Federal Ministry
for Economic Affairs
and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

11th annual meeting of SGSCC Sub-Working Group Electromobility

14 October 2024 | Meeting

Start: 14:00 / 17:30 CEST

Moderation + Agenda

Mr. Mario Beier

DIN

Agenda

Time	Topic	Speaker
Moderator: Mr. Mario Beier, DIN		
15 min	Welcome speech BMWK	Mr. Dr. Thomas Zielke (BMWK)
	Welcome speech SAMR	Mr. Wang Yu (SAMR)
	Welcome speech and opening of the meeting	Mr. Dr. Michael Stephan (DIN)
10 min	Report of Sino-German SWG Workshop from 29th August, 2024 and follow-up	Mr. Ni Feng (NARI Group) Mr. Mario Beier (DIN)
14:25	**Bidirectional Charging**	
15 min	Prospect of key standards on Vehicle-to-grid	Ms. Zhou Libo (CEC)
15 min	V2L status and strategy	Mr. Tan Yi (BYD)
14:55	**Battery Technology**	
10 min	Deep discharge in the recycling process	Mr. Mathias Nippraschk (BLC – The Battery Lifecycle Company)
15 min	Current progress on EV battery recycling standards in China	Mr. Tongzhu ZHANG (CATARC)
15 min	Application of retired battery energy storage system	Mr. Qin Chao (TELD)

Agenda

15:35	**Charging Technology**	
20 min	Loaddump – Current status on developments regarding GB/T 18487.1 / ISO 21498	Ms. Meixia Pan (Mercedes Benz)
30 min	Charging Performance of EV - Testing procedure ISO/SAE 12906	Mr. Michael Scholz (P3-Group)
15min	Status charging infrastructure for ships	Ms. Liu Lifang (SPIC) Ms. Liu Minming (SUNGROW)
16:40	**Break** (20 min)	
17:00	**Review and Closing remarks**	
10 min	Review of the draft Report of the SWG	Mr. Liu Yongdong (CEC)
10 min	Review of the SWG presentation (to be presented during the Sino-German Commission-Meeting)	Mr. Mario Beier (DIN)
5 min	Closing remarks	Mr. Florian Spiteller (DKE) Mr. Wang Yu (SAMR)
5 min	Group photo of SWG attendees	all
17:30	**END**	

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Standardization Administration of the P.R.C.

Opening Remarks

Mr. Dr. Thomas Zielke

BMWK

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Opening Remarks

Mr. Wang Yu

SAMR

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Opening Remarks

Mr. Dr. Michael Stephan

DIN

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Report of Sino-German SWG Workshop from 29th August, 2024 and follow-up

Mr. Ni Feng

NARI Group

Mr. Mario Beier

DIN

Report of Sino-German SWG Workshop from 29th August, 2024 and follow-up

Ni Feng (NARI) / Mario Beier (DIN)

2024-10-14

Introduction

- Based on results of the last Sino-German SWG-meeting in November 2023 a couple of topics have been identified for further bilateral discussions and information exchange
- Following, the arrangement of a virtual Workshop with more than 30 attendees was agreed to address various topics in the areas:
  - Megawatt Charging System
  - Adapter Safety
  - Bidirectional Charging (V2G / V2L)
  - AC/DC Overlay

Megawatt Charging System (MCS)

- Germany provided an overview regarding the status of MCS
  - Relevant standards and timelines
  - System overview
  - Key harmonization items
    - Overall safety concept
    - Basic signaling
    - HLC physical layer and 15118-10 / -11
    - Sequences
- China provided an overview regarding China's MCS demonstration project
  - Development of Heavy-Duty-Vehicle market
  - Application Scenarios and Technology currently used in China
  - Current demonstration projects in China and their objectives
  - Standardization activities

Megawatt Charging System (MCS)

Discussion regarding

- integration of UltraChaoJi in IEC 61851-23-3
- relation between UltraChaoJi and MCS
- maximum Power of MCS
- dimension of short circuit bridge
- Status of current IEC TS 62196-7

Adapter Safety

- China provided a brief introduction of vehicle adapter
  - Background (several types of adapters used in China, DC/DC and AC/DC)
  - Definition and classification
  - Safety design (electrical, mechanical, thermal)
  - Standards (international, national)
- Germany provided an overview about field observations and gave an outlook
  - Background and position paper
  - Market Observations (offers, transparency, field samples)
  - Learnings, Questions (standardization, safety issues, …)

Bidirectional Charging (V2G / V2L) + AC/DC Overlay

V2G – Vehicle to Grid

- Germany provided an overview regarding the progress and status of Vehicle to Grid (V2G) reverse power transfer
  - System overview and standards
  - General system approach
    - Electrical Safety
    - Grid Integration
  - Next steps in AC-and DC-BPT standardization
- China provided an overview regarding standardization progress of EV-Grid interaction in China
  - Scenario and System Architecture
  - Demands and general use cases
  - Work progress, standardization plan and current standards
  - Working group and links to national technical committees
  - Outlook regarding further needs for research and developments

Bidirectional Charging (V2G / V2L) + AC/DC Overlay

V2L – Vehicle to Load

- Germany provided an overview regarding the topic of Vehicle to Load (V2L) adapter
  - Overview of relevant use cases
  - Overview of EV requirements for the application of the standard
  - Definition for detection configuration

- China provided an overview regarding the V2L status and strategy
  - Current market status, use cases and development process
  - Classification (AC/DC V2L)
  - Strategy (protections mechanisms) and requirements
  - Outlook and further developments

Bidirectional Charging (V2G / V2L) + AC/DC Overlay

AC/DC Overlay

- China provided an overview regarding the concepts and development of AC/DC Overlay
  - Background and potential use cases
  - Possible solutions and options
  - Done research work and projects (coupler, control pilot, system architecture, communication, …)
  - Further approach and plan (coupler, charging system, communication)

Bidirectional Charging (V2G / V2L) + AC/DC Overlay

Discussion regarding (V2G)

- the role of certificates for grid access and country specific requirements
- the national implementation in China concerning grid codes (DC in use, AC requires further developments, Ethernet could be a future option)
- The relevance of frequency stabilization caused by an increasing number of renewable energies
- the current developments on AC V2G in Germany
- electrical safety and compliance to the grid codes (stationary EV supply equipment, (non-)use of adapters, …)
- Smart charging in China (currently no mandatory standards and further developments are required)

Bidirectional Charging (V2G / V2L) + AC/DC Overlay

Discussion regarding (V2L)

- safety issues (IMD, RCD, grounding, waterproof, prevent indoor devices to be used outside, communication, …)
- development expectations in China for V2L and future standardization activities and a potential collaboration on IEC level for future standardization efforts
- Safety analysis and to share/ discuss them in further meetings in the future

→ A high need for future exchange between Chinese and German side has been seen from both sides regarding V2L

Further steps and follow-up

- For most of the topics a continuation of the information exchange and discussions on expert level could take place accordingly to the individual development of each of the topics and the concrete needs of both, Chinese and German experts (as conducted in the past)
  - Megawatt Charging System
  - AC/DC Overlay
  - Adapter Safety

- Regarding bidirectional charging an exchange of information, experiences and further developments is recommended

- In particular, it is recommended to continue the exchange regarding Vehicle to Load (V2L) aspects and topics. Therefore it is proposed that China and Germany figure out the opportunity for an appropriate collaboration format (e.g. a follow-up workshop).

Thank you!

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Prospect of key standards on Vehicle-to-grid

Ms. Zhou Libo

CEC

Prospect of Key Standards on Vehicle-to-Grid

China Electricity Council

October 2024

CONTENTS

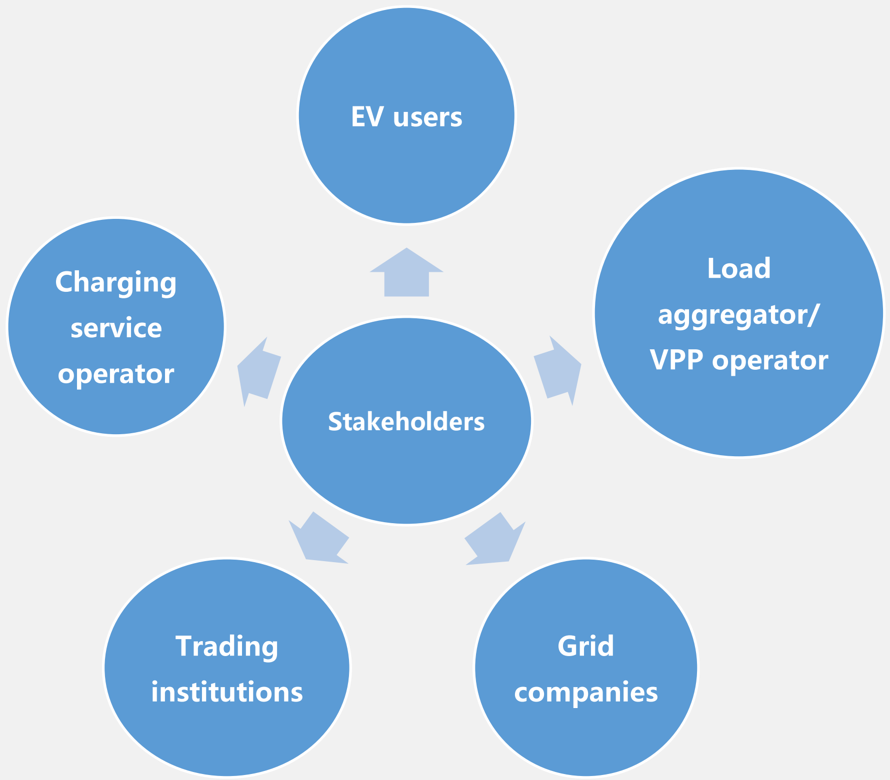
Types of VGI and Stakeholders

VGI includes various operational modes such as **coordinated charging, V2H, V2B, and V2G**; multiple application scenarios including **coordinated charging(discharging), microgrid operations, electricity markets, and emergency power supply**; and involves multiple stakeholders including **EV users, grid companies, operators, and trading institutions.**

Types of VGI

Operational Mode
- Coordinated charging
- V2H
- V2B
- V2G

Application Scenarios
- Coordinated charging (discharging)
- Microgrid operations
- Electricity markets
- Emergency power supply



National Policies

中国电力企业联合会
CHINA ELECTRICITY COUNCIL

Release Date	Policy	Main Content
2015.10	"Guiding Opinions of the General Office of the State Council on Accelerating the Construction of Electric Vehicle Charging Infrastructure"	Build Smart Charging Service Platform to **Facilitate Bidirectional Energy and Information Interaction Between EVs and Smart Grids**. **Actively Explore** Technical Solutions for the **Integration** of Charging Infrastructure with Smart Grids, Distributed Renewable Energy, and Smart Transportation, and **Strengthen R&D of Key Technologies for V2G**.
2018.11	"Notice on Issuing the Action Plan for Enhancing the Guaranteed Charging Capacity for Electric Vehicles"	**Accelerate the Promotion of Intelligent Coordinated Charging for EVs**. Address issues such as insufficient power capacity in **older residential areas** by guiding EVs to charge during **off-peak hours**.
2020.11	"Development plan for the new energy vehicle industry (2021-2035)"	Encourage Local Areas to Carry Out **V2G Demonstration Applications**. Promote the Construction of Multifunctional Integrated Stations for "Distributed Photovoltaic Generation—Energy Storage Systems—Charging and Discharging".
2022.1	"Opinions on further improving the guaranteed servicing capability of electric vehicle charging infrastructure"	Promote **Technological Innovation and Pilot Demonstrations for VGI**. Accelerate the **Advancement of Testing and Standardization Systems for VGI**. Explore Implementation Pathways for NEVs to Participate in the **Electricity Spot Market**. **Encourage the Promotion of Coordinated Charging**.
2023.5	"Implementation Opinions on Accelerating Charging Infrastructure to Support Rural Adoption of New Energy Vehicles and Revitalization"	Promote New Models Such as **Coordinated Charging.** Encourage Research on Key Technologies for **Bidirectional Interaction Between EVs and the Grid (V2G), and Collaborative Control of Photovoltaic and Energy Storage**. Implement **Time-of-Use Pricing Policies** and Encourage Users to Charge During Off-Peak Hours.

☐ National Policies

中国电力企业联合会
CHINA ELECTRICITY COUNCIL

Release Date	Policy	Main Content
2023.6	"Notice on Issuing the Action Plan for Enhancing the Guaranteed Charging Capacity for Electric Vehicles"	Vigorously Promote the **Application of Intelligent Charging Infrastructure**. Actively Advance **the Intelligent Transformation of Distribution Networks** to Strengthen Control Over EV Charging and Discharging Behavior
2024.1	"Implementation Opinions on Strengthening the Integration and Interaction Between New Energy Vehicles and Power Grid" **China's First Top-Level Design Policy Document for VGI**	Collaboratively Advance **Key Technical Breakthroughs** for VGI, Accelerate the Establishment of a VGI **Standard System**, Optimize and Improve Supporting **Pricing and Market Mechanisms**, Explore Comprehensive **Demonstrations of Bidirectional Charging and Discharging**, Actively Enhance the **Interaction Level** of Charging and Swapping Facilities, and Systematically Strengthen the **Support and Assurance Capabilities** of Grid Enterprises.
2024.7	"Action Plan for Accelerating the Construction of a New Power System (2024-2027)"	**Strengthen the Integration and Interaction Between EVs and the Grid,** Establish and Improve the **Standard System for Charging Infrastructure,** and Accelerate the Integrated Development of EVs and Energy Transition.
2024.9	"Notice on Promoting the Scaled Application of Vehicle-to-Grid Interaction Pilot Work"	**Comprehensively Promote Coordinated Charging for New Energy Vehicles, Expand the Scale of Bidirectional Charging and Discharging (V2G) Projects,** and Enrich the Application Scenarios for VGI. Focus on Cities to Improve Scalable and Sustainable Policy Mechanisms for VGI. Use V2G Projects as the Core to Explore Advanced Technologies, Clear Models, and Replicable Business Models, Striving to Guide the Scalable Development of VGI Through Market Mechanisms.

Progress in VGI Policies

- "The Implementation Opinions on Strengthening the Integration and Interaction Between New Energy Vehicles and the Power Grid" sets forth the development goals for VGI

2025

- China's VGI standard system has been initially established
- Significant progress has been made in the development of market mechanisms
- The **peak-valley electricity pricing mechanism for charging has been fully implemented** and is continuously being optimized
- Increase efforts to conduct VGI pilot demonstrations, aiming for **over 60%** of annual charging volume in participating cities by 2025 to occur during **Off-Peak Hours**, and **over 80%** of charging volume at private charging stations to occur during **Off-Peak Hours**.
- **The potential of new energy vehicles as mobile electrochemical energy storage resources** has been preliminarily verified through pilot demonstrations.

2030

- China's VGI standard system has been largely established
- Market mechanisms have become more refined
- V2G has achieved large-scale application
- **Smart coordinated charging has been fully promoted**
- **NEVs have become an important part of the electrochemical energy storage system, striving to provide the power system with bidirectional flexibility and regulation capabilities at a scale of 10 Gigawatts**

CONTENTS

Achieve comprehensive V2G implementation in phases and across different scenarios

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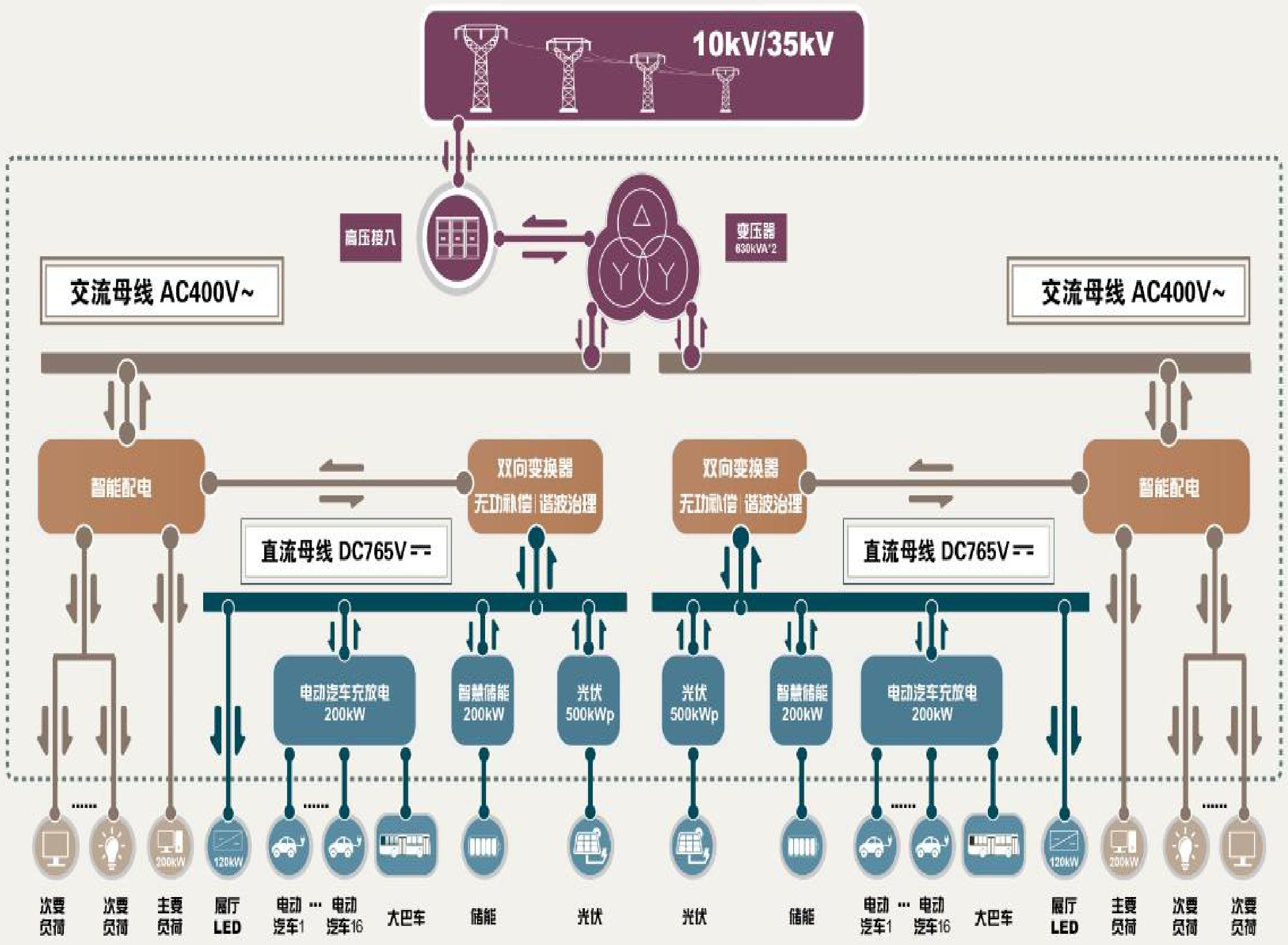
Foster the development of VPP, microgrid, V2B, and V2H

- In 2023, the largest market-oriented VPP in China had a demand-side resource capacity of **over 1,900 MW**
- more than **20** VPP projects
- **2** VPP management centers were established



Advance VGI in the process of deepening power system reform

Accelerate the identification of market participants

01 EV users

- Voluntarily participate in bidirectional EV charging and discharging interaction based on personal needs, and follow the instructions of charging and discharging service operators for coordinated charging (discharging)

02 Charging and discharging service operators

- Responsible for operation management, status monitoring, fault handling, charging and discharging services, and billing and settlement of charging and discharging equipment. Service operators can represent EV users in grid dispatch transactions and distribute interaction profits to EV users

03 EV load aggregators/ VPP operators

- Organize EV load resources for coordinated operation, participate in grid interaction transactions, and determine the scale, participation model, and responsibilities and rights of EV load resources involved in grid interaction transactions. Aggregate EV load resources through load aggregation platforms or VPP platforms, and conduct charging and discharging adjustments according to grid demands. Carry out clearing and settlement in accordance with electricity market trading rules.

Advance VGI in the process of deepening power system reform

Accelerate the identification of market participants

04 Power grid companies

- Provide power supply services to electricity users, and carry out grid operations such as dispatching, transmission and distribution, and demand response. In the bidirectional interaction of EV charging and discharging, manage the dispatch of aggregated resources, such as EV charging and discharging facilities connected to the grid

05 Electricity trading institutions

- Responsible for the construction, operation, and management of electricity trading platforms, organizing medium- and long-term market transactions, and coordinating with dispatch institutions to organize spot trading and ancillary services. Provide fair and high-quality trading services to EV load aggregation operators

Emphasize on the integration of technology across multiple scenarios

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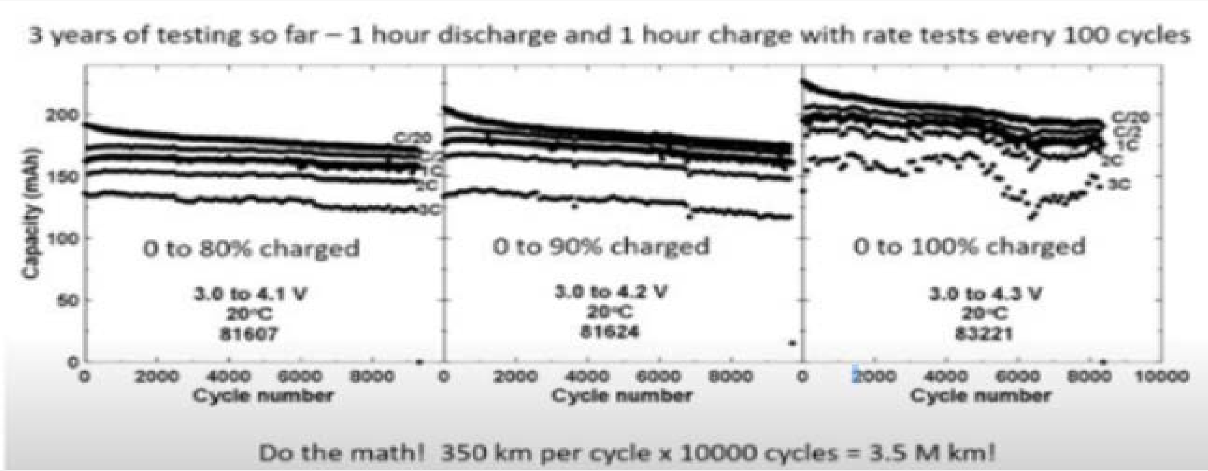
□ Collaboration between EV battery technology and charging/discharging technology

- EV technology and charging/discharging technology require further research to achieve comprehensive and specific coordination with grid demands. The response time for charging and discharging must take into account the response times of vehicles and V2G equipment. Additionally, due to differences in the structure and cooling systems between EV battery packs and conventional energy storage devices, thermal management issues also need to be considered



□ Integration of EV charging/discharging with photovoltaics and energy storage systems

- The solution integrating solar, energy storage, and charging/discharging can create a clean energy usage loop of 'solar power generation, energy storage, and charging station power consumption

