

- **Battery Swap**



four-wheeler battery swapping

two-wheeler battery swapping

lateral battery swapping

bottom battery swapping

rear-end battery swapping

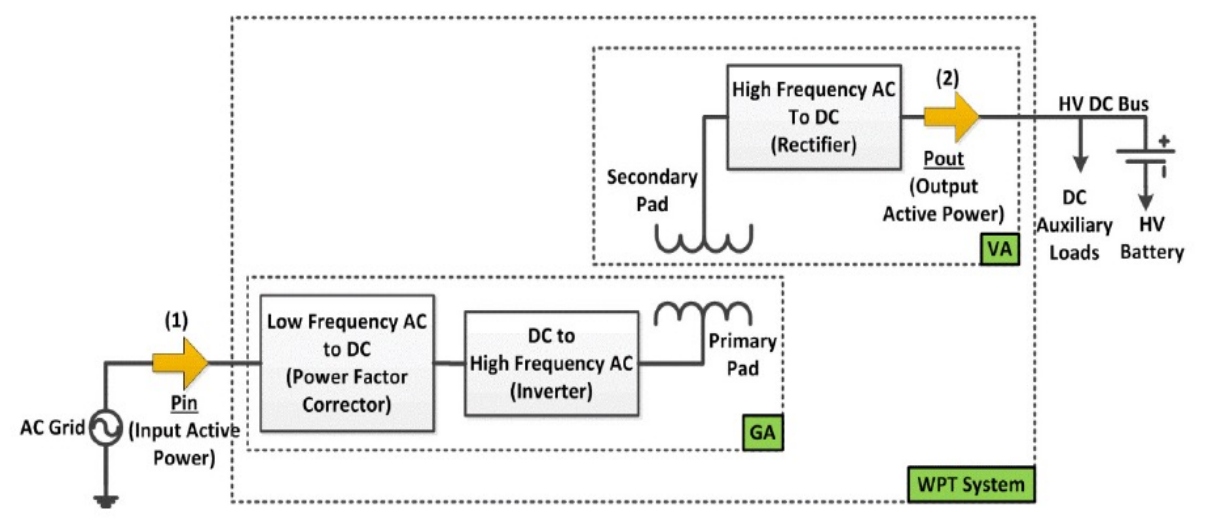
top battery swapping

mid-position battery swapping

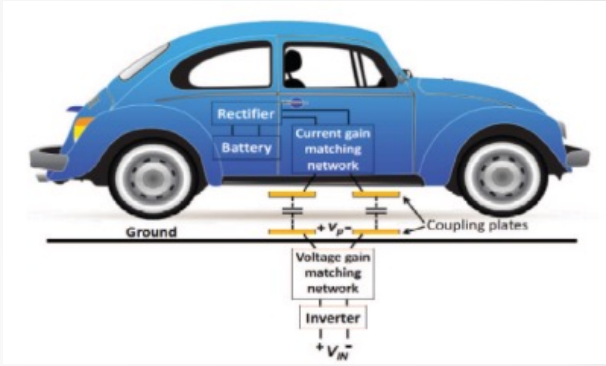
Typical energy supply technologies

Wireless Charging

Wireless charging is a charging technology that utilizes techniques such as electromagnetic induction and electromagnetic radiation to transmit energy.