Emphasize on the integration of technology across multiple scenarios

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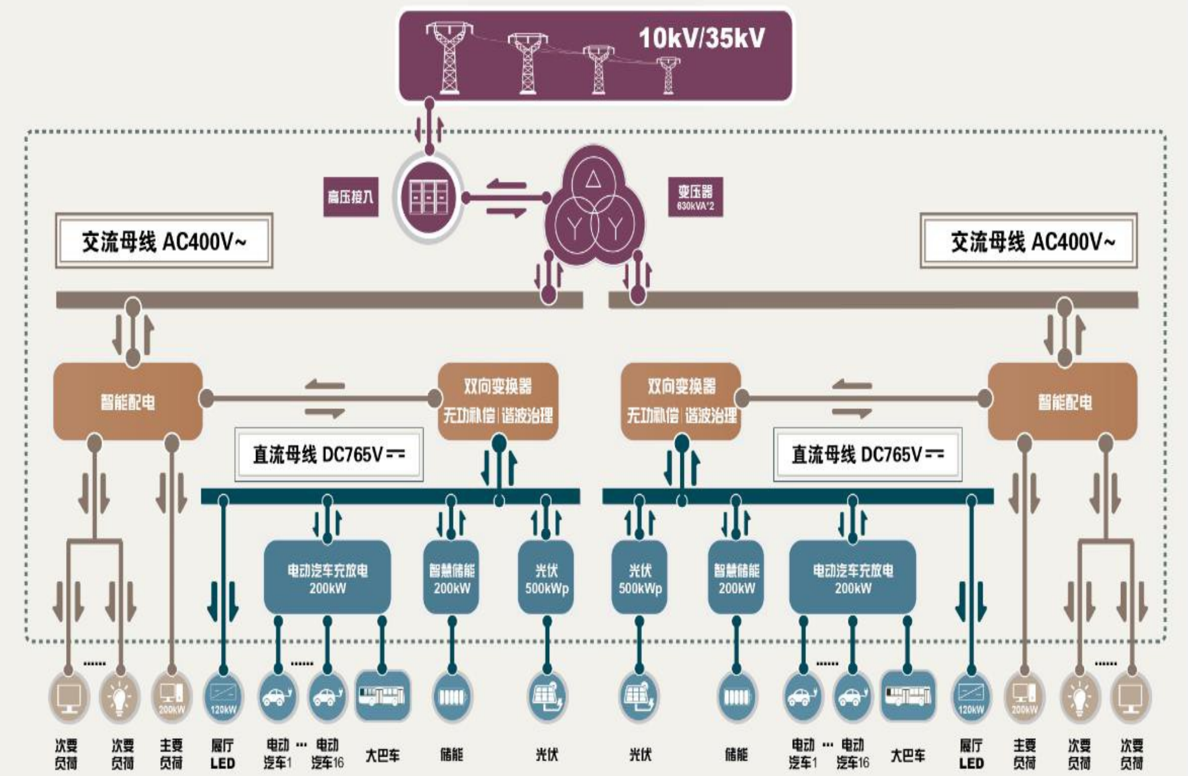
□ Integration of charging/discharging with microgrid technology

- Smart charging microgrids are the primary application scenario for aggregated, adjustable EVs. Strengthen research on the integration of charging/discharging with microgrid technology。

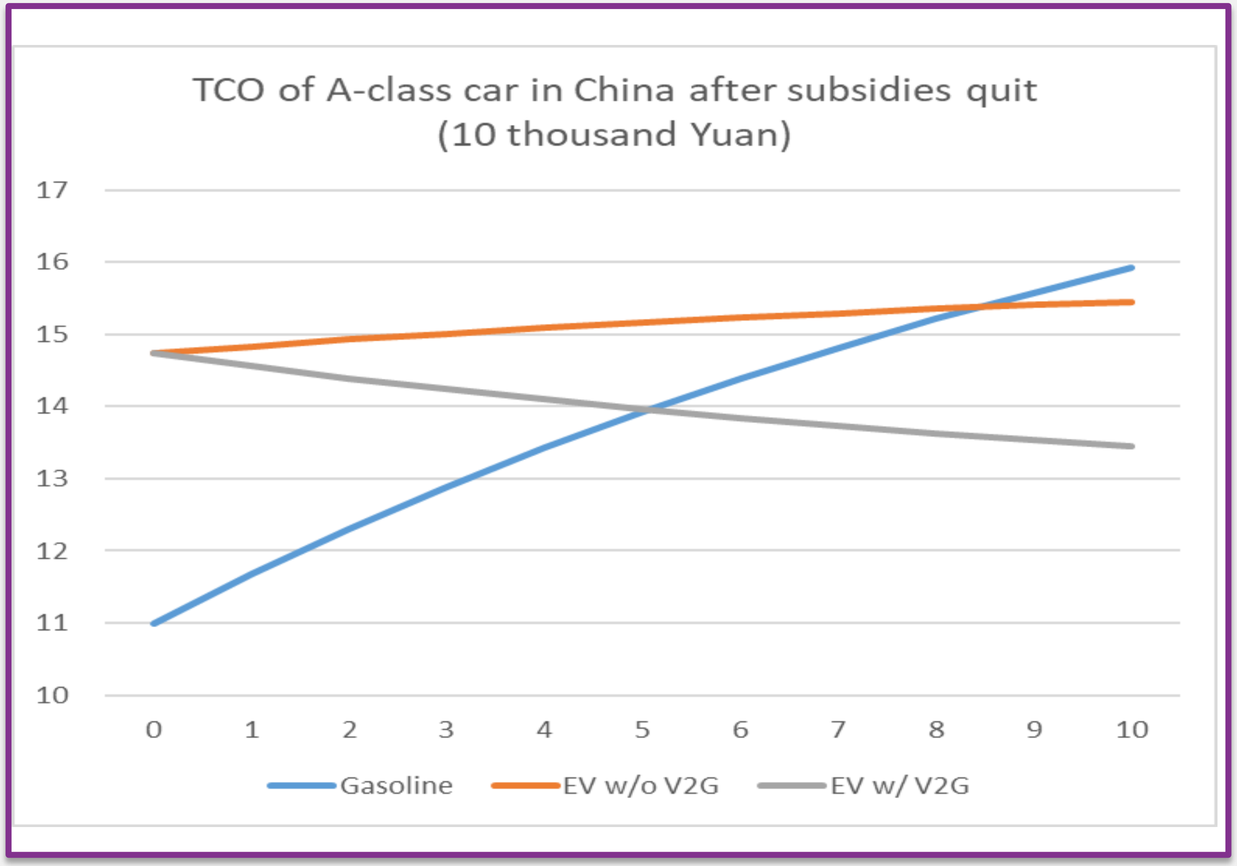


□ Integration of load aggregation and discharge forecasting technology with electricity trading

- Consider travel patterns and user behavior to reasonably assess and forecast the participation of V2G resources in electricity market transactions

Accelerate the establishment of sustainable business models for V2G

◻ Establish sound V2G business models by ensuring benefits for EV owners.



The economic performance of low-intensity used, private BEVs and commercial vehicles is hard to surpass that of ICEs and PHEVs. In Beijing, approximately **40%** of vehicles have an **annual mileage of less than 10,000 km.**

140,000 RMB for energy storage station to invest for 70kWh battery

↓

Uncertainty in mobile energy storage
20-25% standstill rate + presence rate during morning and evening peak hours>50%

↓

The equivalent energy storage potential is expected to be greater than 20-30%.

By leveraging the '**equivalent energy storage value**', the '**rental and shared energy storage capacity value**' of mainstream private cars is about **20,000 to 30,000 RMB**, equivalent to **reducing the cost** of mainstream BEVs by approximately **20%**.

Source: Tsinghua Sichuan Energy Internet Research Institute; Statistics from the Annual Report on Transportation Development in Beijing

CONTENTS

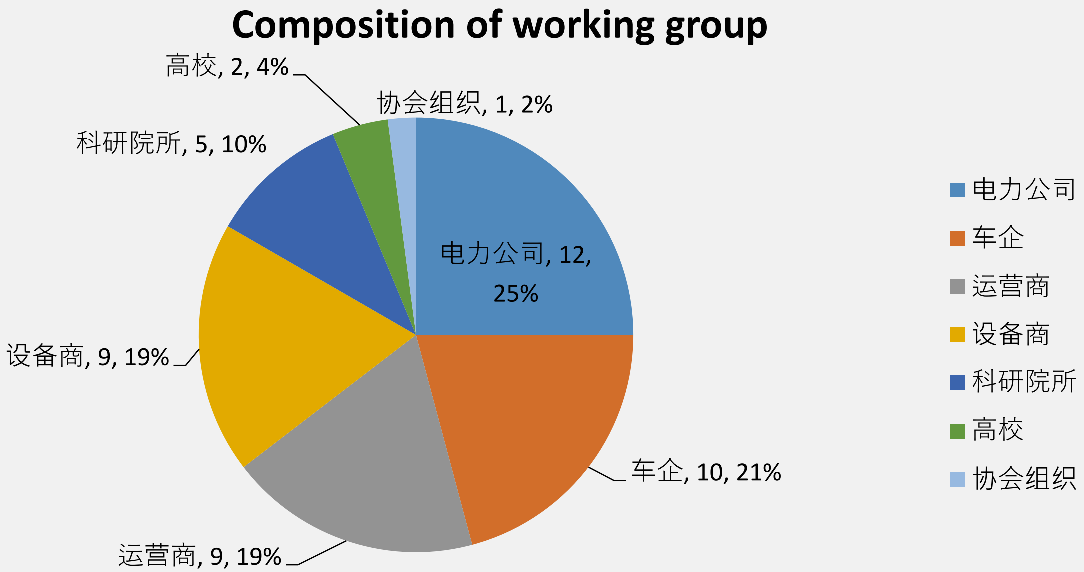
Standard - Establishment of Working Group

VGI Standards Working Group

Standards Committee: Energy Sector EV Charging Facilities Standards Committee (NEA/TC3) (China Electricity Council)

Approved in September 2023, the group consists of 50 experts from 48 organizations, including grid companies, automakers, operators, equipment manufacturers, and research institutions.

Among them are 12 power companies, 10 automakers, 9 operators, 9 equipment manufacturers, 5 research institutions, 2 universities, and 1 association.



能源行业电动汽车充电设施标准化技术委员会

充电标〔2023〕42 号

关于成立能源行业电动汽车充电设施标准化技术委员会车网互动标准工作组的通知

国网智慧车联网技术有限公司，车网互动标准工作组各成员：

为加强车网互动标准化工作，根据第三届能源行业电动汽车充电设施标准化技术委员会工作安排，决定成立车网互动标准工作组（NEA/TC3 WG5）。现将有关事项通知如下：

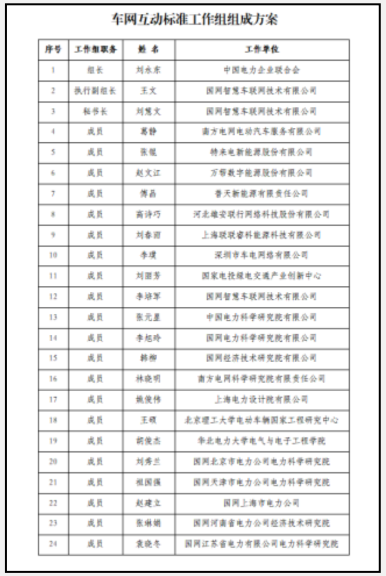
一、工作职责

车网互动标准工作组受能源行业电动汽车充电设施标准化技术委员会委托，负责电动汽车与电网互动领域标准化工作。开展车网互动标准体系建设和完善，统筹车网互动标准制修订工作；协调相关标委会和标准工作组，共同构建车网互动标准体系；促进车网互动领域技术和产业协同，推动标准验证和实施；开展车网互动国际标准化工作。

二、组成方案

车网互动标准工作组组长单位由中国电力企业联合会担任，秘书处挂靠在国网智慧车联网技术有限公司。工作组成员名单见附件。

请秘书处挂靠单位按照车网互动标准工作组职责开展工作。



车网互动标准工作组组成方案

序号	工作组职务	姓名	工作单位
1	组长	刘永东	中国电力企业联合会
2	执行副组长	王文	国网智慧车联网技术有限公司
3	秘书长	刘慧文	国网智慧车联网技术有限公司
4	成员	葛静	南方电网电动汽车服务有限公司
5	成员	张银	特来电新能源股份有限公司
6	成员	赵文江	万帮数字能源股份有限公司
7	成员	傅晶	普天新能源有限责任公司
8	成员	高诗巧	河北雄安联行网络科技股份有限公司
9	成员	刘春雨	上海联联睿科能源科技有限公司
10	成员	李璞	深圳市车电网络有限公司
11	成员	刘丽芳	国家电投绿电交通产业创新中心
12	成员	李培军	国网智慧车联网技术有限公司
13	成员	张元星	中国电力科学研究院有限公司
14	成员	李旭玲	国网电力科学研究院有限公司
15	成员	韩柳	国网经济技术研究院有限公司
16	成员	林晓明	南方电网科学研究院有限责任公司
17	成员	姚俊伟	上海电力设计院有限公司
18	成员	王震	北京理工大学电动车辆国家工程研究中心
19	成员	胡俊杰	华北电力大学电气与电子工程学院
20	成员	刘秀兰	国网北京市电力公司电力科学研究院
21	成员	祖国强	国网天津市电力公司电力科学研究院
22	成员	赵建立	国网上海市电力公司
23	成员	张琳娟	国网河南省电力公司经济技术研究院
24	成员	袁晓冬	国网江苏省电力有限公司电力科学研究院

Unified Standards for EVs, Charging Piles, Platforms, and the Power Grid

中国电力企业联合会
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- **Uphold the unity of standards from the standpoint of unifying the electricity market and the national charging and discharging service market.**

Unified Standards for EVs, Charging Piles, Platforms, and the Power Grid

中国电力企业联合会
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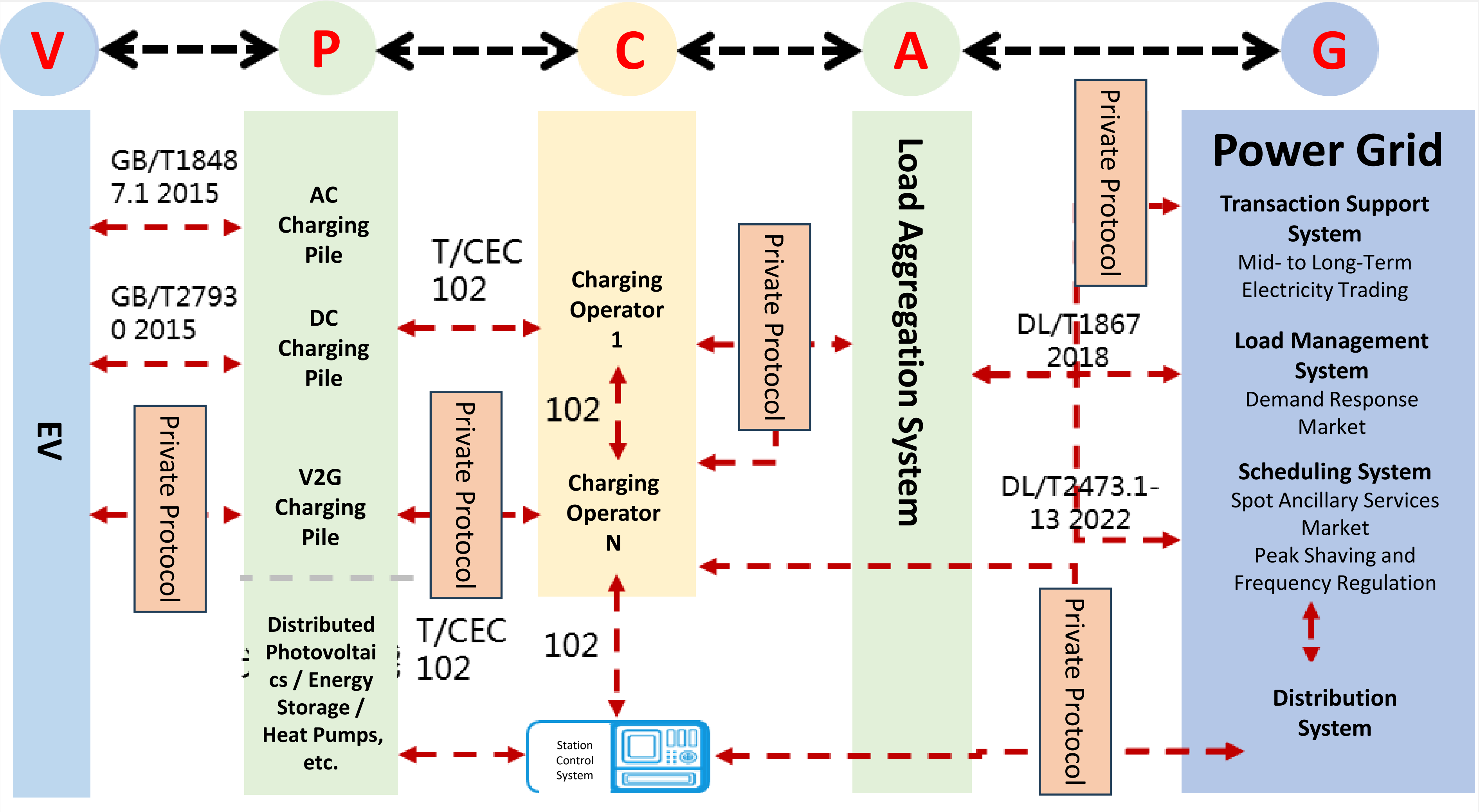
Key Standards: **Charging and Discharging Communication Protocols (AC, DC), Grid Connection Safety Standards, Charging Pile-Platform Standards**



Standards - Newly Issued National Standards

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September 7, 2023, the National Standards Committee announced (Announcement No. 9 of 2023) the release of two national standards for conductive charging systems, **GB/T 18487.1-2023 and GB/T 27930-2023**, which are officially implemented on **April 1, 2024**. These two standards provide solutions for achieving coordinated power regulation and bidirectional charging and discharging in vehicle-pile interaction systems, serving as foundational standards for realizing Vehicle-to-Grid (V2G) interactions.

GB/T 18487.1-2023 " Electric Vehicle Conductive Charging System– Part 1: General Requirements": Specifies the control guidance circuits and control timing for AC and DC charging, clarifying the method by which AC charging stations and vehicles adjust charging power in real-time through PWM duty cycle. The informational appendix provides the V2G DC charging and discharging technical solution for charging connection devices using GB/T 20234.4 (ChaoJi interface), including the control guidance circuit and the charging and discharging control process.

GB/T 27930-2023 "Digital Communication Protocols between Off-Board Conductive Charger and Electric Vehicle": Defines the interactive protocols and procedures by which DC chargers send command messages such as charging start/stop and power adjustments during the charging phase, and how vehicles receive and process these command messages. It outlines the application scenarios for charging and discharging systems using charging interfaces compatible with GB/T 20234.4 (ChaoJi interface), including the interactive protocols and processes for vehicles and charging stations to receive and handle command messages.

Standards – Draft Standards

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According to the standard system planning and standard formulation/revision plan, **9 NB** standards are currently being developed and revised, and related standard project applications are continuously being submitted.

No.	Starndard Name	Standard Type	Formulation/ Revision	Current Status	Target Completion Date
1	NB/T33021 Technical specifications for off-Board charging and discharging equipment for electric vehicles	NB	Revision	Final Draft (Approved)	2024
2	General requirements for shared DC bus optical storage and charging integrated systems	NB	Formulation	Final Draft (Approved)	2024
3	NB/T33023 Planning Guidelines for Electric Vehicle Charging and Swapping Facilities	NB	Revision	Final Draft (Approved)	2024
4	Design Standards for the Connection of Electric Vehicle Charging and Swapping Facilities to the Distribution Grid	NB	Formulation	Final Draft (Approved)	2024
5	Electric Vehicle Off-Board Conductive Charging Module	NB	Formulation	Draft for comments	2024
6	Testing Requirements for Off-Board DC Charging and Discharging Devices for Electric Vehicles	NB	Formulation	Working Draft	2025
7	Technical Specifications for Electric Vehicle Load Aggregation Systems	NB	Formulation	Working Draft	2025

Standards – Draft Standards

According to the standard system planning and standard formulation/revision plan, **2 GB** standards are currently being developed.

No.	Starndard Name	Standard Type	Formulation/ Revision	Current Status	Target Completion Date
8	Communication Requirements for Resource Access in Electric Vehicle Load Aggregation Systems	NB	Formulation	Working Draft	2025
9	Technical Specifications for Grid-Connected Operation and Control of Adjustable Loads – Part 15: Inspection and Testing Specifications (Electric Vehicles)	NB	Formulation	Working Draft	2025
1	Technical specification for intelligent bi-directional EV supply equipment	GB	Formulation	Working Draft	2026
2	Technical guidelines for the construction and operation of electric vehicle coordinated charging system	GB	Formulation	Working Draft	2026

Standards – Next Steps

The VGI Working Group will actively implement the requirements of the "Implementation Opinions on Strengthening the Integration and Interaction between New Energy Vehicles and the Power Grid" issued by the National Development and Reform Commission and other departments regarding the acceleration of establishing the VGI standard system. The next steps will focus on the following three areas:

1

- Accelerate the Revision and Development of Key Technical Standards for Charging and Discharging Equipment and Interfaces, Load Aggregation Systems, Communication Access Specifications, and Related Testing Standards. Organize Technical Standard Verification and Actively Pursue New Technical Standard Project Applications in the Field of Vehicle-to-Grid Interaction.

2

- Strengthen Research and Analysis on Industry Technology Development Trends, Market Demand, and Practical Application Scenarios, Continuously Optimize and Improve the VGI Standard System, and Essentially Form a Systematic Support Framework for VGI Business.

3

- Fully Leverage the Role of the VGI Working Group, Organize Timely Discussions on Key Technical Roadmaps and Standards, Strengthen Collaborative Efforts with Relevant Standardization Committees in Cross-Sector Areas, and Jointly Promote the Standardization and Industrialization of VGI Interaction Technologies.

Thank You！

China Electricity Council

email：zhoulibo@cec.org.cn

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会 Standardization Administration of the P.R.C.

V2L status and strategy

Mr. Tan Yi

BYD

China V2L Status and Strategy

Content

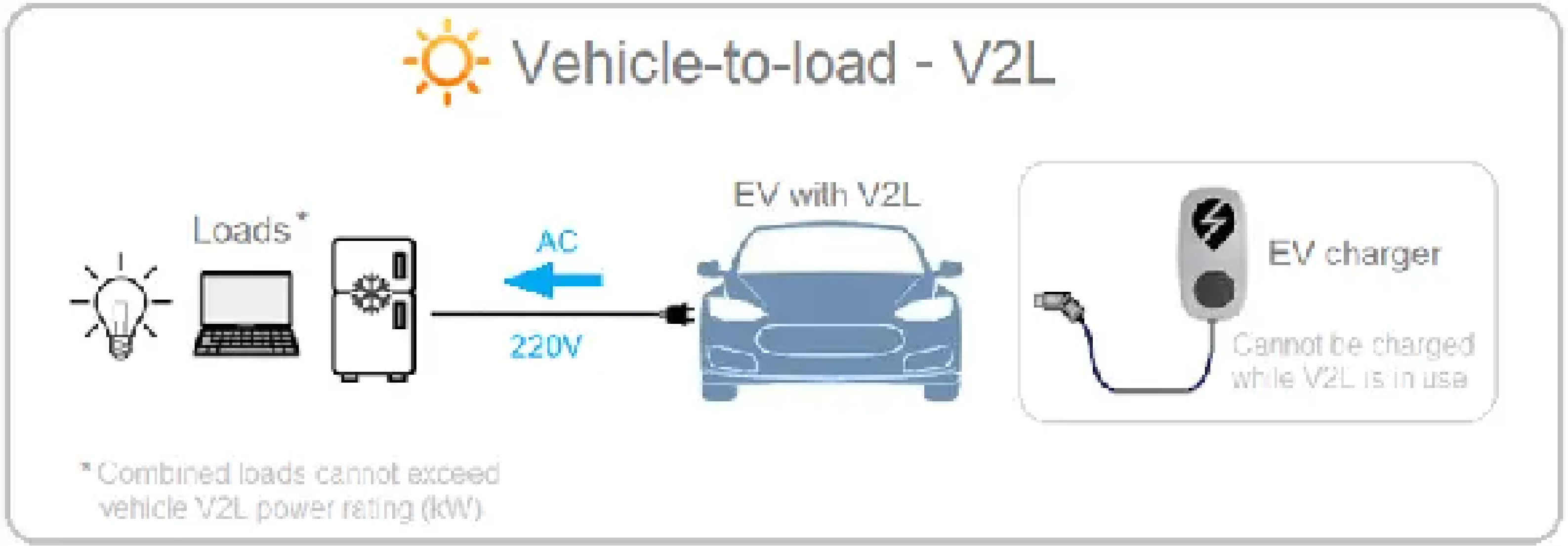
Current status

Definition

V2L (Vehicle to Load) is defined as the technology of vehicle discharging outward, which allows electric vehicles to output electric energy to external devices when they are parked.