Wireless Charging System Framework



passenger car

commercial vehicle

multi-level car park

car rental

Typical energy supply technologies

- **Application Scenario**

public charging

semi-public charging

home charging

Conductive Charging

demonstration zone

luxury car home charging

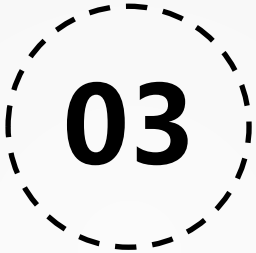
Wireless Charging

passenger car

taxi

heavy-duty truck

Battery Swap



Emerging Technologies

Advanced technologies

- **Plug&Charge**

Fast and convenient charging

- No scanning
- No card
- No need for account and passwords

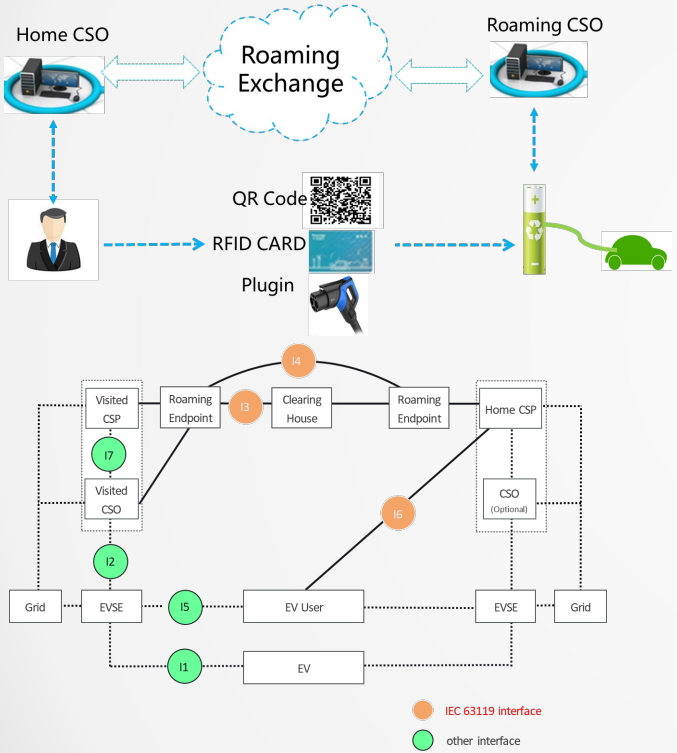
Plug in

Unplug

One-click stop charging

Advanced technologies

Roaming



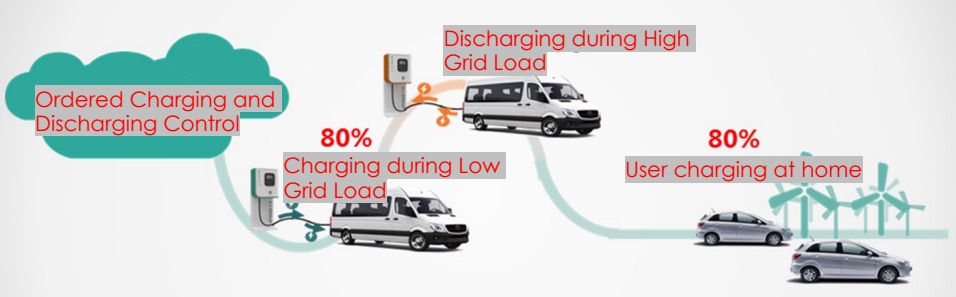
Charging Roaming Service Architecture

One charging app to rull them all, across the world!

Participants

Interaction of EV and Grid

☐ Orderly Charging



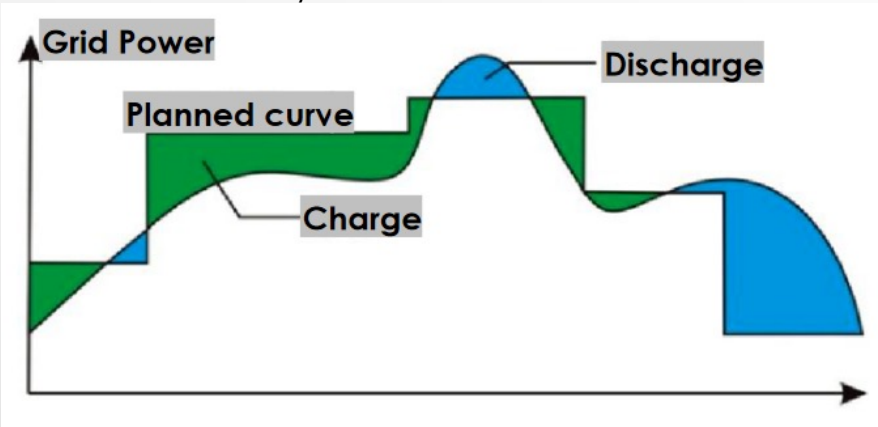
- When the power grid load is high, guiding user to discharg.
- when the power grid load is low, guiding users to charge during off-peak periods.

For users, orderly charging can save charging fees

Interaction of EV and Grid

Bi-direction Charging

- **Energy Interaction:** Serving as a mobile distributed energy storage unit, enabling bidirectional energy flow with the grid or electric vehicles based on their needs.
- **Information Interaction:** Establishing information exchange between electric vehicles, users, and the power grid (vehicle energy status, grid load status, billing information, etc.)