Background

With the continuous development of electric vehicle technology, the range and battery capacity of electric vehicles have been significantly improved, making V2L technology possible. This technology can meet the needs of outdoor electricity, emergency rescue and other scenarios, and further expand the scope of use of electric vehicles.



Current status

Application of V2L in the field of electric vehicles

Outdoor leisure activity

Electric vehicles can provide power for outdoor camping, picnics and other activities through V2L technology to meet the needs of lighting, cooking and so on.

Emergency power supply

In case of power failure or emergency, electric vehicles can be used as emergency power supply to provide power for household appliances, medical equipment and so on.

Environmental protection and energy saving

By using the energy storage capacity of electric vehicles, we can reduce the dependence on traditional power generation methods, such as fuel-based power generater in construction fields, which can reduce carbon emission and contributes to sustainability.

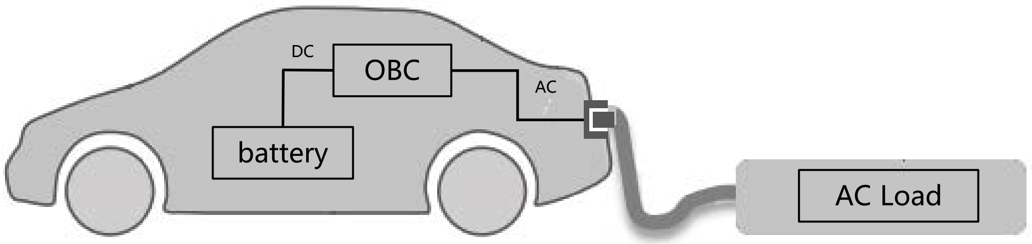
V2L power extracter

Current status

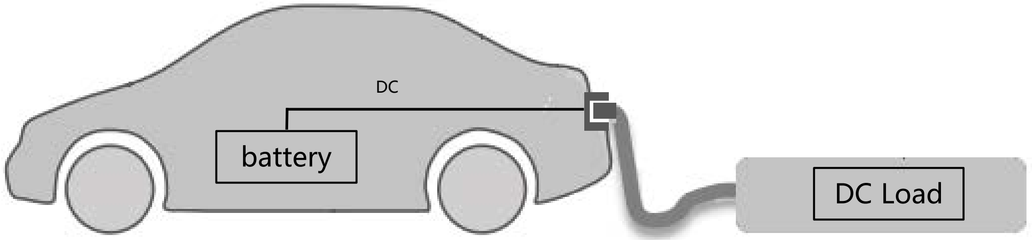
V2L classification

According to the type of vehicle output power, V2L is divided into AC V2L and DC V2L.

AC V2L
The direct current of the battery is inverted into alternating current through the OBC, and is discharged to the alternating current load through the alternating current charging coupler.



DC V2L
The direct current of the battery is discharged to the DC load through the DC charging coupler, and the load receives the direct current.



Current status

Development process

Since BYD launched V2L off-board discharge in 2015, the domestic market has developed AC V2L and DC V2L with 3.3-6.4 kW.

In 2015, BYD Qin introduced the V2L external discharge function with a maximum power of 3.3 kW.

The maximum discharge power of BYD Tang in 2021 is 6 kW.

Model Y equiped with One-Way OBC, discharging through DC interface and external inverter equipment

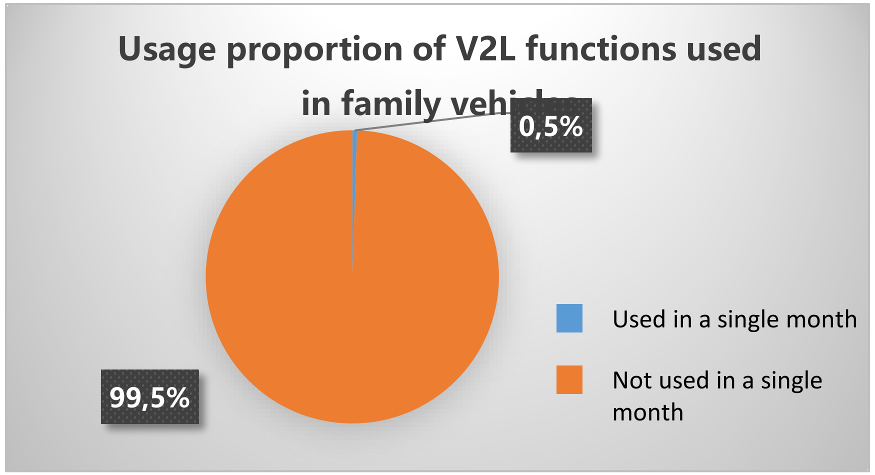
The NIO ES6 has no OBC configuration. Instead, the official specifications indicate that the vehicle is equipped with a direct current (DC) charging and discharging all-in-one machine.

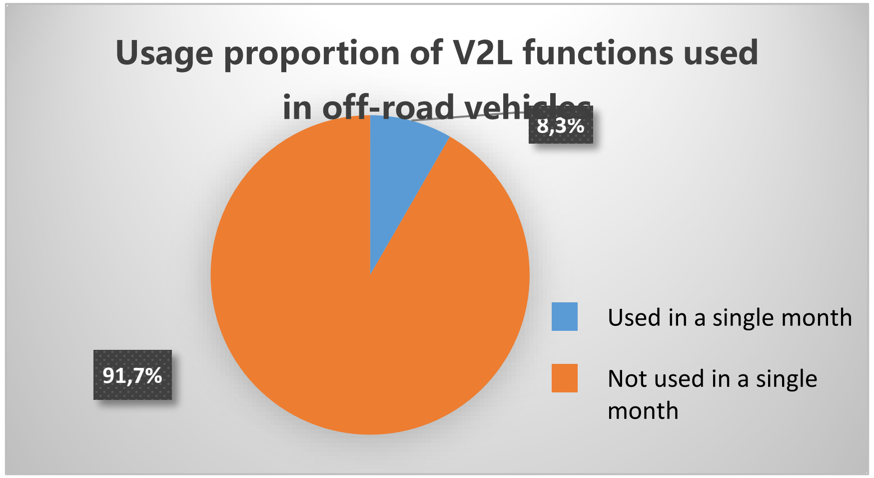
Growing discharging power

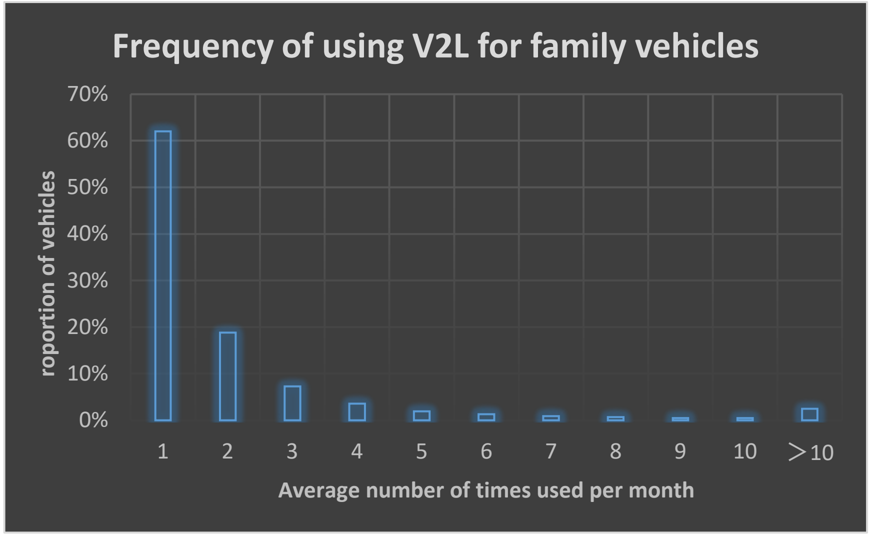
Different technical approaches

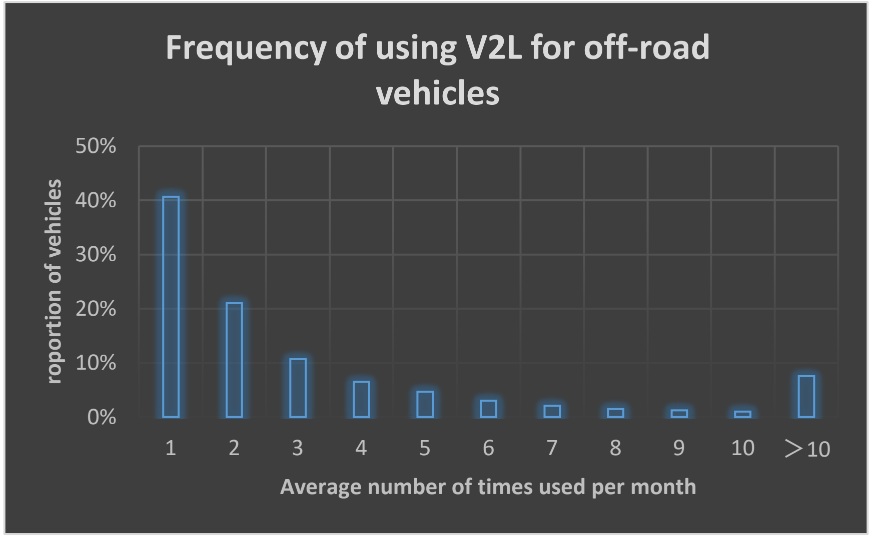
Current status

V2L application comparison









Current status

V2L application, not only for entertainment, but also for emergency

In China, people used V2L function to provide basic power supply to the local community after flood disaster

People used his electric car to help people affected by power outages in Bonogin

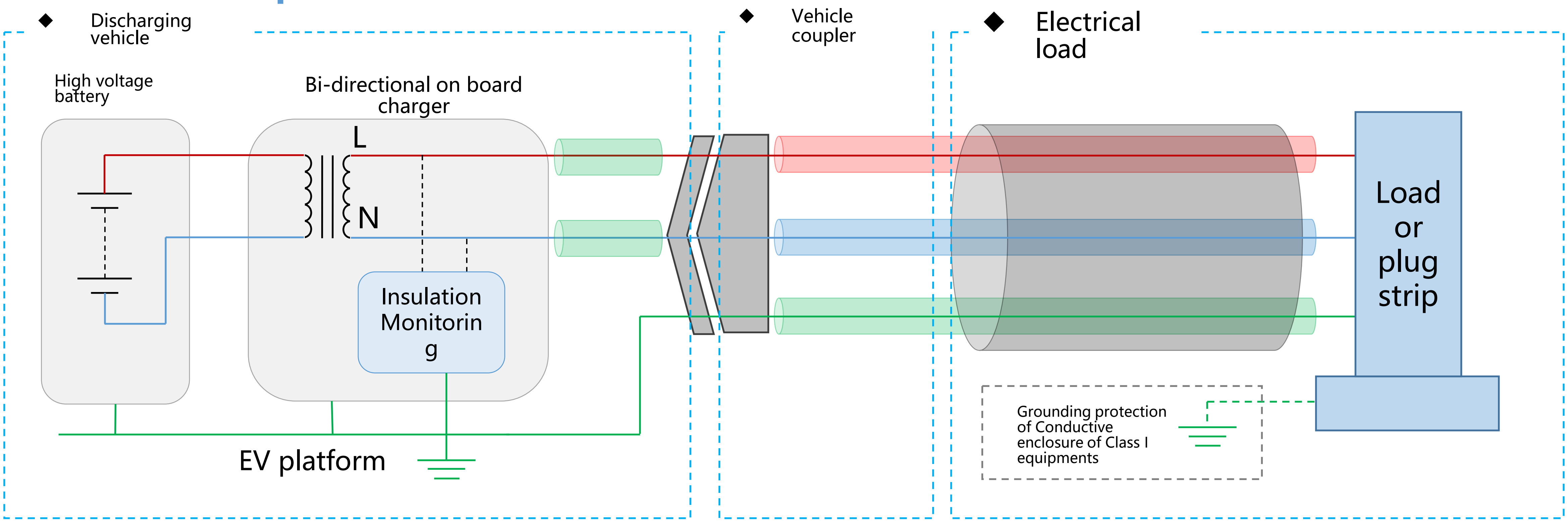
In Australia, people used V2L function to provide power to Hemodialysis machines in sudden power shutdown caused by flood

General requirements

V2L	AC V2L	DC V2L
Coupler	Conform to GB/T20234.2-2015	Conform to GB/T20234.3-2015
		
Discharge specification	Maximum 220V/32 A or 380V/63 A	Maximum 1000 V/250A
Grounding protection	Grounding protection provided by the load	Grounding protection provided by the load
Insulation detection	Provided by vehicle	Provided by vehicle
Communication	PWM communication	CAN communication

Strategy-AC V2L

Electric shock protection of V2L



- **Electric shock protection measures for discharging vehicles:**
  1. AC discharge insulation monitoring

- **Vehicle coupler:**
  1. Double insulation or reinforced insulation

- **Protective measures for electric shock at load side:**
  1. 360 ° shielded cable with protective conductors at both ends
  2. Protective conductor of Class I equipment is grounded
  3. Double insulation or reinforced insulation for Class II equipment
  4. Gounding warning sign

Strategy-AC V2L

Other protection

- ◆ Coupler protection

- ➢ After connected with the protection device, the level of protection is IP54;
- ➢ After the coupling of vehicle coupler, the level of the protection raise to IP55;
- ➢ The vehicle coupler is equipped with a drain for water release;
- ➢ Adding sealing rings to vehicle coupler;

Drain

Sealing ring

- ◆ AC output short circuit protection

- ◆ AC output overload protection

Overload protection

Standard system

V2L standard system in China

Aspect	Standards
Coupler	GB/T 20234.2(AC) Connection set for conductive charging of electric vehicles—Part 2: AC charging coupler GB/T 20234.3(DC) Connection set for conductive charging of electric vehicles—Part 3: DC charging coupler
Connection set	Specific standard for V2L is under consideration
Control pilot	GB/T 18487.4 Electric vehicle conductive charging and discharging system—Part 4: Discharging requirements for electric vehicle (FDIS)
Safety	GB/T 43332 Safety requirements of conductive charging and discharging for electric vehicles
Communication	GB/T 18487.4 Electric vehicle conductive charging and discharging system—Part 4: Discharging requirements for electric vehicle (FDIS)


Thank You!

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Deep discharge in the recycling process

Mr. Mathias Nippraschk

BLC – The Battery Lifecycle Company

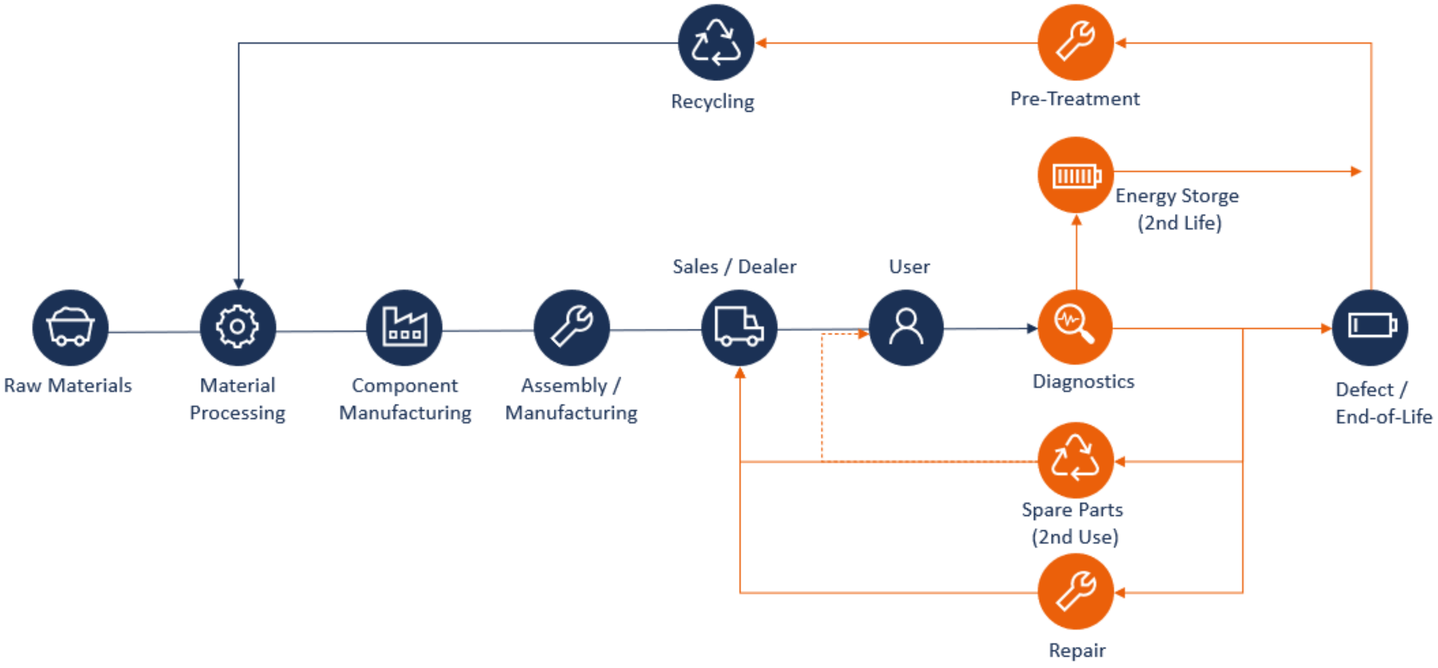
Sino-German
Sub-Working Group Emobility

„Deep discharge in the recycling process“

14.10.2024

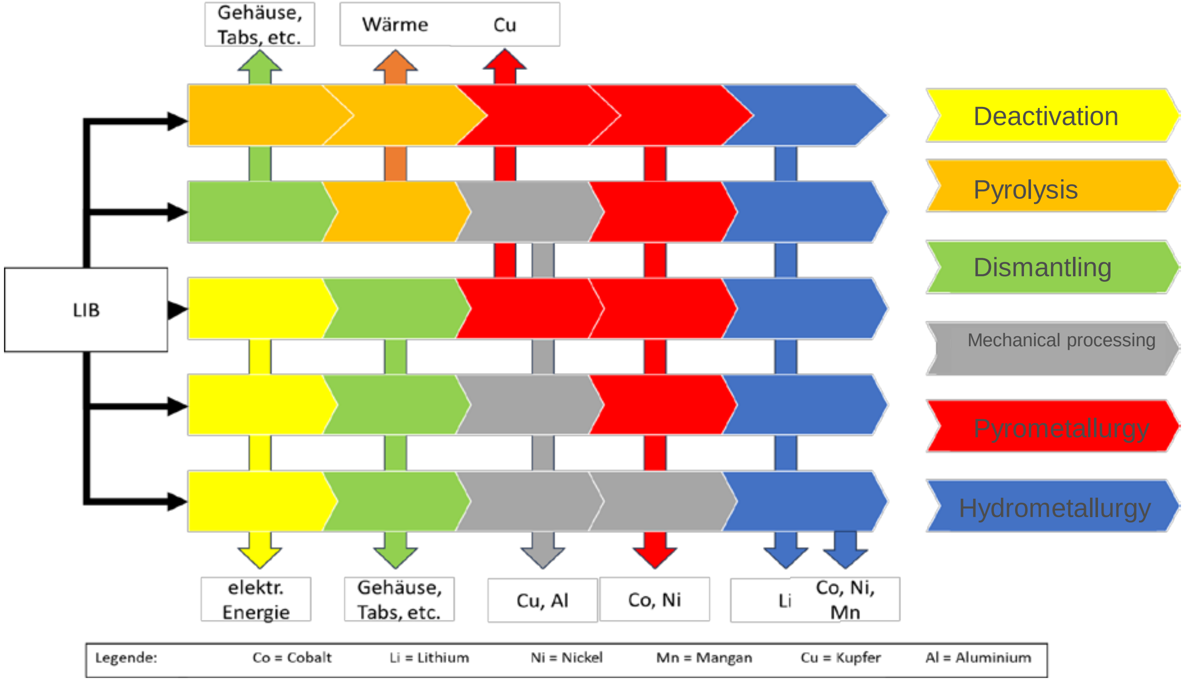
DIN DKE VDE DIN VDA Normenausschuss Auto und Mobilität

Value Chain Batteries



DIN DKE VDE DIN VDA | Normenausschuss Auto und Mobilität

Variety of recycling processes



DIN DKE VDE DIN VDA Normenausschuss Auto und Mobilität

Potantial hazards of Batteries & Advantages of deep discharge in recycling

- Electrical hazards
- Fires
- Burns
- Arcing etc.

- Work safety
- Recyclingprocess
- Transportation
- Warehousing

Our aim is to develop a standardized definition for deep discharge, including the associated procedures, requirements and a test procedure.

DIN DKE VDE DIN VDA Normenausschuss Auto und Mobilität

Working Group Information

- Call for Experts on 11.10.2023
- DKE/AK 371.1.19 "Tiefentladung von Lithium-Ionen Batterien vor dem Recyclingprozess“
  - (engl.: Deep discharge of lithium-ion batteries before the recycling process)
- 1. Meeting: 31.01.2024 (8 meetings held in the meantime)
- Number of persons: 18
- Industry, Research & Development, employers' liability insurance association etc.

Current work status

- First the definitions at cell level, then module level, then battery level
  - Start at the cell level
- Splitting the process into: before, during and after deep discharge
- Definition of which parameters, data, requirements are relevant during these steps
- Presentation of best practice

- Goal: Completion by the end of the year

Contact details

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Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会 Standardization Administration of the P.R.C.

Current progress on EV battery recycling standards in China

Mr. Tongzhu ZHANG

CATARC

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

Current progress on EV battery recycling standards in China

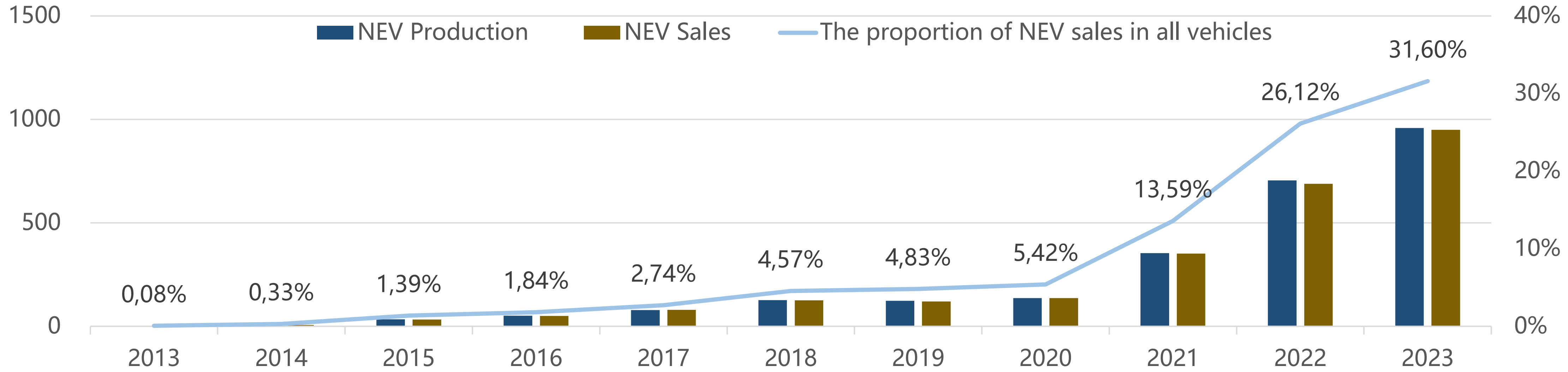
Tongzhu ZHANG
zhangtongzhu@catarc.ac.cn

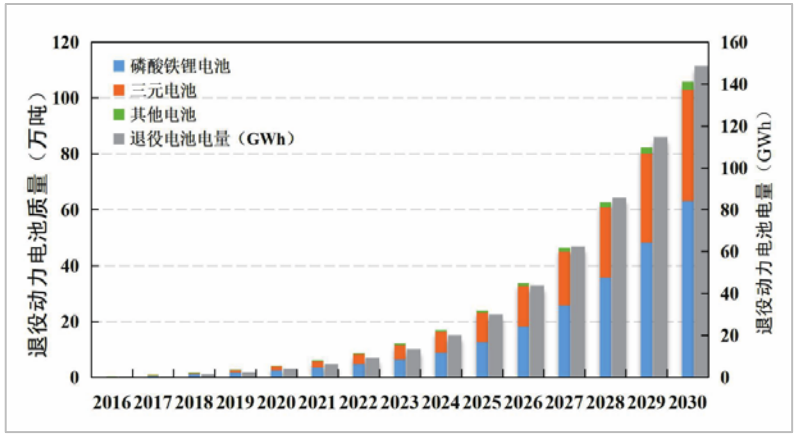
Bonn (Germany)，14 October 2024

目录 Contents

2023年，中国新能源汽车产销量接近1000万辆，保有量达到2041万辆，退役动力电池总量超58万吨

With the rapid growth of electric vehicle industry in China， nearly 10 Million NEVs were sold in 2023， the number of electric vehicles exceeded 20 million， more than 0.58 millon tons of EV batteries retired and there will be quantity of retired EV batteries in the future.