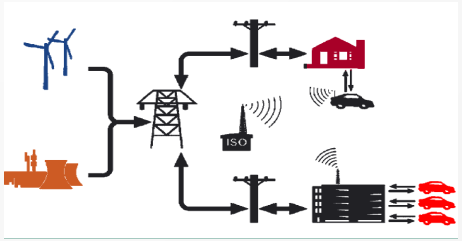
Potential of the key task for climate action in China

Scenario:
100 Mio. BEV in 2030 x 10 kWh/day = 1000 GWh

If one third **of 1000 GWh** could be shifted in times of excess, **330 GWh of stored energy** could be used, e. g. for devices in households. These 330 GWh don't have to be produced by burning fossil fuels as for example coal.

Savings of CO_2 emissions =

109 Mt CO_2 / year
This is equal to 1 % of Chinas total CO_2 emissions/year
Costs of approx. 11 Billion € (100€/T)



04

Next Generation DC charging technology-ChaoJi

Next Generation DC charging technology-ChaoJi

- Features

Safe

Compatible

Compact

Robust

Flexible

Unified

Reasons for choosing ChaoJi

Next Generation DC charging technology-ChaoJi

History

2016.03, Shenzhen, China 1st HPC seminar

2017.05, Beijing, China establish HPC workgroup

2018.02, Nanjing, China Determine interface, control pilot circuit and other technical solutions

2019.10, Shanghai, China Summary meeting for HPC

Technical exchanges with EV OEM

2023.09, GB/T 18487.1&27930&20234 .4 standards published

2016 Investigate &survey **2017** Discussion **2018** Joint development of key technologies **2019** Demonstration Project **2020** Standardization **2023**

2019.07, Japan Establish International ChaoJi JWG

2020.06, China&Japan Release ChaoJi White Paper & CHAdeMO 3.0

Next Generation DC charging technology-ChaoJi

History

First ChaoJi international Workshop

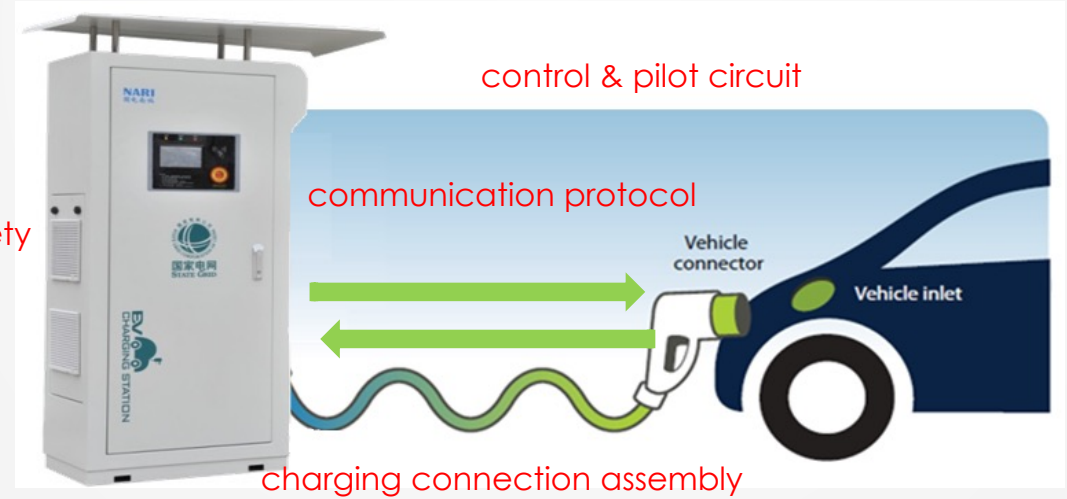
- ✓ 2019.07 Japan
- ✓ Three SWGs:
  - SWG1: (coupler, control pilot & compatibility)
  - SWG2: (system safety requirement)
  - SWG3: (communication protocol)
- ✓ Participants:

CN, JP, DE, IT, AU, NL、CH、KR

Next Generation DC charging technology-ChaoJi

Parameters&Components

- Maximum Voltage: 1000（1500）V
- Maximum Current: 500(600) A with cooling, 150-200A without cooling
- Maximum Current: 900kW