Quantity of retired EV batteries

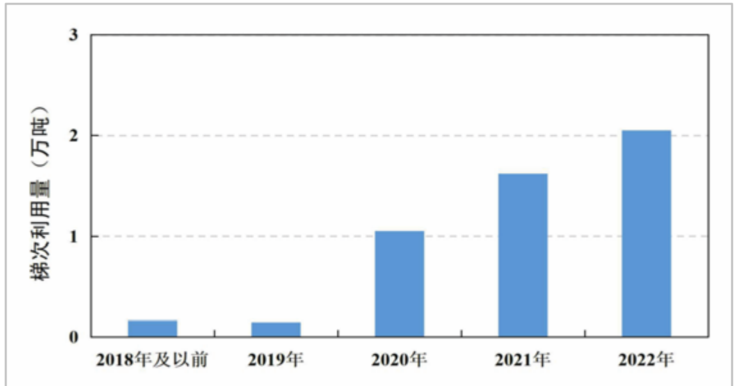


图 1.3.1 历年废旧动力电池梯次利用量

Quantity of batteries that to be repurposed

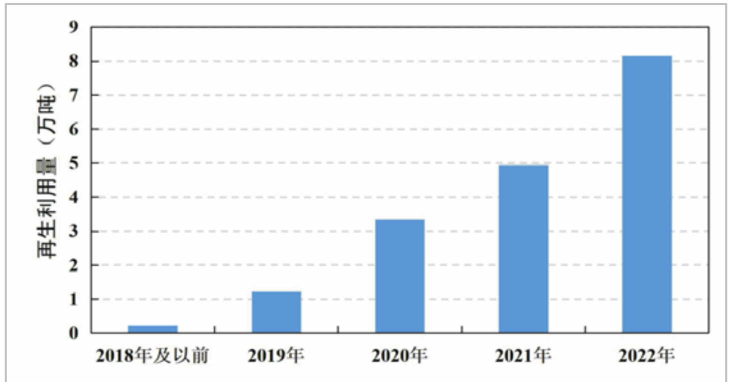


图 1.4.1 历年废旧动力电池再生利用量

Quantity of batteries that to be recycled

一、中国汽车动力电池回收利用标准体系

Part1：Standard framework of EV battery recycling

为促进汽车全生命周期资源节约、气候减缓、环境保护，构建了汽车绿色低碳循环标准体系框架

In order to promote the sustainable development of auto industry, we have built a green, low-carbon and circular developmen standard system focusing on resources conservation, climate change mitigation and environmental protection in China, including EV battery recycling standard system.

Automotive sustainable development standard system framework

1 Green development standards — Environmental protection

- 1.1 General standard
- 1.2 green factory assessment
- 1.3 green supply chain assessment
- 1.4 green design product assessment
- 1.7 vehicle in-door air quality
- 1.8 evaporative Pollutants of vehicle and part
- *1.9 exhaust Emissions*
- *1.10 Vehicle noise emission*
- *1.11 electromagnetic radiation pollution*

2 Low-carbon development standards — Climate change mitigation

- 2.1 General standard
- 2.2 carbon monitoring and Measurement
- 2.3 product carbon footprint accounting
- 2.4 enterprises carbon emission accounting
- 2.7 carbon emission information disclosure
- 2.8 carbon assessmen（low/high/neutrality）
- 2.9 carbon emission & footprint threshold
- 2.10 carbon management system & technology
- 2.11 carbon reduction technology standards

3 Circular development standards — Resources conservation

- 3.1 General standard
- 3.2 RRR of new vehicles
- 3.3 reuse of recycled materials
- 3.4 water efficiency/ water footprint
- 3.7 reused part of ELVs
- 3.8 remanufactured parts of ELVs
- 3.9 recovery of EV traction batteries
- 3.10 reutilization of waste（solid/liquid/gas）
- 3.11 recycling rate/ recovery rate of ELVs

4 comprehensive sustainable assessment（LCA、OEF、PEF、ESG、CSR）/ comprehensive sustainable management（digital passport、Supply chain due diligence、expanded producer responsibility）

2012年，根据《节能与新能源汽车产业发展规划（2012-2020年）》，启动动力电池回收利用国家标准研究

In the year 2012， The Chinese government issued《Energy Saving and New Energy Vehicle Industry Development Plan（2012-2020）》， it clarified the requirements for EV battery recycling standards， so we started to make EV battery recycling standards from the year 2012.

3.Circular standard

- 3.1 General standard
- 3.2 RRR promoting
- 3.3 Use of recycled materials
- 3.4 Water consumption/PWF
- 3.5 Biological/mineral resources
- 3.6 Disassembly of ELVs
- 3.7 Part reuse from ELVs
- 3.8 Component remanufacturing
- **3.9 Traction battery recovery**
- 3.10 Solid/liquid/gas waste dispose
- 3.11 Actual recycling rate of ELV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中央政府门户网站 www.gov.cn 2012年07月09日 09时11分 来源：国务院办公厅
【字体：大 中 小】 打印本页 关闭窗口

《Energy Saving and New Energy Vehicle Industry Development Plan（2012-2020）》

国发〔2012〕22号

各省、自治区、直辖市人民政府，国务院各部委、各直属机构：

现将《节能与新能源汽车产业发展规划（2012—2020年）》印发给你们，请认真贯彻执行。

国务院
二〇一二年六月二十八日

节能与新能源汽车产业发展规划
（2012—2020年）

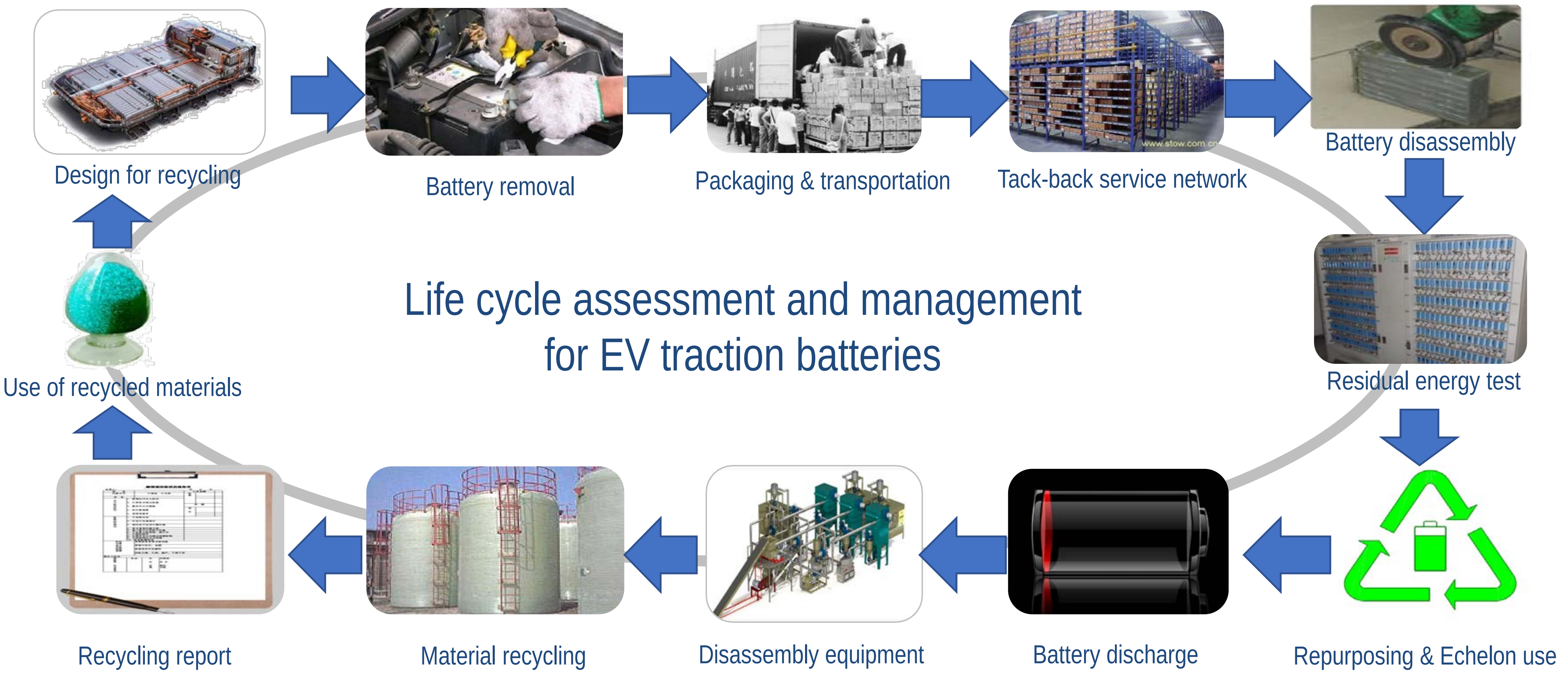
(5) Strengthen the echelon use and recycling management of EV traction batteries.

- Formulate management methods for EV battery recycling, establish a cascade utilization and recycling management system for EV batteries, and clarify the responsibilities, rights and obligations of all relevant parties. Guide EV battery production enterprises to strengthen the recycling of waste batteries, and encourage specialized battery recycling enterprises.
- To set the access conditions for EV battery recycling enterprises, and clarify the technical standards and management requirements for the collection, storage, transportation, treatment, recycling and final disposal of EV batteries.

一、中国汽车动力电池回收利用标准体系
Part1：Standard framework of EV battery recycling

围绕动力电池新品可回收设计、退役电池拆卸、包装运输、梯次利用、再生利用等全方面开展标准研究

Our standards research have been carried out around new battery design for recycling， retired battery removal, disassembly, packaging and transportation, repurposing/echelon use and recycling/recovery， focusing on the whole life cycle of EV traction batteries.



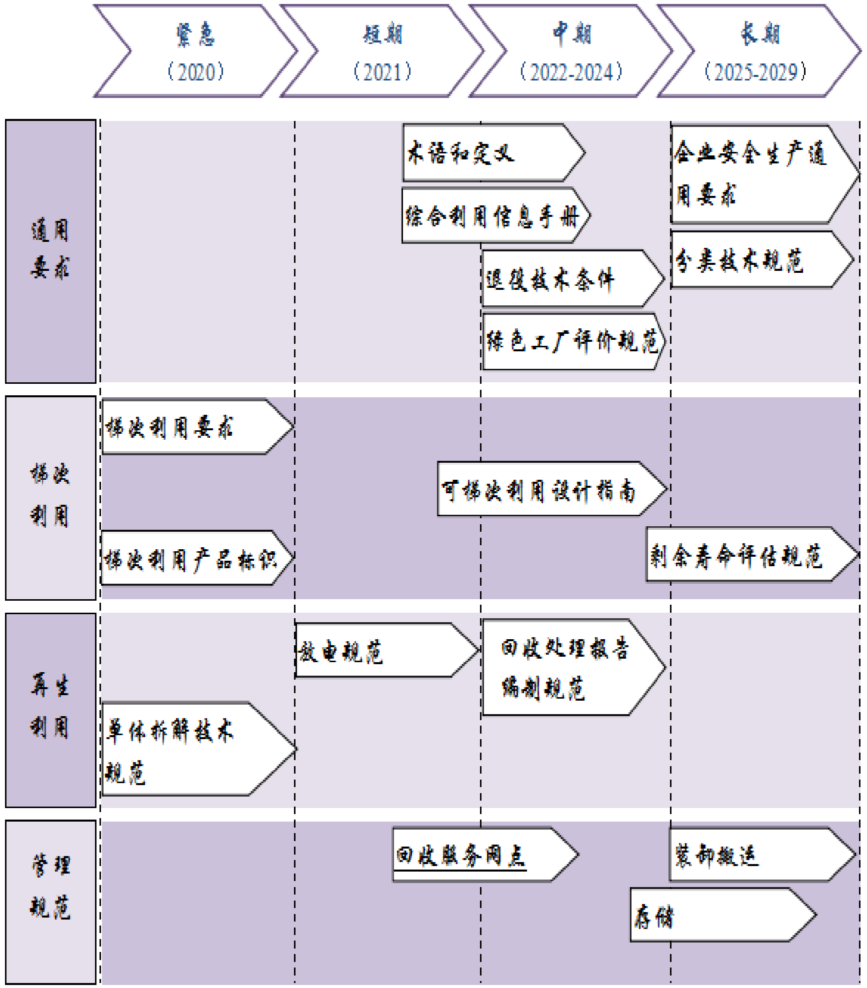
一、中国汽车动力电池回收利用标准体系

Part1：Standard framework of EV battery recycling

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co.,Ltd.

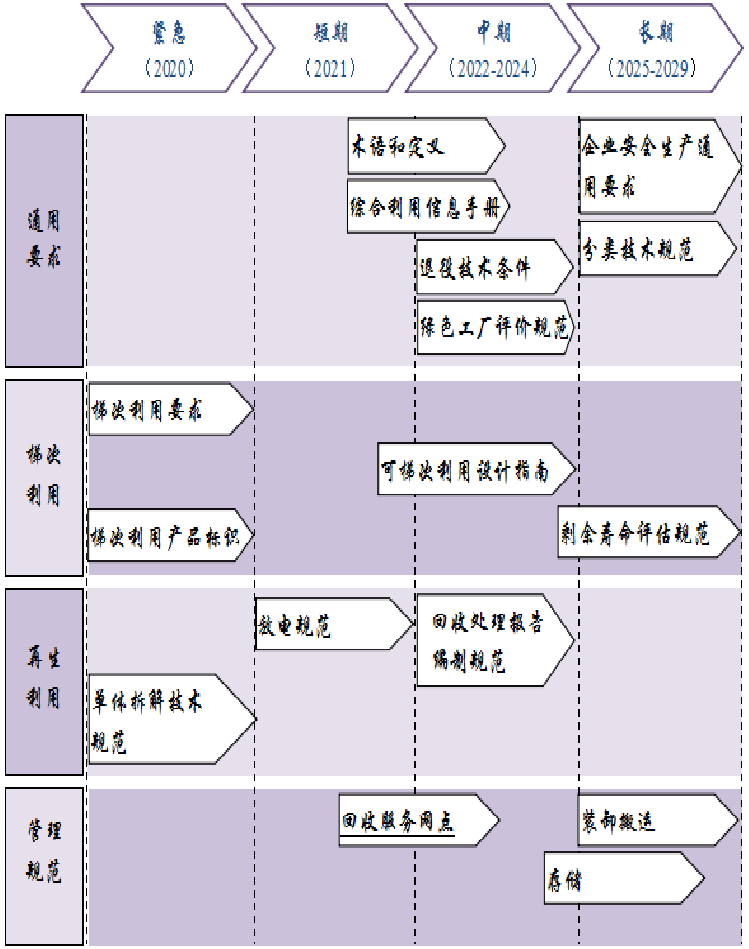
2016年以来发布4版《中国电动汽车标准化工作路线图》,包括回收子体系,研究”通用要求/梯次/再生/管理规范”

From 2016,we have issued 4 versions of “Roadmap for the Standardization of EVs in China” ,including a sub-roadmap for recycling /recovery of EV traction batteries, focusing on “General requirements”, “Echelon use requirements”, “Recycling requirements” and “Management specifications”.



发布动力电池回收相关国标12项/行标1项，其中包括通用要求1项，新品2项，管理2项，梯次4项，再生4项

We have formulated 12 National standards and 1 industry standard around “general requirement” , “New Battery requirements” , “Management specifications” , “Echelon use” , “Recycling” of EV batteies recovery， and there will be many other standards to be drafted in the future.



No.	Type	Name of standards
1	General	Recovery of traction batteries used in EVs—general requirements（GB/T 44132-2024）
2	New Battery	Dimension of traction Battery for electric Vehicles（GB/T 34013-2017）
3		coding regulation for automotive traction Battery（GB/T 34014-2017）
4	Management specifications GB/T 38698	Recovery of traction batteries used in EVs—management specifications—Part 1: packaging and transporting (GB/T 38698.1-2020)
5		Recovery of traction batteries used in EVs—management specifications—Part 2: Take-back service network（GB/T 38698.2-2023）
6		Recovery of traction batteries used in EVs—management specifications—Part 3: Information manual for recovery（studying）
7		Recovery of traction batteries used in EVs—management specifications—Part 4: handling and transport（studying）
8		Recovery of traction batteries used in EVs—management specifications—Part 5: Storage specification（studying）
9	Echelon use GB/T 34015	Recovery of traction batteries used in EVs—Echelon use—Part 1: test of residual capacity（GB/T 34015-2017）
10		Recovery of traction batteries used in EVs—Echelon use—Part 2: removing requirements（GB/T 34015.2-2020）
11		Recovery of traction batteries used in EVs—Echelon use—Part 3: echelon using requirements（GB/T 34015.3-2021）
12		Recovery of traction batteries used in EVs—Echelon use—Part 4:labels for echelon used battery products（GB/T 34015.4-2021）
13		Recovery of traction batteries used in EVs—Echelon use—Part 5:Battery design guide for echelon use（drafting）
14		Recovery of traction batteries used in EVs—Echelon use—Part 6: Residual life evaluation specification
15		Recovery of traction batteries used in EVs—Echelon use—Part 7: Retired and classification
16	Recycling GB/T 33598	Recovery of traction batteries used in EVs—recycling—Part 1: disassembly specifications（GB/T 33598-2017）
17		Recovery of traction batteries used in EVs—recycling—Part 2: materials recycling requirements (GB/T 33589.2-2020)
18		Recovery of traction batteries used in EVs—recycling—Part 3: specifications for discharging (GB/T 33589.3-2021)
19		Recovery of traction batteries used in EVs—recycling—Part 4:Recovery report preparation（studying）
20		Recovery of traction batteries used in EVs—specifications for secondary cell disassembly（QC/T 1156-2021）

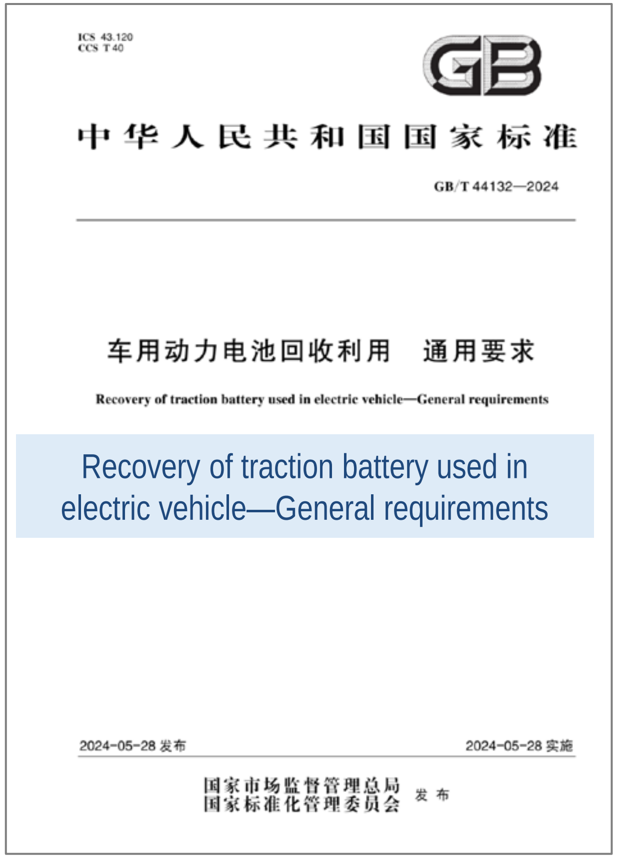
目录 Contents

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

2.1General requirements

2.2New battery | 2.3Management specification | 2.4Echelon use | 2.5Material recycling

"GB/T 44132-2024 Recovery of traction battery used in electric vehicle—General requirements", it gives the "principles of battery recovery", "basic requirements", "collecting requirements", "comprehensive use requirements", including echelon use and recycling requirements and so on.


ICS 43.120
CCS T 40
GB
中华人民共和国国家标准
GB/T 44132—2024
车用动力电池回收利用　通用要求
Recovery of traction battery used in electric vehicle—General requirements
2024-05-28 发布
2024-05-28 实施
国家市场监督管理总局
国家标准化管理委员会 发布

Recovery of traction battery used in electric vehicle—General requirements

回收利用原则 principles of recovery: 安全性原则 principles of safety; 绿色低碳原则 principles of green; 再利用原则 principles of recycling; 全生命周期原则 principles of whole lifecycle

基本要求 basic requirements: 一般要求 general; 产品要求 product; 溯源要求 tracing; 安全要求 safety; 环保要求 environment; 应急要求 emergency

回收要求 collecting requirements: 拆卸要求 removal; 收集要求 collecting; 分类要求 classification; 包装运输要求 packaging & transportation; 贮存要求 storage

综合利用要求 comprehensive use requirements:
- 梯次利用要求 Echelon use: 梯次利用生产要求 Echelon use production; 梯次利用产品要求 Echelon used products
- 再生利用要求 Recycling: 再生利用生产要求 Recycling production; 再生利用产品要求 Recycled products

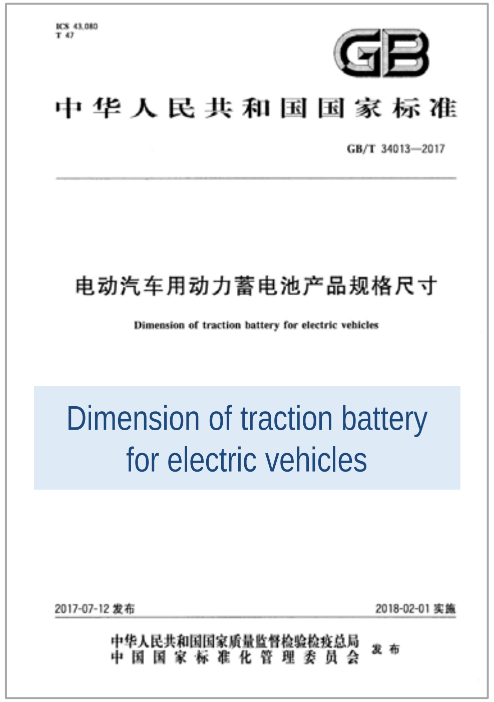
附录A Appendix: 再生材料使用率计算方法 Calculating method of recycled material usage

2.1General requirements

2.2New battery | 2.3Management specification | 2.4Echelon use | 2.5Material recycling

"GB/T 34013-2017 Dimension of traction battery for electric vehicles", gives the specifications and dimensions of traction battery cells, modules and standard boxes for EVs. Applicable to lithium-ion batteries and nickel metal hydride batteries used in electric vehicles. This standard can promote the large-scale disassembly and repurposing of retired batteries.

"GB/T 34014-2017 Coding regulation for automotive traction battery", gives the code object, code structure composition, code structure representation method and data carriers. Applicable to EV batteries, supercapacitors and other rechargeable energy storage devices.This standard can promote the tracing of batteries through all the lifecycle.


ICS 43.080
T 47

GB

中华人民共和国国家标准

GB/T 34013—2017

电动汽车用动力蓄电池产品规格尺寸

Dimension of traction battery for electric vehicles

2017-07-12 发布 2018-02-01 实施

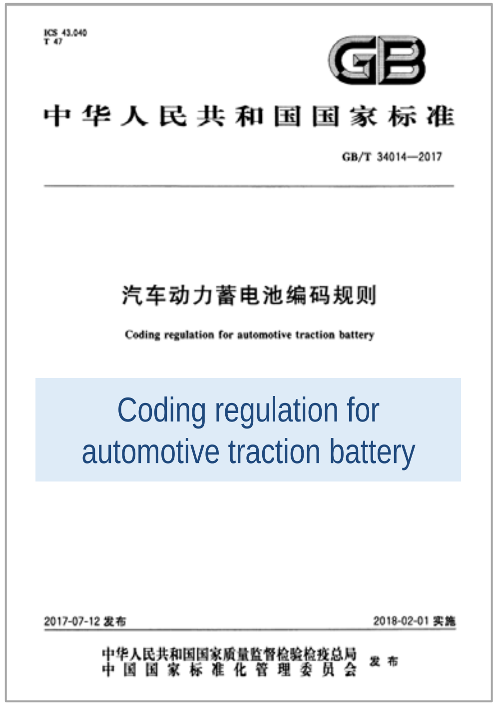
中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

Dimension of traction battery for electric vehicles

模块/标准箱/单体尺寸要求
module/box/cell dimension

编码结构及含义
Codings and their meaning

- X1、X2、X3 **厂商代码**
- X4 **产品类型**
  - P、M、C分别代表包、模块、单体
- X5 **电池类型**
  - A、B...Z分别代表镍氢、磷酸铁锂……其他
- X6、X7 **规格代码**
  - 企业自行定义，备案使用，代表产品规格型号
- X8、X9...X14 **追溯信息代码（梯次电池无）**
  - 企业自行定义，备案使用，代表产品追溯机制
- X15、X16、X17 **生产日期代码**
  - 依据标准中相应对照表格进行编码
- X18、X19 ... X23、X24 **序列号**
  - 当日生产统一规格梯次利用产品序列号
- X25、X26 **梯级利用代码（新电池无）**


ICS 43.040
T 47

GB

中华人民共和国国家标准

GB/T 34014—2017

汽车动力蓄电池编码规则

Coding regulation for automotive traction battery

2017-07-12 发布 2018-02-01 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

Coding regulation for automotive traction battery

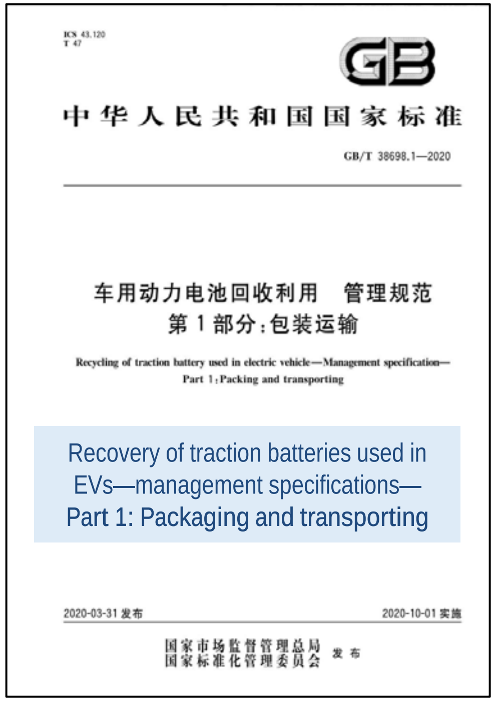
二、汽车动力电池回收利用关键标准介绍

Part2：Key Standards introduction and application

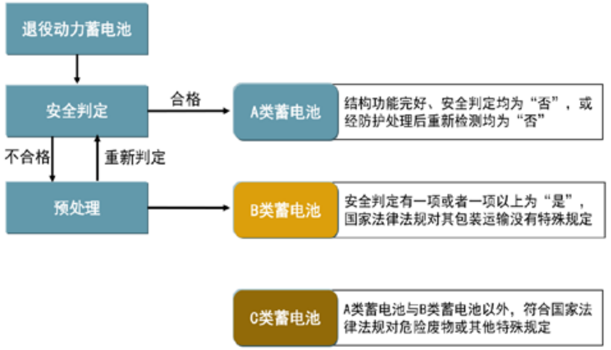
2.1General requirements

2.2New battery | **2.3Management specification** | 2.4Echelon use | 2.5Material recycling

"GB/T 38698.1-2020 Recovery of traction batteries used in EVs—management specifications—Part 1: packaging and transporting", provides the terms and definitions, classification requirements, general requirements, packaging requirements, transporting requirements and marking requirements for retired batteries used in EVs.



Recovery of traction batteries used in EVs—management specifications—Part 1: Packaging and transporting



□ 包装和运输要求

	包装要求	运输要求
A类蓄电池	• 包装类别：按照GB 12268 • ≤400 kg包装：满足GB 12463 • >400 kg包装：满足GB 19432	• 满足JT/T 617
B类蓄电池	• 满足A类要求 • 根据情况选择防泄漏、绝缘、防起火、防震、缓冲防护包装 • 包装容器：足够强度；根据情况采取阻燃、隔热、防泄漏、绝缘等措施	• 满足A类要求 • 宜安装烟雾报警 • 防泄漏措施
C类蓄电池	• 如属于危废：满足HJ 2025-2012中5.6要求	• 如属于危废：满足HJ 2025-2012中5第4、7章要求

"GB/T 38698.2-2023 Recovery of traction batteries used in EVs—management specifications—Part 2: Take-back service network", It provides the construction requirements, operation requirements, safety requirements, environmental protection requirements and emergency requirements of take-back service network for retired EV batteries.

贮存场地不规范

网点选址不规范

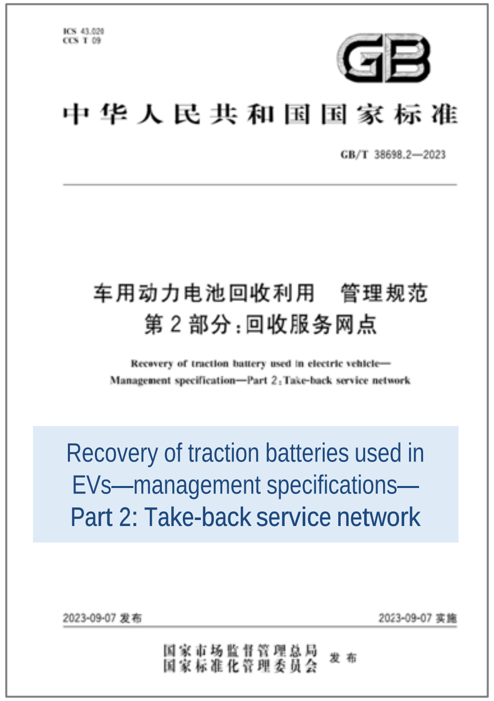
防爆箱等网点设施设备不规范

可能存在安全隐患

车用动力电池回收利用 管理规范 第2部分 回收服务网点

政府：将本标准作为回收服务网点管理依据，开展行业管理，规范行业发展

企业：将本标准作为回收服务网点建设指导要求，合规建设网点，提升电池回收率



Recovery of traction batteries used in EVs—management specifications—Part 2: Take-back service network

二、汽车动力电池回收利用关键标准介绍

Part2：Key Standards introduction and application

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

2.1General requirements

2.2New battery | 2.3Management specification | **2.4Echelon use** | 2.5Material recycling

GB/T 34015—2017

ICS 43.120
T 47

GB

中华人民共和国国家标准

GB/T 34015—2017

车用动力电池回收利用 余能检测

Recycling of traction battery used in electric vehicle—Test of residual capacity

Recovery of traction batteries used in EVs—Echelon use—Part 1: test of residual capacity

2017-07-12 发布 2018-02-01 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

It provides the test requirement, test method and test process of residual capacity for retired batteries used in EVs, so as to decide whether the retired battery can be reused or not.

GB/T 34015.2—2020

ICS 43.120
T 47

GB

中华人民共和国国家标准

GB/T 34015.2—2020

车用动力电池回收利用 梯次利用
第 2 部分：拆卸要求

Recycling of traction battery used in electric vehicle—Echelon use—Part 2: Removing requirements

Recovery of traction batteries used in EVs—Echelon use—Part 2: removing requirements

2020-03-31 发布 2020-10-01 实施

国家市场监督管理总局
国家标准化管理委员会 发布

It provides the basic requirement, removing process requirement, temporary storage and manage requirement for removal of batteries, in order to ensure the battery be removed safely.

GB/T 34015.3—2021

ICS 43.020
CCS T 01

GB

中华人民共和国国家标准

GB/T 34015.3—2021

车用动力电池回收利用 梯次利用
第 3 部分：梯次利用要求

Recovery of traction battery used in electric vehicle—Echelon use—Part 3: Echelon using requirement

Recovery of traction batteries used in EVs—Echelon use—Part 3: echelon using requirements

2021-08-20 发布 2022-03-01 实施

国家市场监督管理总局
国家标准化管理委员会 发布

It provides the basic requirement, appearance / performance requirements and echelon used battery products requirements, to determine whether the battery can be reused.

GB/T 34015.4—2021

GB

中华人民共和国国家标准

GB/T 34015.4—2021

车用动力电池回收利用 梯次利用
第 4 部分：梯次利用产品标识

Recovery of traction battery used in electric vehicle—Echelon use—Part 4: Labels for echelon used battery products

Recovery of traction batteries used in EVs—Echelon use—Part 4:labels for echelon used battery products

2021-08-20 发布 2022-03-01 实施

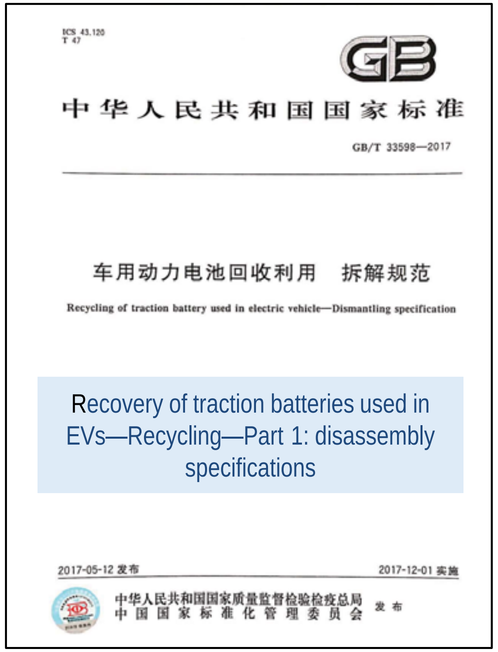
国家市场监督管理总局
国家标准化管理委员会 发布

It provides the label composition, logo requirements, location requirements, marking method and requirements of echelon used battery products labels,to tell the consumer product info.

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

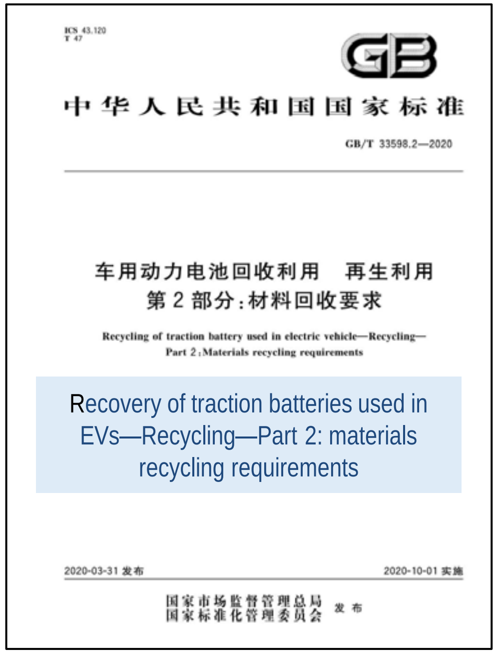
2.1General requirements

2.2New battery | **2.3Management specification** | **2.4Echelon use** | **2.5Material recycling**


ICS 43.120
T 47
GB
中华人民共和国国家标准
GB/T 33598—2017
车用动力电池回收利用 拆解规范
Recycling of traction battery used in electric vehicle—Dismantling specification
2017-05-12 发布 2017-12-01 实施
中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

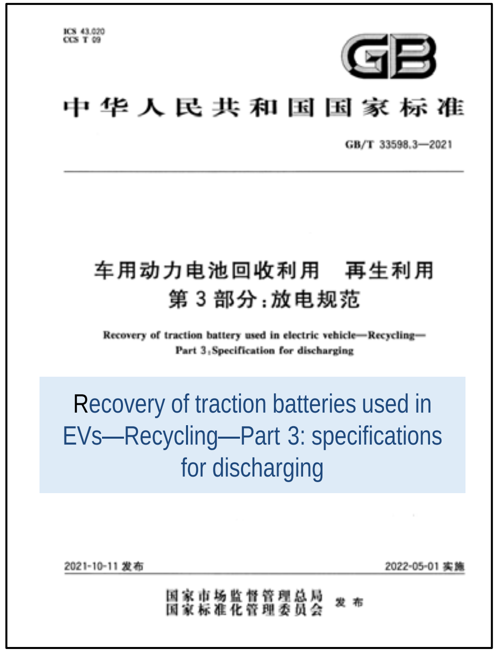
Recovery of traction batteries used in EVs—Recycling—Part 1: disassembly specifications

It provides general requiement, disassembly process, storage and management requirements of EV battery disassembly, so as to disassemble battery package/ module into modules/cells.


ICS 43.120
T 47
GB
中华人民共和国国家标准
GB/T 33598.2—2020
车用动力电池回收利用 再生利用
第2部分：材料回收要求
Recycling of traction battery used in electric vehicle—Recycling—Part 2: Materials recycling requirements
2020-03-31 发布 2020-10-01 实施
国家市场监督管理总局
国家标准化管理委员会 发布

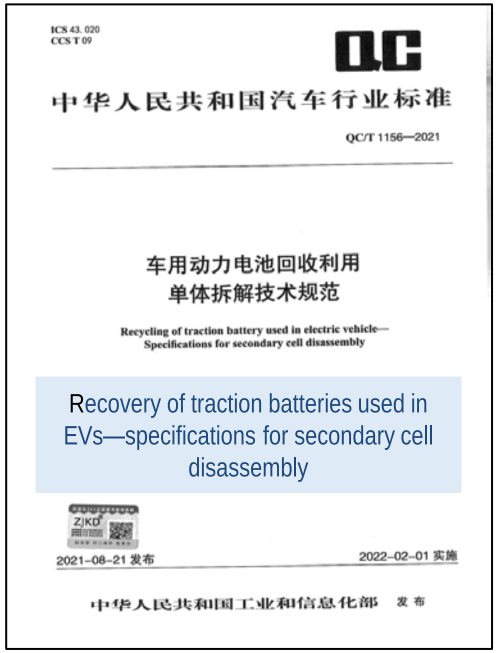
Recovery of traction batteries used in EVs—Recycling—Part 2: materials recycling requirements

It provides the basic requirement, staff /site requirements,recycling rate and environment pollution control requirements, in order to ensure the safety, environment protection & resources efficiency.


ICS 43.020
CCS T 09
GB
中华人民共和国国家标准
GB/T 33598.3—2021
车用动力电池回收利用 再生利用
第3部分：放电规范
Recovery of traction battery used in electric vehicle—Recycling—Part 3: Specification for discharging
2021-10-11 发布 2022-05-01 实施
国家市场监督管理总局
国家标准化管理委员会 发布

Recovery of traction batteries used in EVs—Recycling—Part 3: specifications for discharging

It provides the basic requirement, discharging process selection, discharging methods, storage and environment requirements, to ensure the retired batteries can be discharged completely.


ICS 43.020
CCS T 09
QC
中华人民共和国汽车行业标准
QC/T 1156—2021
车用动力电池回收利用
单体拆解技术规范
Recycling of traction battery used in electric vehicle—Specifications for secondary cell disassembly
2021-08-21 发布 2022-02-01 实施
中华人民共和国工业和信息化部 发布

Recovery of traction batteries used in EVs—specifications for secondary cell disassembly

It provides general requiement, disassembly process, storage and management requirements of battery cells disassembly, so as to make battery cells into recycled battery materials.

3项国家标准（拆解规范/余能检测/包装运输），支撑工信部发布《新能源汽车动力蓄电池梯次利用管理办法》

3 national standards of traction battery recovery support Chinese government (MIIT) issuing the policy of “Management measures for echelon use of traction batteries used in new energy vehicles” in 2021. The policy and 3 national standards regulate the battery echelon use enterprises in China.

Management measures for echelon use of traction batteries used in new energy vehicles

新能源汽车动力蓄电池梯次利用管理办法

二、梯次利用企业要求

第六条 梯次利用企业应符合《新能源汽车废旧动力蓄电池综合利用行业规范条件》(工业和信息化部公告2019年第59号)要求。鼓励采用先进适用的工艺技术及装备，对废旧动力蓄电池优先进行包(组)、模块级别的梯次利用,电池包(组)和模块的拆解符合《车用动力电池回收利用 拆解规范》(GB/T 33598)的相关要求

第十条 鼓励新能源汽车、动力蓄电池生产企业等与梯次利用企业协商共享动力蓄电池的出厂技术规格信息、充电倍率信息，以及相关国家标准规定的监控数据信息(电压、温度、SOC 等)。梯次利用企业按照《车用动力电池回收利用 余能检测》(GB/T 34015)等相关标准进行检测，结合实际检测数据，评估废旧动力蓄电池剩余价值，提高梯次利用效率，提升梯次产品的使用性能、可靠性及经济性。

第十七条 梯次产品包装运输应符合《车用动力电池回收利用管理规范第1部分:包装运输》(GB/T 38698.1)等有关标准要求。

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

4项国家标准（编码/回收网点/梯次标识/材料回收），支撑工信部发布《综合利用管理办法》（征求意见稿）

4 national standards of traction battery recovery, such as coding requirements/ take-back service network/echelon product labels/ material recycling, support Chinese government (MIIT) issuing the policy of “Management measures for comprehensive utilization of traction batteries for NEVs” in 2023.

中华人民共和国工业和信息化部
Ministry of Industry and Information Technology of the People's Republic of China

工业和信息化部 新闻动态 政务公开 政务服务 公众参与 工信数据 专题专栏

首页 > 政务公开 > 文件公示

《新能源汽车动力电池综合利用管理办法（征求意见稿）》公示

Management measures for administration of comprehensive utilization of traction batteries for NEVs（Draft for comment）

为加大废旧新能源汽车动力电池综合利用管理力度，促进资源循环利用，推动新能源汽车产业高质量发展，工业和信息化部研究起草了《新能源汽车动力电池综合利用管理办法（征求意见稿）》，现予以公示。公示时间为2023年12月15日至2024年1月15日。如有意见，请将书面意见反馈至工业和信息化部节能与综合利用司。

联系电话：010-68205360 68205337（传真）
电子邮箱：zyzhly@miit.gov.cn

附件：《新能源汽车动力电池综合利用管理办法（征求意见稿）》

工业和信息化部节能与综合利用司
2023年12月15日

新能源汽车动力电池综合利用管理办法（征求意见稿）

第二章 研发、设计、生产及运营要求
第六条 [设计阶段要求] 电池生产企业应尽量使用无毒无害或低毒低害原料，采用标准化、通用性及易拆解的产品结构设计，按照《汽车动力蓄电池编码规则》（GB/T 34014）要求对所生产的动力电池进行编码……。

第九条 [网点设置要求] 汽车生产企业应在本企业新能源汽车销售的地级及以上行政区域内自设或委托建立与销售量相匹配的收集型回收服务网点；……回收服务网点建设应符合《车用动力电池回收利用 管理规范 第 2 部分：回收服务网点》（GB/T 38698.2）要求。鼓励各企业共建、共享回收渠道。

第四章 梯次利用和再生利用要求
第十八条 [梯次利用产品要求] 梯次利用产品应符合所应用领域的法律法规、政策和强制性标准要求，并贴有符合国家有关标准要求的梯次利用产品标识（GB/T 34015.4）。

第二十条 [再生利用企业要求] 再生利用企业应按照汽车生产企业提供的拆解技术信息拆解、利用废弃动力电池中有价值的资源，拆解处理过程的污染控制应符合国家有关废动力电池处理污染控制标准要求，主要有价金属等材料的利用率应符合《车用动力电池回收利用 再生利用 第 2 部分：材料回收要求》（GB/T 33598.2）要求。

GB 中华人民共和国国家标准
GB/T 34014-2017
汽车动力蓄电池编码规则
Coding regulation for automotive traction battery
coding requirements
2017-07-12 发布 2018-02-01 实施
中华人民共和国国家质量监督检验检疫总局 中国国家标准化管理委员会 发布

GB 中华人民共和国国家标准
GB/T 38698.2-2023
车用动力电池回收利用 管理规范 第 2 部分：回收服务网点
Recovery of traction battery used in electric vehicle—Management specification—Part 2: Take-back service network
take-back service network
2023-09-07 发布 2023-09-07 实施
国家市场监督管理总局 国家标准化管理委员会 发布

GB 中华人民共和国国家标准
GB/T 34015.4-2021
车用动力电池回收利用 梯次利用 第 4 部分：梯次利用产品标识
echelon product labels
国家市场监督管理总局 国家标准化管理委员会 发布

GB 中华人民共和国国家标准
GB/T 33598.2--2020
车用动力电池回收利用 再生利用 第 2 部分：材料回收要求
Recycling of traction battery used in electric vehicle—Recycling—Part 2: Materials recycling requirements
material recycling
国家市场监督管理总局 国家标准化管理委员会 发布

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co.,Ltd.

7项国家标准(拆解/编码/梯次/梯次标识/放电/包装运输/单体拆解)，支撑工信部发布《综合利用行业规范条件》

7 national standards of traction battery recovery, such as disassembly/coding/echelon use/echelon product labels/discharging/ packaging&transporting /cell disassembly, support MIIT issuing the policy of “Regulative conditions for NEV waste traction battery comprehensive utilization industry” in 2024.

Regulative conditions for NEV waste traction battery comprehensive utilization industry
(Draft for comment)

新能源汽车废旧动力电池综合利用行业规范条件
（2024 年本）（征求意见稿）

第二章 研发、设计、生产及运营要求

（二）梯次利用企业要求

2. 应具备废旧动力电池拆分的技术手段和能力，……按照《车用动力电池回收利用 拆解规范》（GB/T 33598）要求进行电池包（组）和模块的拆解，并将拆分后的零部件分类存放。

3. 应具备检测动力电池性能指标的技术手段和能力，……按照《车用动力电池回收利用 梯次利用 第 3 部分：梯次利用要求》（GB/T 34015.3）判定其是否满足梯次利用要求。

5. 应按照《汽车动力电池编码规则》（GB/T 34014）及锂电池编码规则有关政策和国家标准要求对梯次产品进行重新编码，……在产品显著位置贴示符合《车用动力电池回收利用 梯次利用 第 4部分：梯次利用产品标识》（GB/T 34015.4）要求的梯次产品标识。

（三）再生利用企业要求

1. 具备废旧动力电池安全拆解机械化作业平台及工艺，……按照《车用动力电池回收利用 再生利用 第3 部分：放电规范》（GB/T 33598.3）、《车用动力电池回收利用 单体拆解技术规范》（QC/T 1156）要求对废旧动力电池进行放电、拆解、破碎及分选。

六、安全生产和人身健康

（三）企业运输或委托其他单位运输废旧动力电池的，……确保运输管理符合《车用动力电池回收利用 管理规范 第 1 部分：包装运输》（GB/T 38698.1）等有关国家标准、行业标准的要求。

总结及展望
Summary and Outlook

中国汽车技术研究中心有限公司
China Automotive Technology and Research Center Co., Ltd.

未来，将系统构建电池回收通用/电池新品/梯次/再生/管理/绿色/低碳/安全/设备/再生产品/等多维度标准体系

We have made more than 10 standards now, and we will make more battery recycling/recovery standards around general requirements/ new battery design for recycling/ green factory， GHG management/ safety/ equipment and echelon used /repurposed / recycled products & materials and so on.