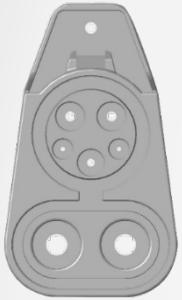


Next Generation DC charging technology-ChaoJi

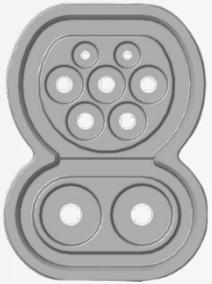
Charging Coupler

Compact design and flexible configuration

CCS1



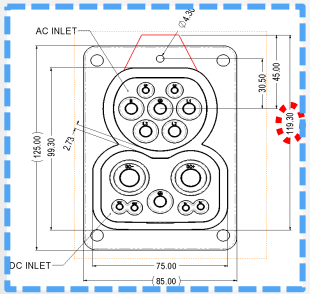
CCS2



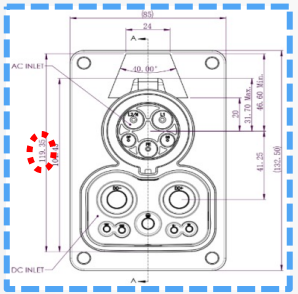
CHAdeMO

GB/T 2015

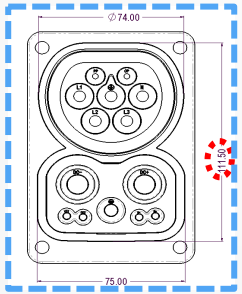
ChaoJi



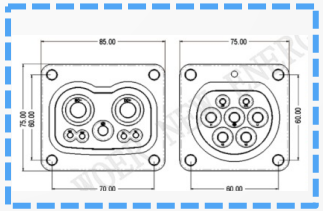
ChaoJi+GB combo



ChaoJi +TYPE1 combo



ChaoJi +TYPE2 combo

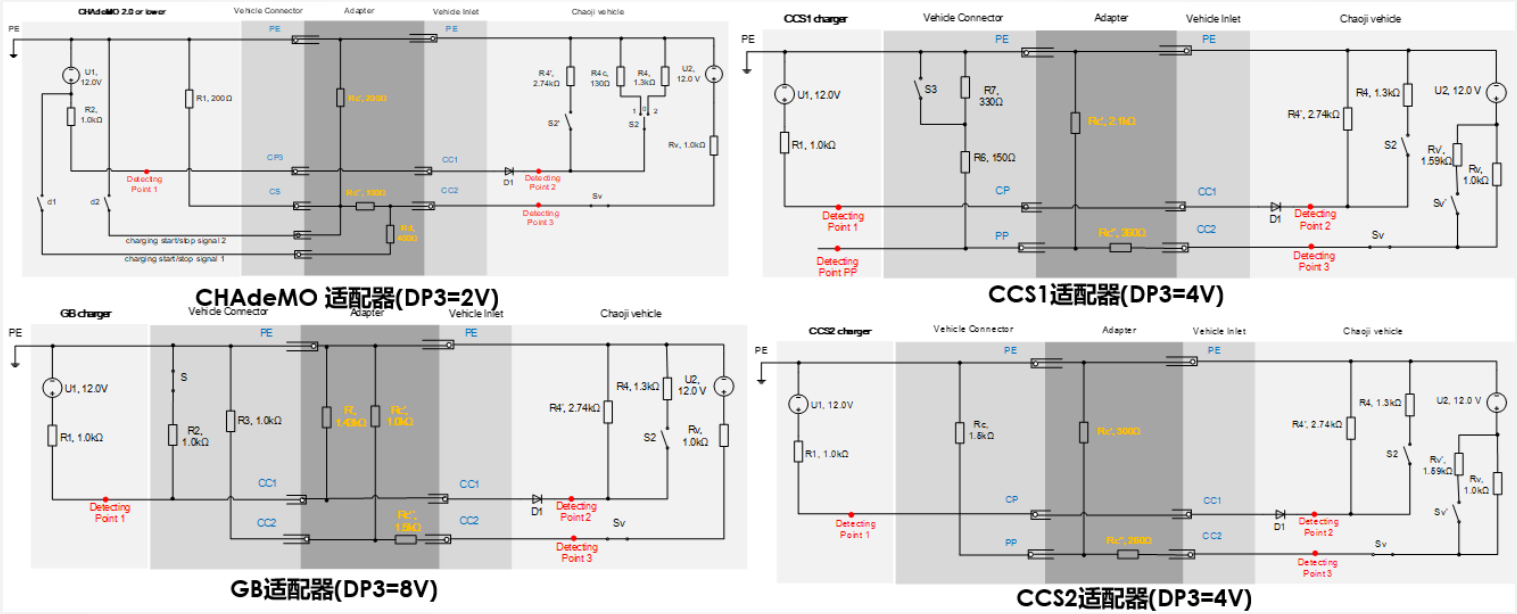


ChaoJi +AC (GB, Type 1, Type2)

Expected to unify global charging coupler

Next Generation DC charging technology-ChaoJi

Compatibility



The adapter is used for physical size conversion, and the Control pilot circuit is used to identify different systems.

Next Generation DC charging technology-ChaoJi

- High power and Ultra High power Charging

ChaoJi Technology

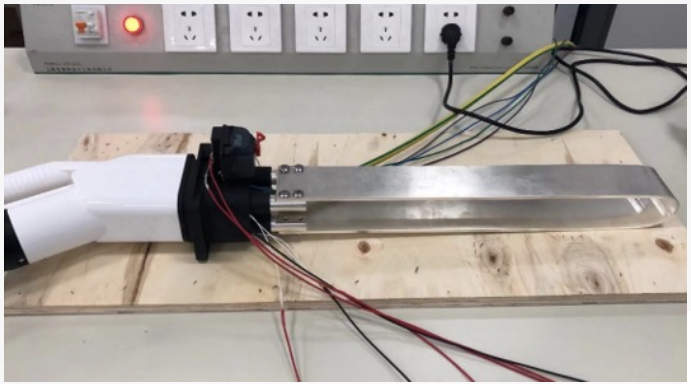