EV Traction battery recycling / recovery standard system

issued | drafting | planning

- **New battery**
  - dimension — GB/T 34013-2017
  - coding — GB/T 34014-2017
- **Echelon use**
  - residual capacity — GB/T 34015-2017
  - removal — GB/T 34015.2-2020
  - echelon use — GB/T 34015.3-2021
  - echelon label — GB/T 34015.4-2021
  - Design for reuse
  - residual life
- **Recycling**
  - disassembly — GB/T 33598-2017
  - material recycling — GB/T 33598.2-2020
  - discharging — GB/T 33598.3-2021
  - cell disassembly — QC/T 1156-2021
  - Recovery report
- **Management**
  - package&transport — GB/T 38698.1-2020
  - take-back — GB/T 38698.2-2023
  - comprehensive use info.
  - handling
  - storage
- **Green Produce**
  - green factory
  - energy consumption
  - water saving
  - green supply chain
  - green product
- **GHG manage**
  - echelon use enterprise
  - echelon used product
  - recycling enterprise
  - recycled product
- **safety**
  - collection storag safety
  - echelon use safety
  - recycling safety
- **Equipment**
  - safety box
  - discharging box
  - disassembly equipment
- **echelon product**
  - Backup battery
  - energy storage
  - low speed vehicle
- **recycled material**
  - recycled anode material
  - recycled negative materials
  - recycled...

GB/T 44132-2024《Recovery of traction batteries used in electric vehicles—General requirement》

中国汽车技术研究中心有限公司

China Automotive Technology and Research Center Co., Ltd.

Federal Ministry
for Economic Affairs
and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Application of retired battery energy storage system

Mr. Qin Chao

TELD

Application of retired battery energy storage system

TELD New Energy Co., Ltd.

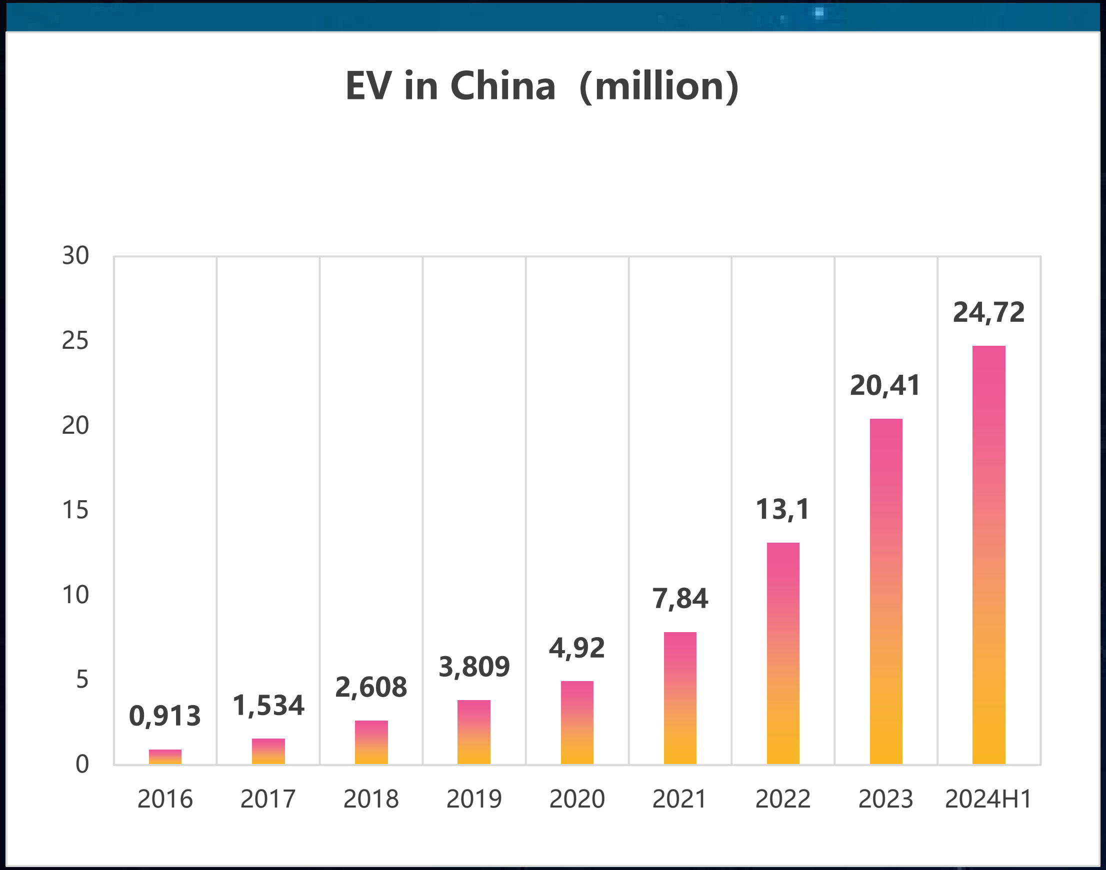
2024.10

EV development

80-100 million EVs to be expected by 2030

Explosive growth from 2016 to 2023 with annual growth rate exceeding 56%

4.39 million new registered EVs in 2024H1



中华人民共和国公安部

Ministry of Public Security of the People's Republic of China

首 页 | 机构设置 | 警务信息 | 办事服务 | 警民互动

当前位置： 首页 > 数据信息 > 交管数据 > 正文

2024年上半年全国机动车达4.4亿辆
驾驶人达5.32亿人 新能源汽车保有量达2472万辆

时间： 2024年07月09日 来源：公安部交通管理局 字体： 大 中 小 分享到：

据公安部统计，截至2024年6月底，全国机动车保有量达4.4亿辆，其中汽车3.45亿辆，新能源汽车2472万辆；机动车驾驶人5.32亿人，其中汽车驾驶人4.96亿人。2024年上半年全国新注册登记机动车1680万辆，新领证驾驶人1397万人。

上半年新注册登记机动车1680万辆，新注册登记汽车1242万辆。2024年上半年，全国新注册登记机动车1680万辆。其中，汽车新注册登记1242万辆，同比增长5.70%。

新能源汽车保有量达2472万辆，上半年新注册登记439.7万辆。截至6月底，全国新能源汽车保有量达2472万辆，占汽车总量的7.18%。其中，纯电动汽车保有量1813.4万辆，占新能源汽车总量的73.35%。上半年新注册登记新能源汽车439.7万辆，同比增长39.41%，创历史新高。新能源汽车新注册登记量占汽车新注册登记量的35.41%。

Number of EVs on road 2016-2024H1 (including PHEV)

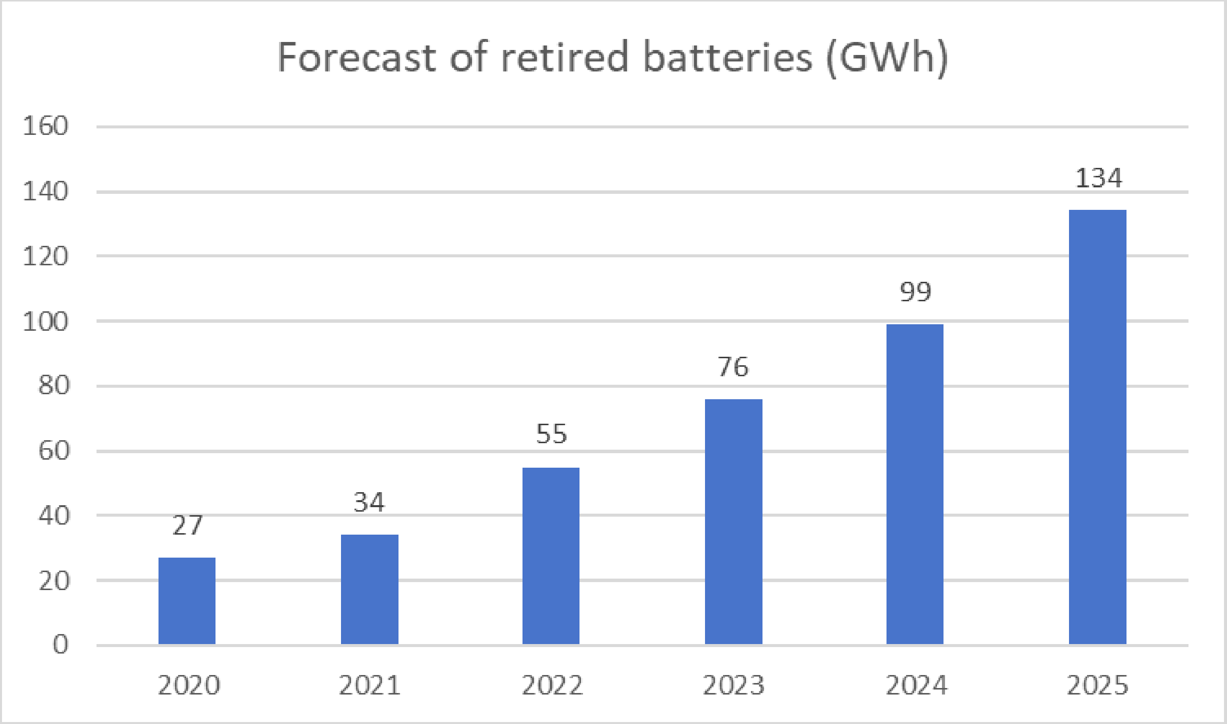
Trend of retired battery

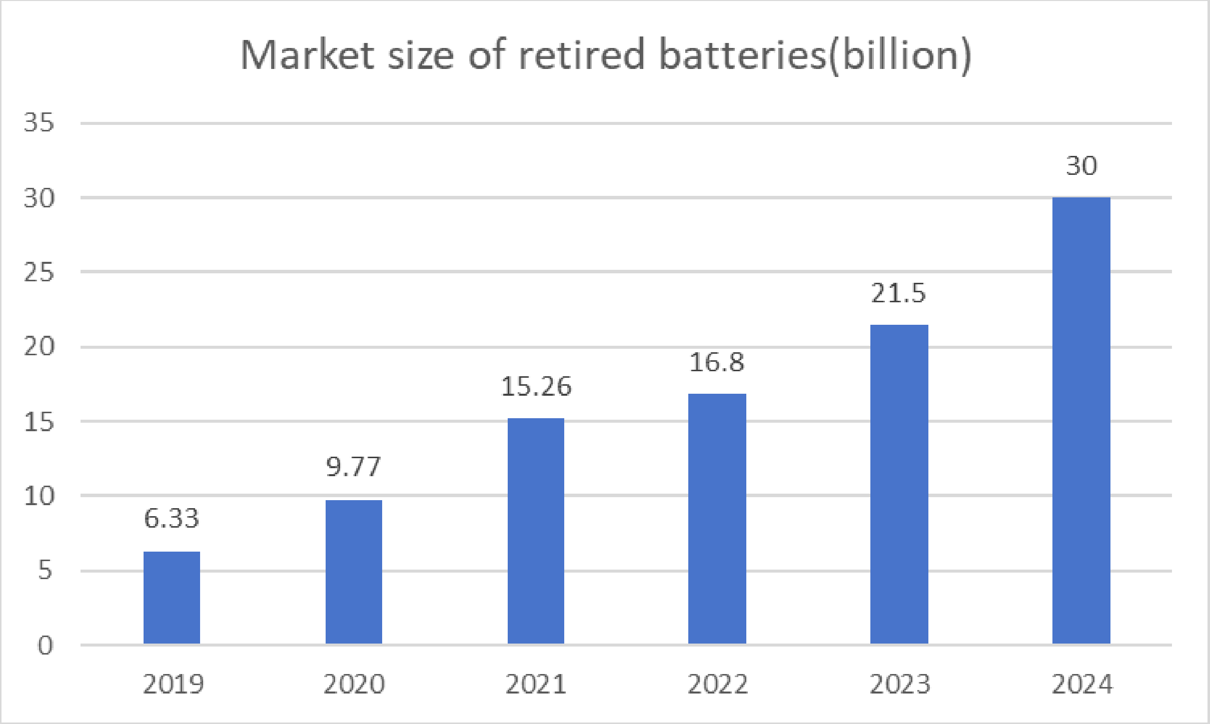
Based on a 4-8 year service life for lithium batteries,

800,000 tonnes (approx. **134GWh**) of batteries to be retired by **2025,**

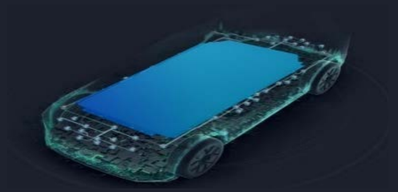
30 billion yuan of retired battery market size to be reached by **2025**, and **over 100 billion** yuan by **2030.**

Note: Retired battery estimates sourced from China Merchants Securities' "In-Depth Report on Lithium-ion Battery Recycling and Secondary Use".





Pack Utilizing of Retired battery to maximize battery potential and usage



Retired

Raw Materials

Power Batteries

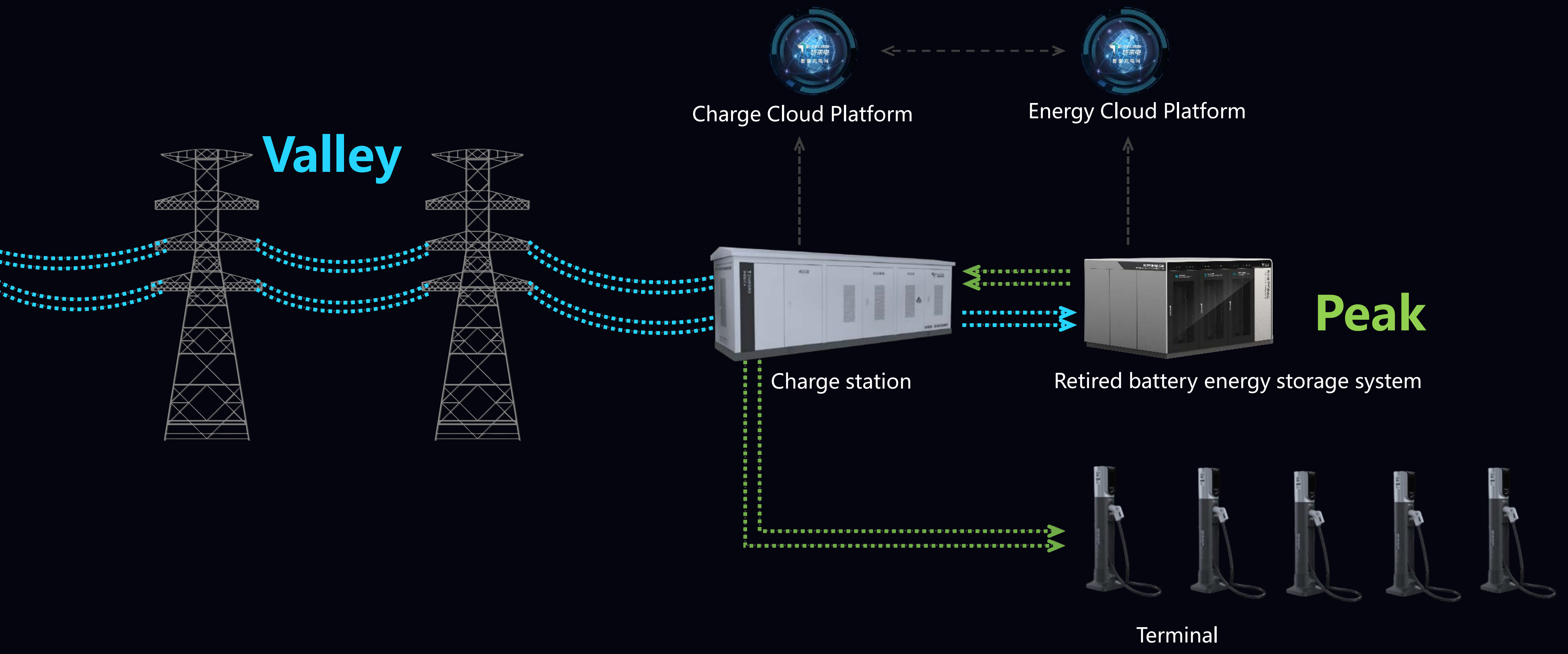
Products

Disassembly

Retired battery **"Recycle—Energy Storage—Recourse & Reuse"** chain

Refining & Reprocessing

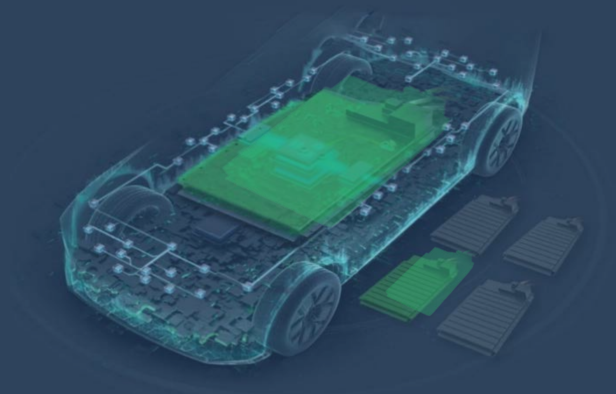
Application Scenarios



Key points of energy storage : **Safety & Cost**

Safety Protection for end-of-life Batteries

Screening—Pre-use



Online battery lifespan and residual value assessment

Battery health and safety risk evaluation

Monitoring—On-use

Two-layer safety protection
Three-level monitoring

Big Data Layer

Firefighting—Emergency

Fire isolation layer
Automatic tripping
Firewater pool

Equipment Layer

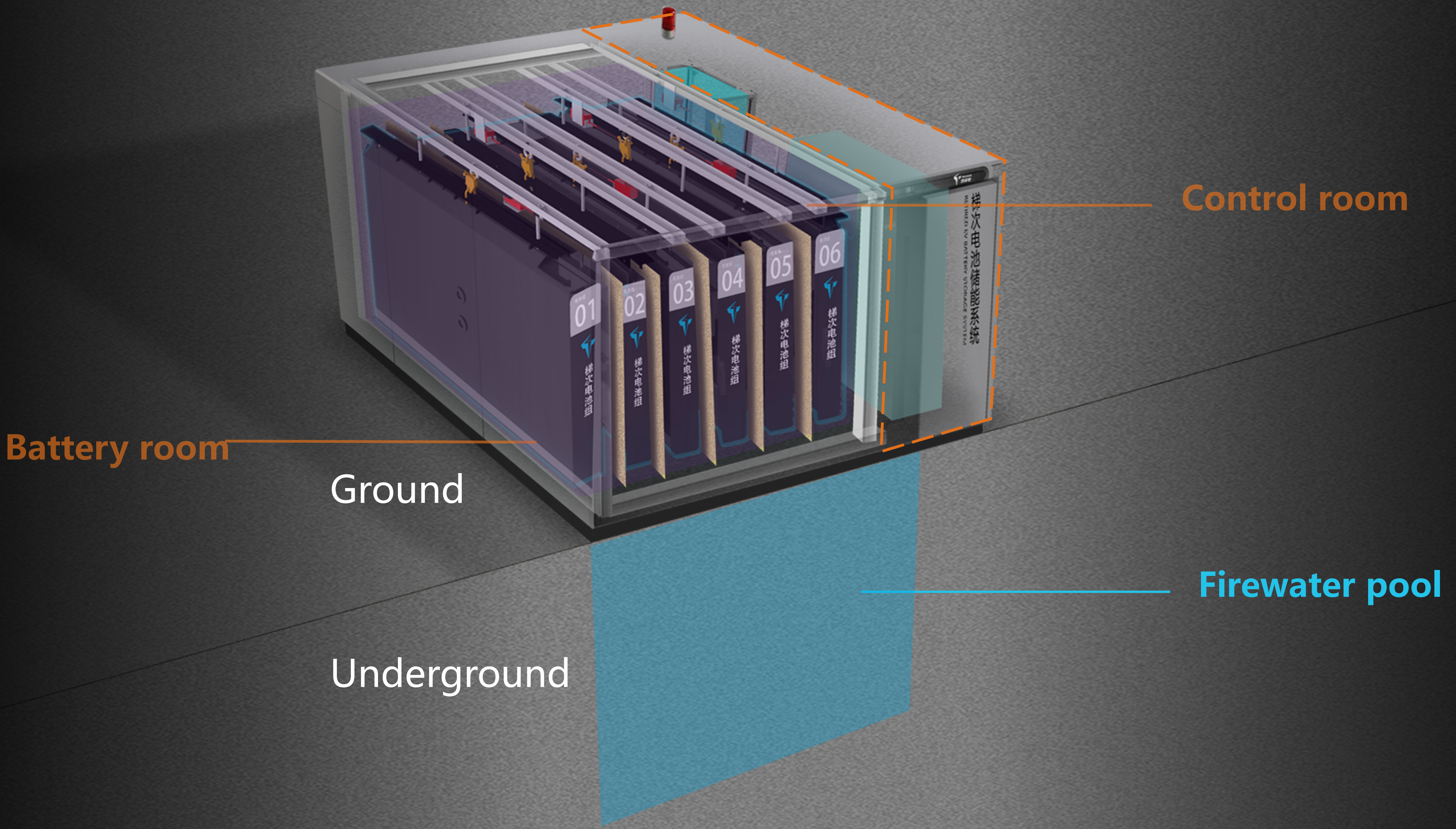
Retired Battery Energy Storage System

Product paramaters

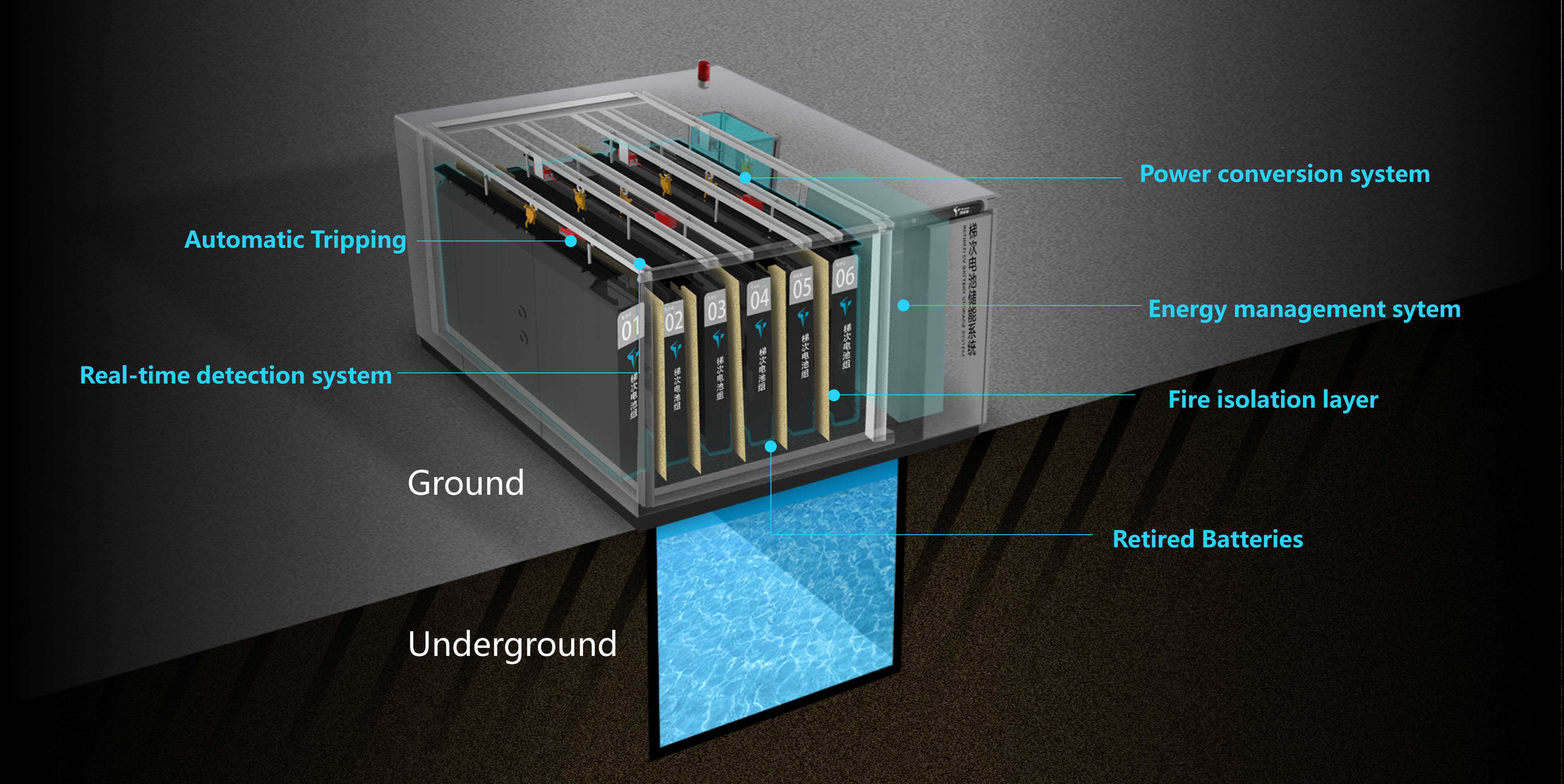
- **System configuration**: **6 units**
- **Single battery pack capacity**: **30~60kwh**
- **Total capacity**: **180~300kwh**
- **charge/discharge cycle**: **3h**