Maximum charging power: 900kW
Maximum output voltage: 1500V
Maximum output current: 600A

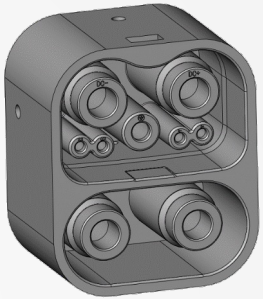
Ultra-ChaoJi Technology

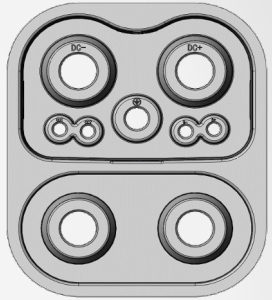
Maximum charging power: ≥1MW
Maximum output voltage: 1500V
Maximum output current: 1500A

Next Generation DC charging technology-ChaoJi

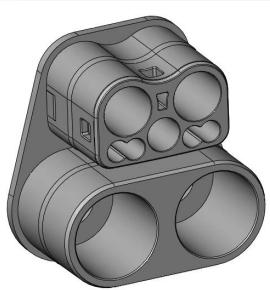
- Ultra High power Charging

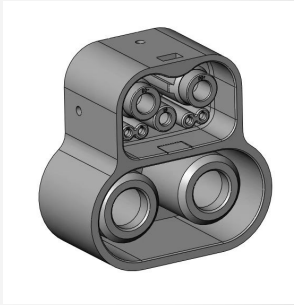




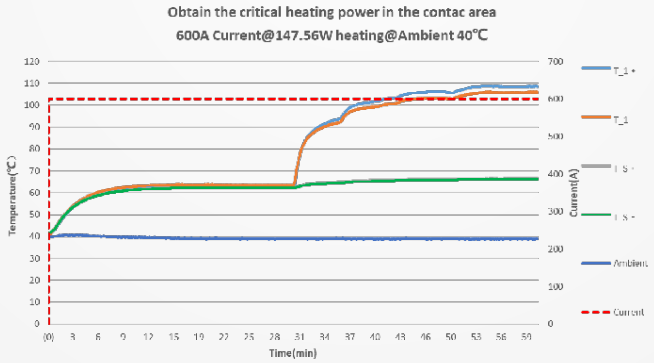


Ultra-ChaoJi1





Ultra-ChaoJi2



Compatible with ChaoJi charging coupler

Next Generation DC charging technology-ChaoJi

- Demonstration Project

XuJi&BAIC

Star Charge& FAW

ATC&BYD

NARI& Audi

NARI&Daimler

NARI&BMW

Next Generation DC charging technology-ChaoJi

Demonstration Project

Q2 2022- Q4 2023, SGCC deployed 6 high power charging stations with ChaoJi interface along the G1(Beijing to Shanghai) Highway.