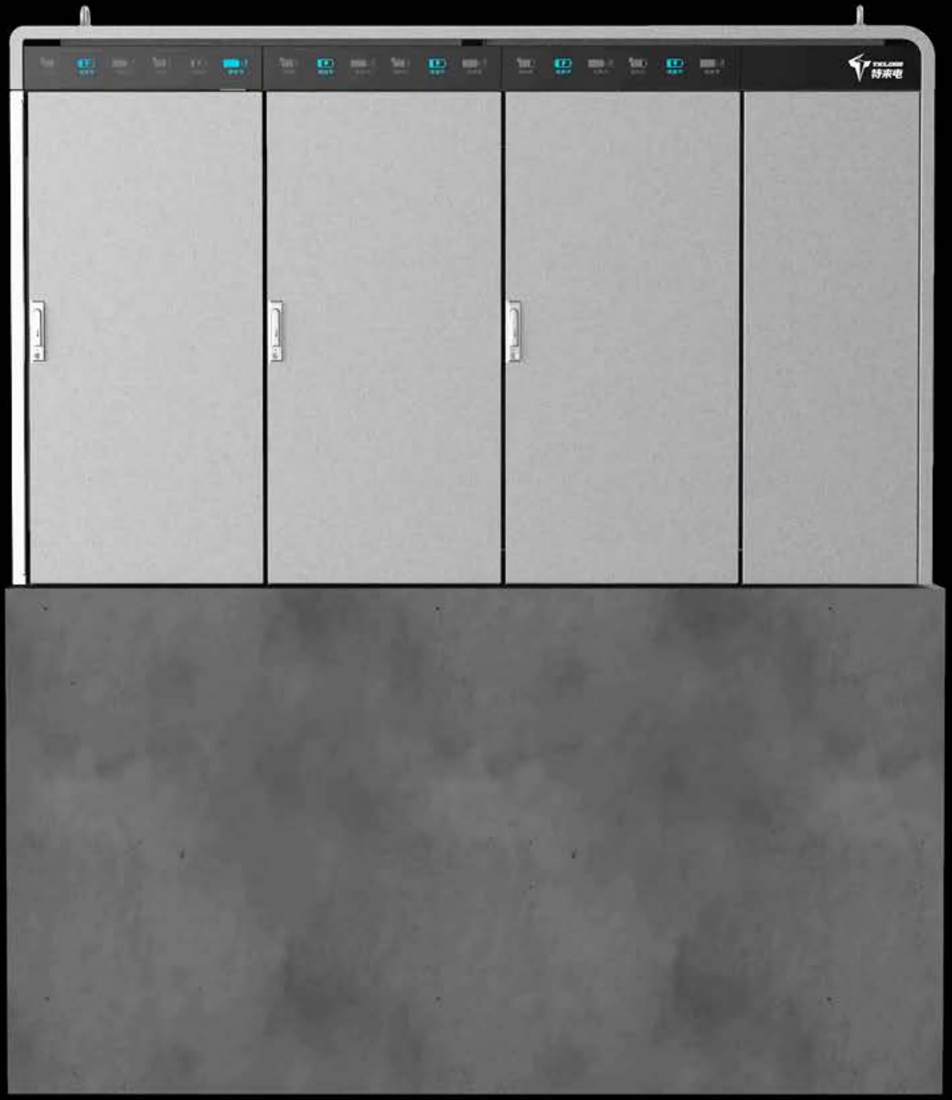
Total capacity: **180~300kWh**, Sufficient to charge **4-5** electric vehicles in one discharge

System Configuration



System Configuration




特来电

1 cut off

Input/output disconnection

5 dimensions

2 drops

Battery trip

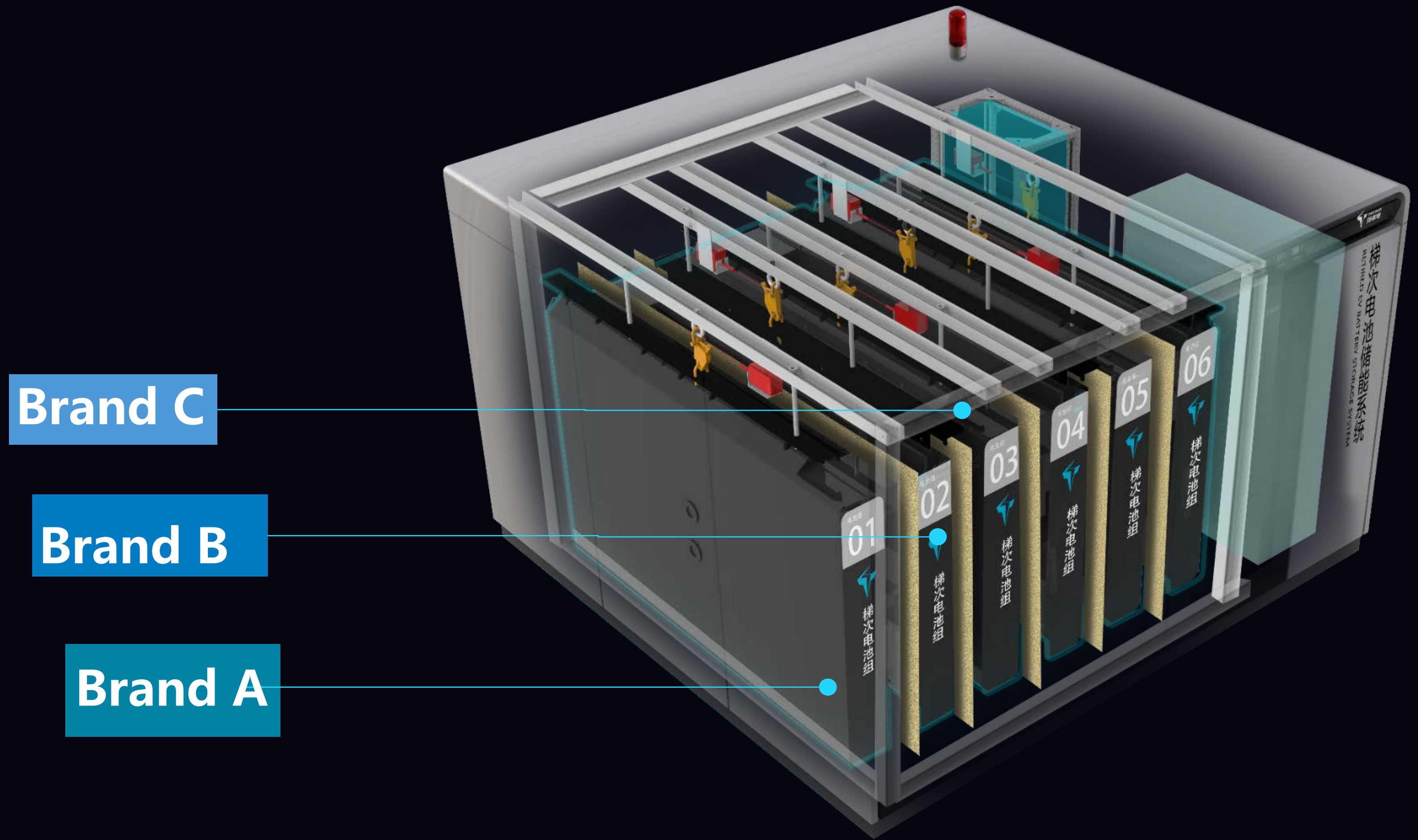
Cell Temperature

Shell temperature

Voltage and Voltage difference

Smoke signal

Flammable gas



Multi brand, multi model, fully compatible with software and hardware

Cheng Du

Configuration: 150kwh;100kW

Shang Hai

Configuration: 200kwh;100kW

Qing Dao

Configuration: 300kwh;120kW

Application data of TELD industrial park

The cumulative discharge capacity is **13019 kwh**

Save electricity costs **9113 yuan**

Electricity cost<0.3 yuan per kilowatt hour

Accurate safety evaluation data

Accumulated 5 times of first and second level security protection

Thanks

Federal Ministry
for Economic Affairs
and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Loaddump – Current status on developments regarding GB/T 18487.1 / ISO 21498

Ms. PAN Meixia

Mercedes-Benz

Sino-German
Sub-Working Group Emobility

DC Charging Load Dump Tests in China @ Catarc and State Grid

14.10.2024

DIN

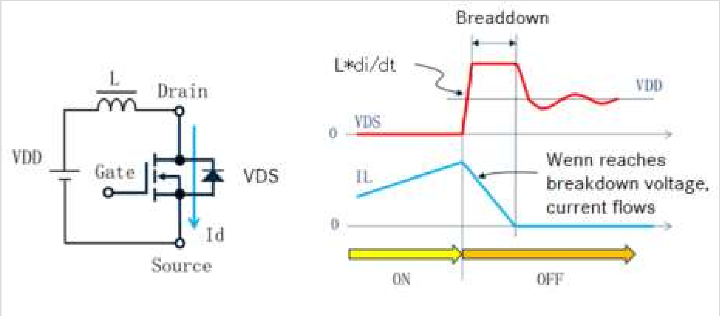
DKE VDE DIN

VDA Normenausschuss Auto und Mobilität

Problems of Load Dump Overvoltage:

- EVSEs may violate load dump overvoltage requirement
- Overvoltage is harmful for onboard HV components

e.g. MOSFET avalanche breakdown



If the withstand voltage is exceeded, current will flow even when the MOSFET is in the OFF state, huge damage may occur

Purpose of the China Test Trip:

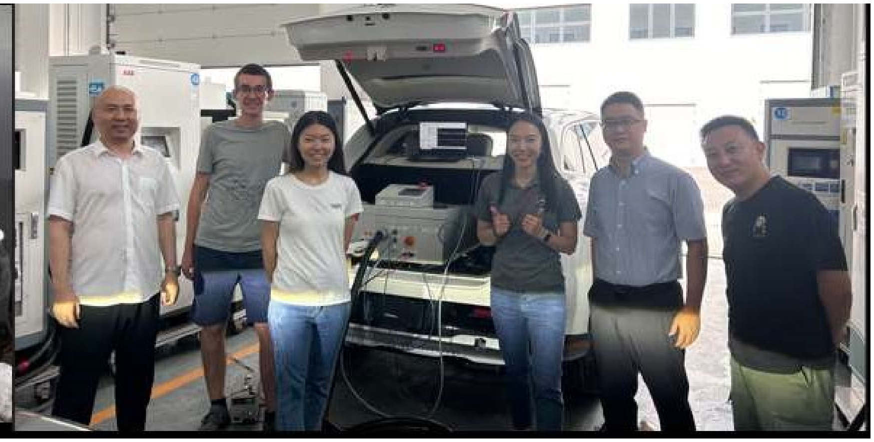
- Observing the charging load dump overvoltage in China
- Demonstrating the test to internal and external partners
- Address potential risks transparently
- Harmonization of load dump requirement in DC charging standards
- Promote safer and robuster DC charging infrastructure
- Handover further investigation to Mercedes-Benz RD China

DIN DKE VDE DIN VDA Normenausschuss Auto und Mobilität

Impressions

@ Catarc Charging Interop Validation Hall





@ Nari Group - State Grid Electric Power Research Institute


Load Dump Requirement in DC Charging Standards

IEC 61851-23 Edition 2, 2023:

CC.6.1 Requirements for load dump

In case of a load dump, after the first 3 ms, the voltage overshoot at side B between DC+ and DC– shall be less than or equal to

- for a rated maximum voltage of the EV, as communicated (in the last request message before t3) during the initialization phase, > 500 V: 110 % of the rated maximum voltage of the EV, or
- for a rated maximum voltage of the EV, as communicated (in the last request message before t3) during the initialization phase, ≤ 500 V: rated maximum voltage of the EV plus 50 V.

See Formula (CC.16).

$$V_{EVSE\_Out} \leq \max(110\ \% \times V_{EV\_MAX\_CPD}, V_{EV\_MAX\_CPD} + 50\ V) \qquad (CC.16)$$

where

V_{EVSE_Out} is the present voltage at side B, expressed in volts;

$V_{EV\_MAX\_CPD}$ is the maximum voltage of the EV, communicated in the last ChargeParameterDiscoveryReq message, expressed in volts.

GBT 18487.1 for GBT 2015 and Chaoji, and GB 39752:

GB/T 18487.1-XXXX

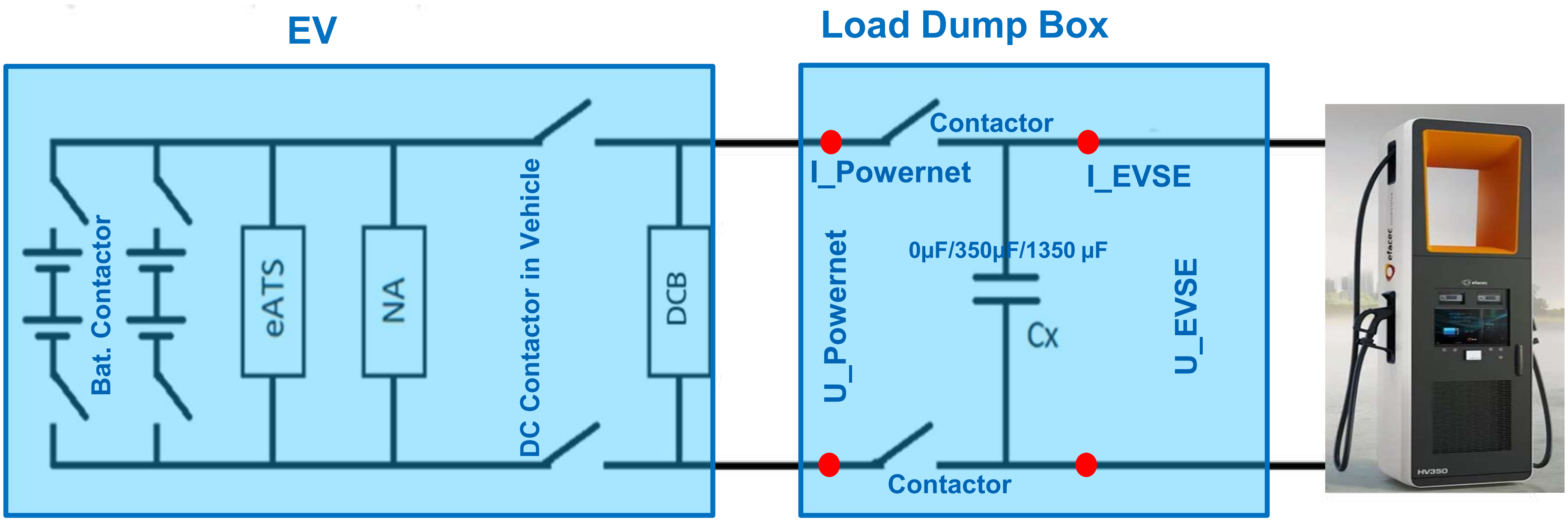
B.3.7.105 In the power transmission phase, when the load drops (such as load dump) due to a fault, the instantaneous output overvoltage value shall not exceed the bigger one between 110% of the output voltage at the vehicle adapter during the load drop and the output voltage +50 V (d.c.), and no hazardous conditions shall occur.

Note: The instantaneous voltage lasting up to 10ms that may occur during load drop may be negligible.

Compliance test will be defined in NBT 33001 NBT 33008.1 Amd., the amendment is ongoing

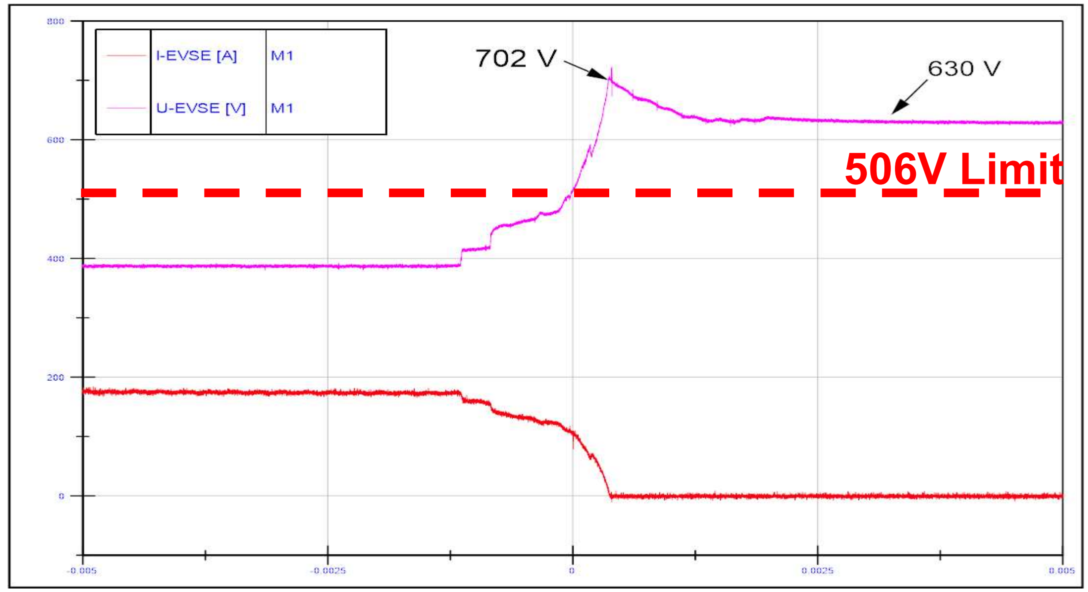
DIN DKE VDE DIN VDA Normenausschuss Auto und Mobilität

Loaddump Test Setup



What to Measure?

- Overvoltage peak
- Overvoltage duration
- Charging station shutdown curve
- Loaddump with and without Cx capacitance



Example from a CCS 80KW EVSE, tested in Netherland during the visit to ELAAD, overvoltage limit calculation based on IEC61851-23-2014

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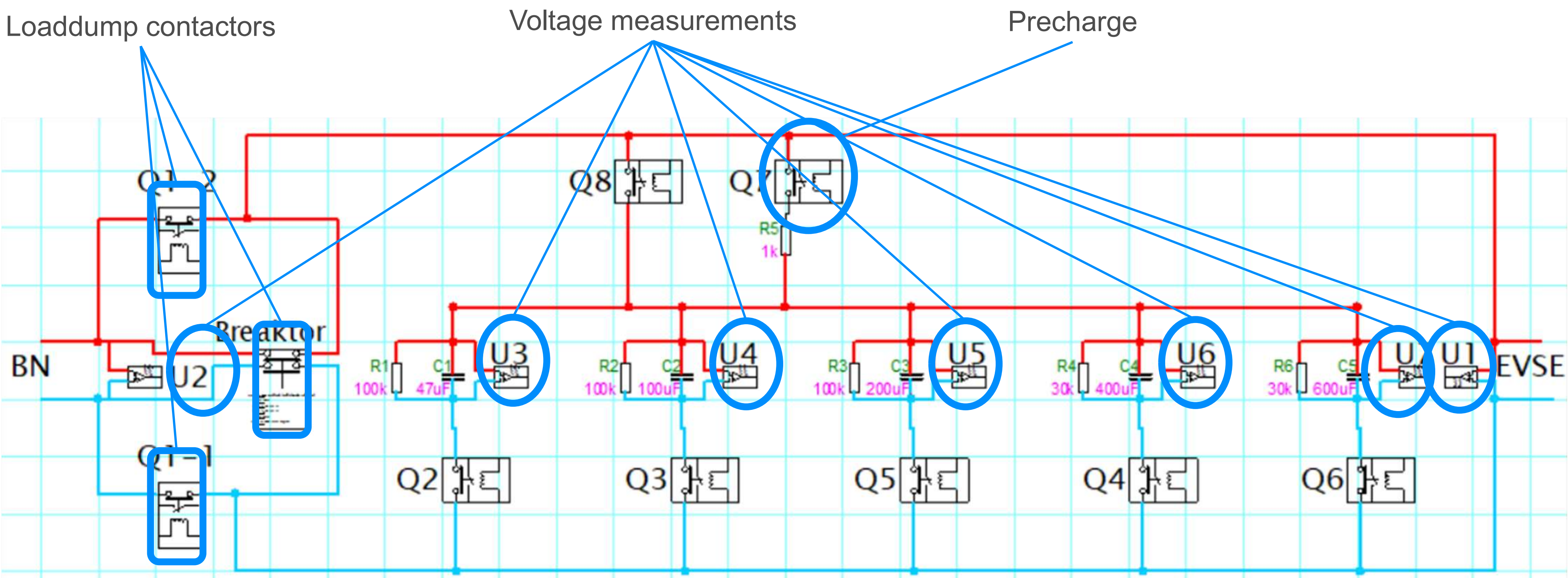
Load Dump Box and its HMI Interface

- Emergency-Stop button (HMI)
- Touchscreen
- Physical buttons

High Voltage Circuit of the Load Dump Box



Test Results

Red marked: EVSE showed deviations

EVSE	Nr.	Contactor		Cx in LDB (uF)			Charging voltage (V)	Charging current(A)	Loaddump overvoltage(V)	over-voltage limit
		Breaktor	EV200	0	350	1350				
1	M1		x	x			387	240	422	437
	M2		x		x		383	240	421	433
	M3		x			x	383	240	421	433
	M4		x	x						
	M5	x		x			384	240	421	434
	M6	x			x		384	240	423	434
	M7	x				x	384	240	422	434
2	M8		x	x			388	250	411	438
	M9		x		x		388	250	413	438
3	M10		x	x			386	250	419	436
	M11		x		x		error			
	M12		x		x		388	250	420	438
	M13		x			x	389	250	420	439
	M14	x		x			390	250	421	440
4	M15		x	x			380	80	**468**	430
	M16		x		x		381	80	**464**	431
	M17		x			x	381	80	**455**	431
	M18	x		x			381	80	**470**	431
	M19	x			x		381	80	**465**	431
	M20	x				x	383	80	**455**	433
5	M21		x	x			392	250	430	442
	M22		x		x		394	250	432	444
	M23		x			x	395	250	433	445
	M24	x		x			396	250	438	446
6	M25		x	x			396	230	433	446
	M26		x		x		396	230	436	446
	M27		x			x	397	230	436	447
	M28	x		x			397	230	438	447
7	M29		x	x			392	125	433	442
	M30		x		x		394	125	431	444
	M31		x			x	393	125	430	443
	M32	x		x			393	125	433	443
8	M33	x		x			397	208	432	447
	M34		x	x			FAIL			
	M35		x	x			397	208	433	447
	M36		x		x		398	208	428	448
	M37		x			x	398	208	427	448

EVSE's overvoltage is slightly over the allowed limit

Test Results

Red marked: EVSE showed deviations

EVSE	Nr.	Contactor		Cx in LDB (uF)			Charging voltage (V)	Charging current(A)	Loaddump overvoltage(V)	over-voltage limit
		Breaktor	EV200	0	350	1350				
9	M1		x			x	FAIL			
	M2		x	x			401	250	448	451
	M3		x		x		402	250	450	452
	M4		x			x	403	250	449	453
	M5	x		x			403	250	450	453
10	M6		x	x			403	390	460	453
	M7		x		x		403	390	461	453
	M8		x			x	403	390	462	453
	M9	x		x			403	390	463	453
	M10		X	X			403	200	452	453
11	M11		x	x			403	250	460	453
	M12		x		x		403	250	457	453
	M13		x			x	403	250	455	453
	M14	x		x			403	250	460	453
12	M16		x	x			400	100	441	450
13	M17						398	80	434	448
14	M18	ERROR								
	M19	ERR0R								
	M20						401	100	455	451
15	M21		x	x			405	200	Abnormality of current ripple during charging	455
16	M22		x	x			405	200	**501**	455
	M23		x		x		407	200	**470**	457
	M24		x			x	406	200	**469**	456
	M25	x		x			406	200	**504**	456
	M26		x	x			407	200	**510**	457