Participators : NARI, SGCCEV, Lusoft Technology, Sanyou, ATC, Xu Ji, BAIC, BMW

BeiJing	Yizhuang Tongming Lake Park
TianJin	WuQing Wangqingtuo service area
HeiBei	Cangzhou Qingxian Service Area
ShanDong	DezhouYucheng Service Area
ShanDong	Linyi Tancheng service Area
JiangSu	Taizhou Xuanbao Service Area
ShangHai	Jiading Anting International Automobile City

05

Standardization

Standardization

China's Standard System

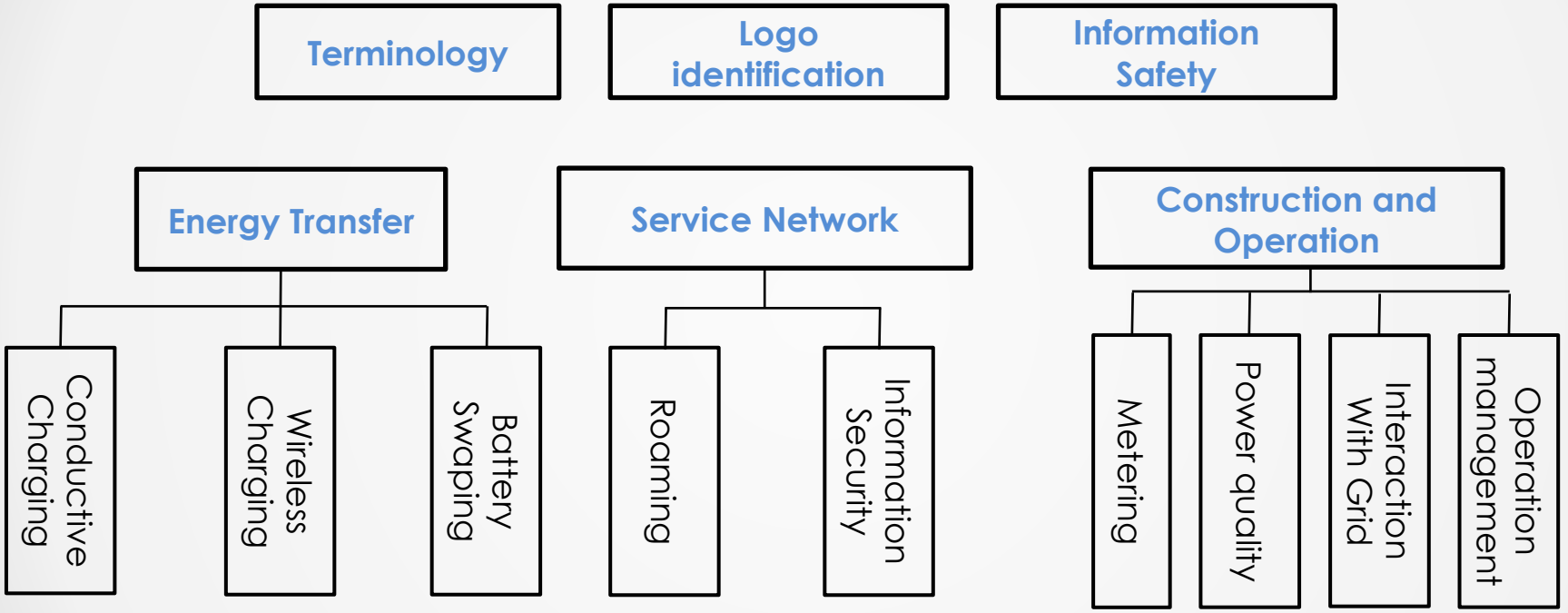
Government-led formulation
(政府主导制定)

Market-driven formulation
(市场自主制定)

- Mandatory National Standards
- Recommended National Standards
- Recommended Industry Standards
- Recommended Local Standards
- Group Standards
- Corporate Standards

Standardization

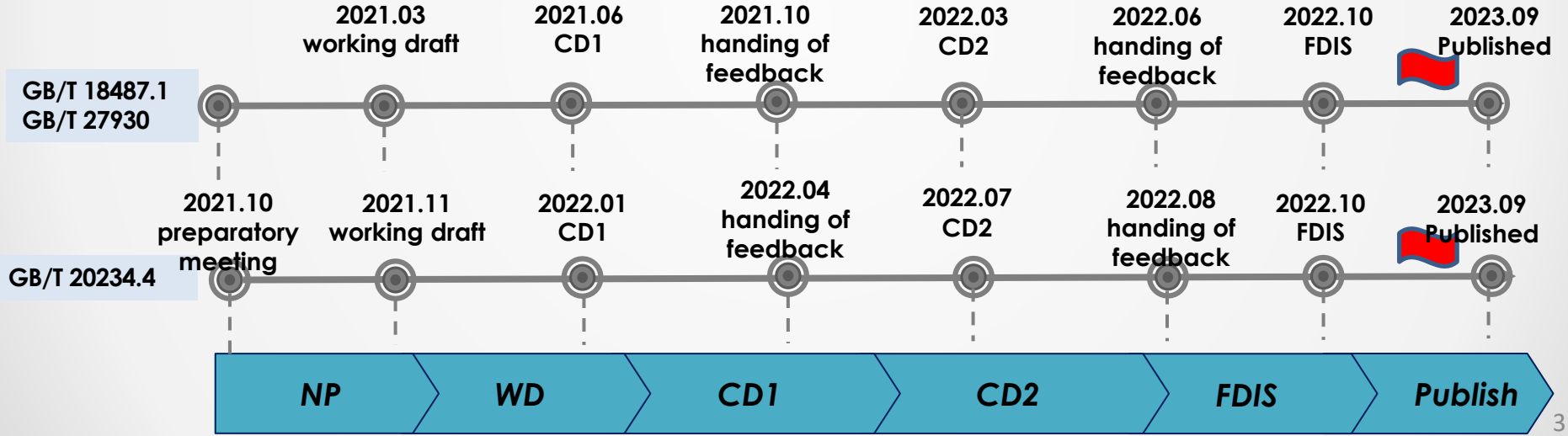
China's Electric Vehicle Charging Infrastructure Standard System



By February 2023, a total of ***31*** national standards and **26** industry standards have been issued

Standardization

- GB/T 18487.1 Electric Vehicle Conductive Charging System - Part 1: General Requirements
- GB/T 27930 Digital communication protocols between off-board conductive charger and electric vehicle
- GB/T 20234.4 Connection set of conductive charging for electric vehicles - Part 4: High power DC charging coupler



Standardization

International Electrotechnical Commission

TC69

- ahG17(Interoperability and safety issues of using charging adapters between different DC charging systems): prepare a TR for backward compatiablity between system D and AA/BB
- MT5(Maintenance of IEC 61851-23 and IEC 61851-24): will propose system D and Ultr ChaoJi In 61851-23
- WG12(Electric Vehicles conductive power/energy transfer system): Propose Adapter

SC23H

- Published IEC PAS 63454 for configuration GG
- Add configuration GG in 62196-3
- Add Configuration JJ to IEC TS 63379

Communicaiton: Unified protocol is still pending

Standardization

Served as the convener for 9 international standards, published 8 international standards, and 1 technology report.

AC charging technology

- Promoting the inclusion of AC charging interfaces in the IEC standards.

DC charging technology

- Maintenance of GB/T 2015.
- Advocating for ChaoJi to become the fourth set of charging standards

Battery Swaping

- Completion of the development of the first battery swap series standard IEC 62840 series.

Charging Roaming

- Completing the development of the 63119 series standards

IEC SyC SET

- Advocating for the establishment of the seventh IEC Systems Committee, IEC SyC SET

Conclusions

- The development of NEV and infrastructure in China is a long-term process.
- Different policies are adopted at different stages to guide the direction of industrial development and ensure its healthy growth.
- Actively explore various technologies to promote the scientific development of industries.
- To ensure the safety bottom line of products and the interoperability of various subsystems with standardization.

Thank you

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