Test Results

Red marked: EVSE showed deviations

EVSE	Nr.	Contactor: Breaktor	Contactor: EV200	Cx in LDB (uF): 0	Cx in LDB (uF): 350	Cx in LDB (uF): 1350	Charging voltage (V)	Charging current(A)	Loaddump overvoltage(V)	over-voltage limit
17	M1		x	x			378	80	**433**	428
	M2		x		x		378	80	406	428
	M3		x			x	378	80	406	428
	M4	x		x			378	80	**435**	428
18	M5		x	x			375	20	421	425
	M6		x			x	375	20	407	425
19	M7		x	x			379	80	414	429
	M8		x			x	379	80	408	429
20	M9		x	x			379	80	410	429
21	M10		x	x			389	250	435	439
	M11		x			x	388	250	425	438
22	M12		x	x			390	250	442	440
	M13		x			x	392	250	441	442
23	M14		x	x			391	200	418	441
	M15		x			x	393	200	419	443
24	M16	FAILURE								
	M17		x	x			394	250	425	444
	M18		x			x	394	250	423	444
25	M19		x	x			391	150	426	441
26	M20		x	x			395	250	**467**	445
	M21		x		x		396	250	**457**	446
	M22		x			x	396	250	**452**	446
	M23	x		x			397	250	**464**	447

EVSE's overvoltage is slightly over the allowed limit

Test Results

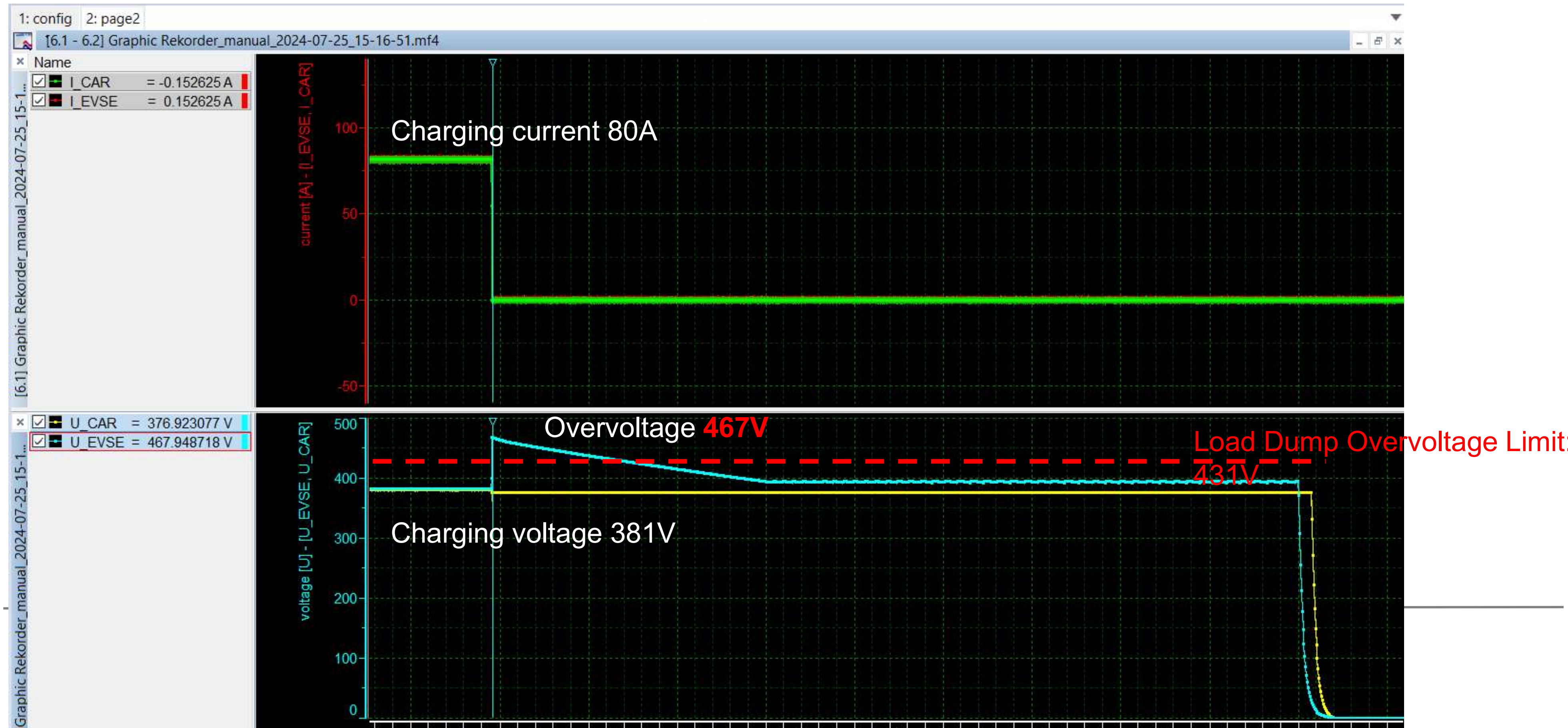
Red marked: EVSE showed deviations

EVSE	Nr.	Contactor		Cx in LDB (uF)			Charging voltage (V)	Charging current(A)	Loaddump overvoltage(V)	over-voltage limit
		Breaktor	EV200	0	350	1350				
27	M1		x	x			405	388	448	455
	M2		x			x	406	384	445	456
	M3	x		x			failure			
	M4	x		x			408	380	450	458
28	M5		x	x			407	287	469	457
	M6		x	x			408	286	467	458
	M7		x	x			failure			
	M8		x	x			407	286	467	457
29	M1		x	x			400	100	445	450
	M2		x		x		400	100	437	450
	M3		x			x	401	100	425	451
	M4	x		x			401	100	445	451

EVSE‘s overvoltage is slightly over the allowed limit

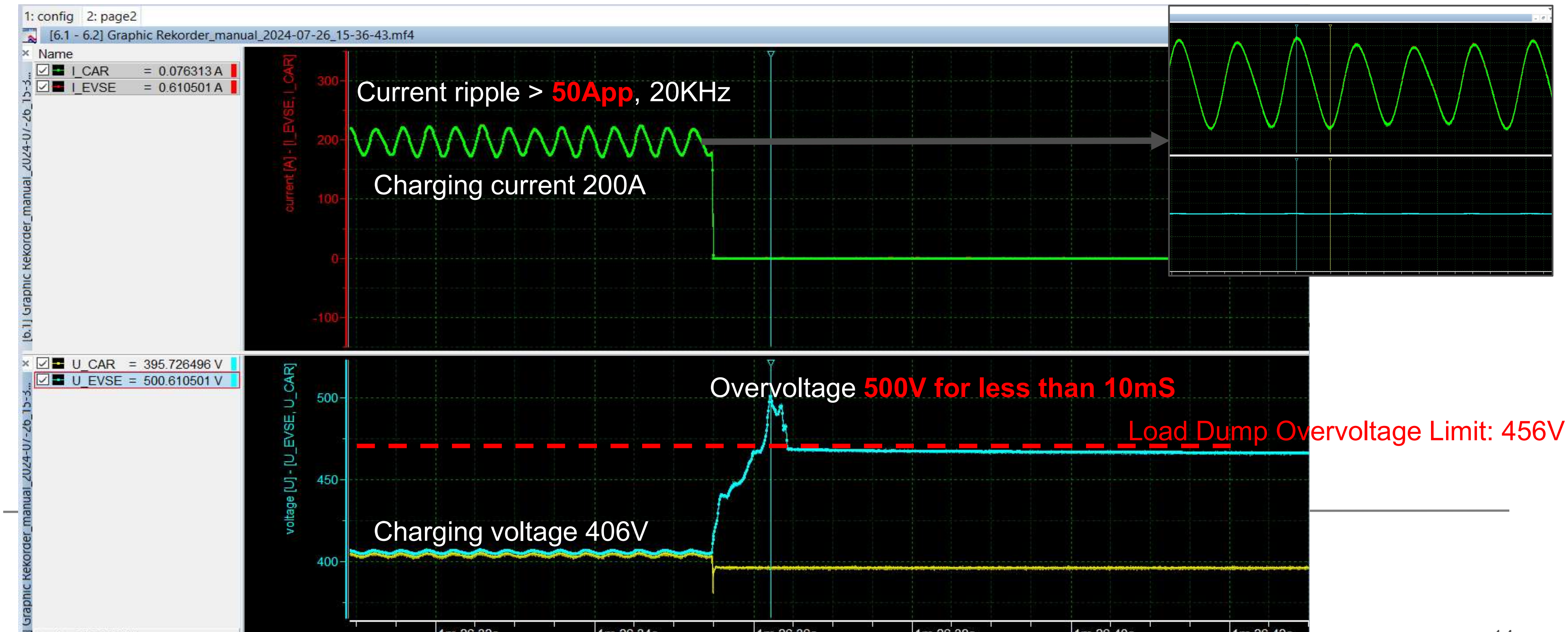
Test Results: Deviations from EVSE Nr.4

EVSE overvoltage violates the overvoltage limited defined by DC charging standard



Test Results: Abnormality from EVSE Nr.16

EVSE‘s overvoltage peak is above the allowed limit, but for less than 10mS, counts as compliant. Charging current ripple ist over 50App, GBT has currently no requirement on current ripple, will be regulated in NB/T 33001 Amd.



Purpose of the China Test Trip:

- ✓ Observing the overvoltage and demonstration test
- ✓ Address potential risks transparently
- ✓ Harmonization of requirement in DC charging standards
- ✓ Promote safe and robust DC charging infrastructure
- ✓ Handover further investigation to MB RD China

Summary:

- A successful test trip in China and the visit to Catarc and State Grid:
  - The tested 29 EVSEs have reached market share of over 4.54% *
  - Among the tested EVSEs, about **10%** EVSEs show deviations from load dump overvoltage

- Load dump overvoltage has been defined as mandatory requirement, EVSEs should be certified accordingly from 1st Aug. 2025 on for new type approval and 1st Aug. 2026 on for production EVSEs:
  - GB 39752-2024 Safety requirements of electric vehicle conductive supply equipment (EVSE only)
  - GB 44263-2024 Safety requirements for electric vehicle conductive charging system (EV and EVSE)

- Follow-up:
  - Compliance test to be defined in NBT 33001 NBT 33008.1 Amd. Further exchanges to harmonize it with international standards
  - Preparation of load dump compliance test by CATARC
  - Test equipment handed over to MB RD China for further investigation of 800V charging load dump
  - Further exchange between MB RD China and CATARC to convert ISO21498 to GBT standard

* Based on CATARC EVSE market research

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Charging Performance of EV Testing procedure ISO/SAE 12906

Mr. Michael Scholz

P3-Group

Sino-German
Sub-Working Group Emobility

Charging Performance of EVs
- Testing procedure ISO/SAE 12906 -

14.10.2024

DIN

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Initial situation: Various indicators for charging performance

In

32 min

auf 80 % geladen[2]

27 min

DC-Aufladung: 20 - 80%[a)]

OPEL

TESLA

Unterwegs

Laden Sie bis zu 282 km in nur
15 Minuten* an einem von
50.000+ Superchargern weltweit.

PORSCHE

Ladezeit für Gleichstrom (DC) mit maximaler Ladeleistung (5 auf bis zu 80%)	22,5 min

00:05h

an der High-Power Ladestation für 100 km Reichweite

Polestar

Ladegeschwindigkeit

Der Polestar 2 kann an Ladestationen mit bis zu 11 kW Wechselstrom (AC) oder bis zu 205 kW Gleichstrom (DC) aufgeladen werden. Sie können eine Wechselstrom-Wallbox installieren und bequem zu Hause aufladen. Außerdem finden Sie unterwegs viele passende Ladestationen.

Long Range Varianten – 205 kW DC, von 10 auf 80 %[1]

28 min

Standard Range Variante – 135 kW DC, von 10 auf 80 %[1]

34 min

Aufgeladene Kapazität von 10% auf 80% in ca.

21 Min.[2]

bei maximaler DC-Ladeleistung von bis zu 270 kW[2]

BYD

29 min

Schnellladen 30-80 % SOC

DIN

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Motivation: Harmonization of indicators and test methods

The **performance indicators** used in the media differ widely.

- Recharged range in x minutes
- Charging duration for x kilometers
- Charging duration 0–100% SoC
- Charging duration 20–80% SoC
- etc.

The **test methods** are not standardized.

Lacking provisions for

- Temperatures
- Pre-conditioning
- Voltage tolerances
- etc.

Furthermore, Peak-Power-Definitions are not unified, as well as „start“ and „end of charging“ (from connection, from current flow, etc.).

Harmonization is needed.

For more transparency and comparability.

Development and status of ISO/SAE 12906

today

… 2021 | 2022 | 2023 | 2024 …

… SAE J2953/4 (TIR)

… DIN 70080

→ Joint international ISO/SAE standard ISO/SAE 12906

F2F Detroit

F2F Los Angeles

WD → CD → DIS → FDIS → IS

DIN 70080 and SAE J2953/4 have been published in 2021 and served as a baseline for the development of ISO/SAE 12906.

- One international standard, jointly developed in one working group with SAE and ISO (hosted in ISO TC22/SC37/WG6), co-project lead between Germany and US.
- Continuous active participation from DE, IT, JP, US, KR (CN experts particpated in the beginning).

Premises: *Comparability* | *Imitability and plausibility* | *Reproducibility*

DIN | DKE VDE DIN | VDA Verband der Automobilindustrie

Test procedure and performance indicators according to ISO/SAE 12906

1 Soaking phase

Minimum 12 hours @ 23°C

2 Preparation phase (optional)

- Either drive cycle or extended soaking for max. 30 min
- Optimizing features may be activated
- Ambient temperature range of 0 °C to 30 °C

3 Charging phase

- Starting with any value of remaining electric range ≥ 15 km and ≤ 60 km (can also be set via SOC calculation)
- Measurement of performance indicators

Relocations (optional)

- The EV may be relocated betw. the steps of the test procedure
- Only passive movement
- Optimizing features not activated
- Max. 30 min

Applicable for AC, DC and WPT

test procedure	charging duration	charging efficiency	max. charging power	recharged ADT* range
Normal Charging (full charge)	xx h xx min	xx,x %	xx,x kW	xxx km after 60 min
Fast Charging (10 – 80%)	xx h xx min	xx,x %	xxx kW	xxx km after 10 min

*ADT = Applicable driving test (country specific, in EU it‘s WLTP)

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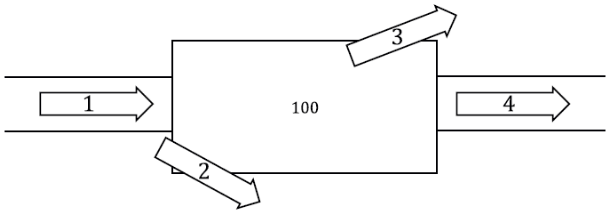
Challenge: Determination of recharged ADT range (1)



Key

1 energy added to the RESS (see MP3 in Figure 4)

2 Q_{loss} for recharging (e.g. loss due to cell chemistry, heating in RESS)

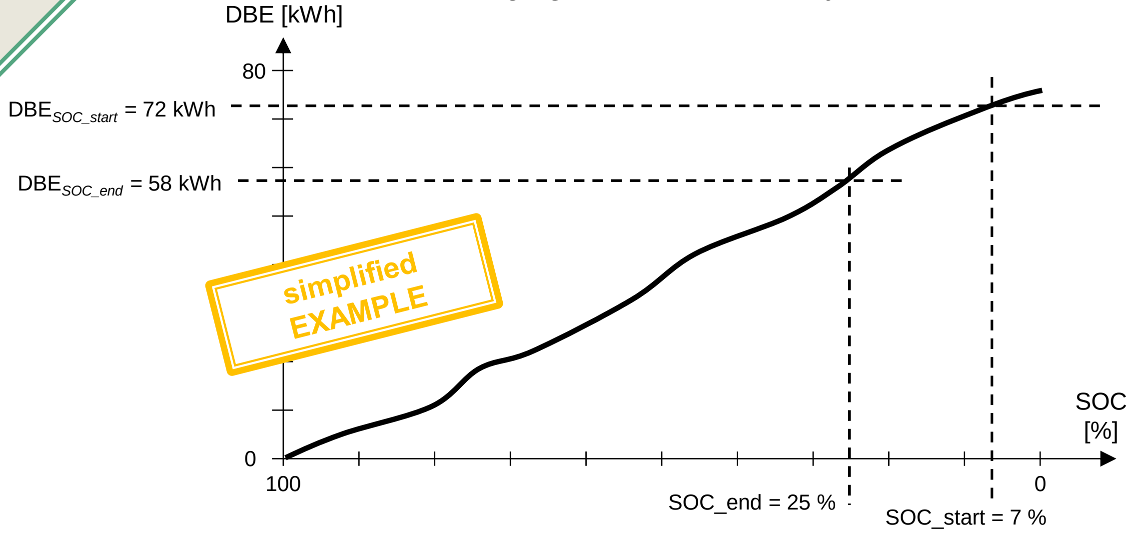
3 Q_{loss} for recharging (e.g. loss due to cell chemistry, heating in RESS)

4 rUBE (see MP4 in Figure 4)

100 RESS

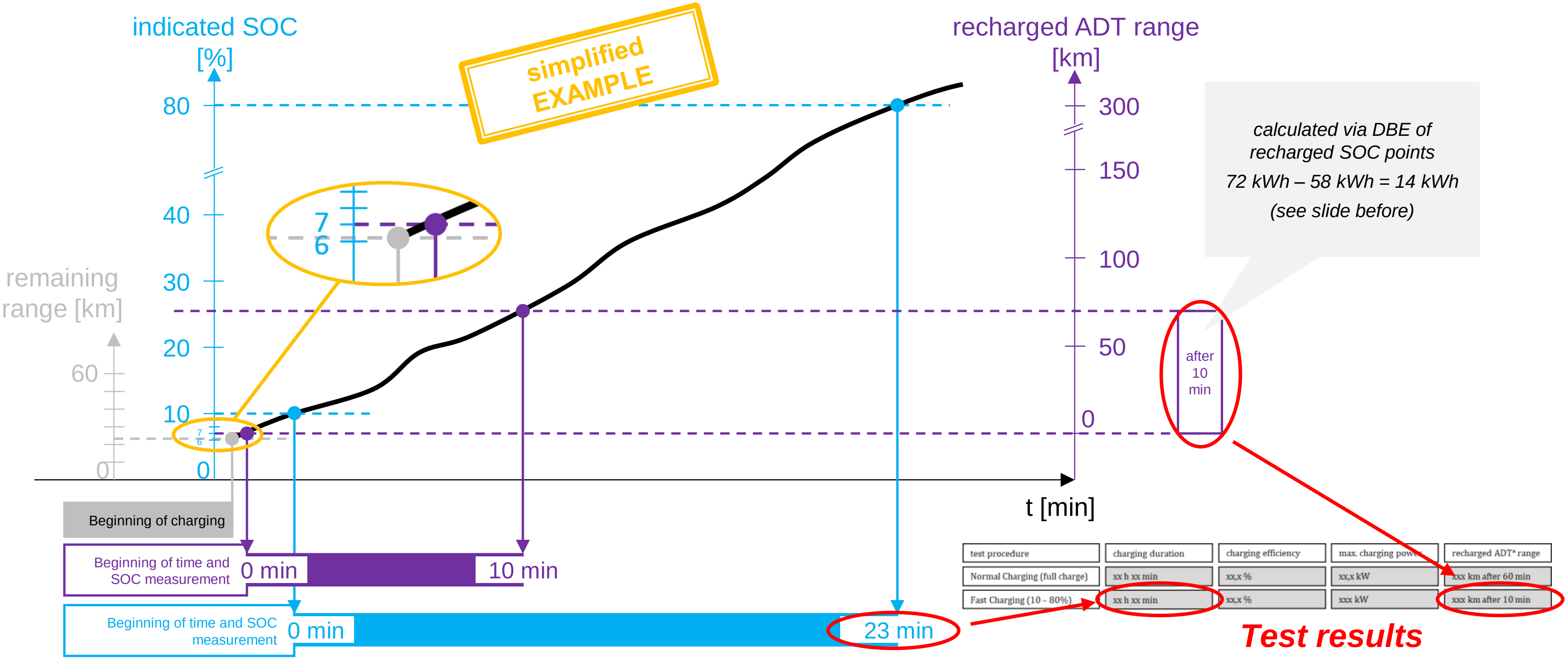
During charging, we can only measure what goes into the battery (1). However, to determine the recharged range, we need to know what is drawn from the battery for driving (4).

So we synchronously measure the energy drawn from the battery and the SOC during the discharging of the ADT drive cycle.



*DBE = Discharged battery energy

Challenge: Determination of recharged ADT range (2)



test procedure	charging duration	charging efficiency	max. charging power	recharged ADT* range
Normal Charging (full charge)	xx h xx min	xx,x %	xx,x kW	xxx km after 60 min
Fast Charging (10 – 80%)	xx h xx min	xx,x %	xxx kW	xxx km after 10 min

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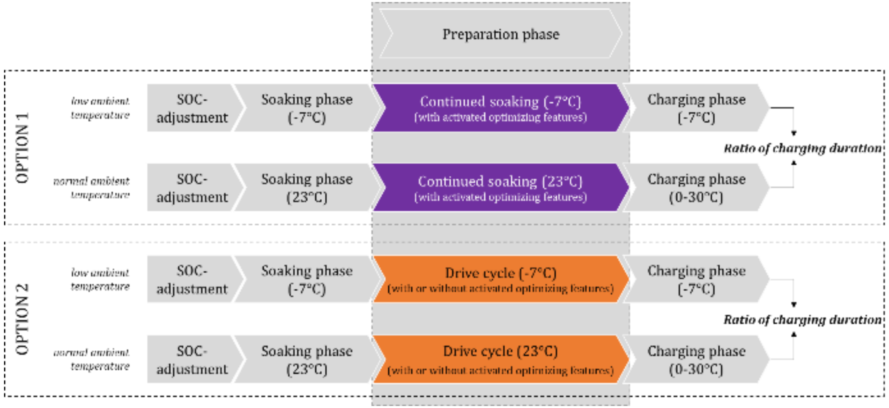
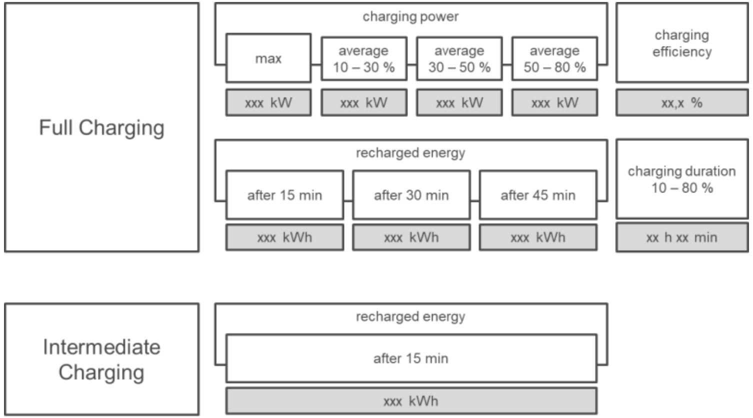
Informative Annexes: Test procedures @ low temperature and for HDV

Two Annexes have been drafted with quite some effort to describe procedures for charging at low temperature (-7 °C) and for heavy duty vehicles. These need further practical evaluation with the goal to move them to the normative part of the document.

The "low temperature method" determines the ratio of charging duration at low temperature to normal temperature.





The performance indicators for HDVs differ as HDVs have specific use cases and different framework conditions (commercial focus, vehicle configuration specific consumption).

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ISO/SAE 12906: Summary

- ISO/SAE 12906 defines standardized test procedures to determine charging performance indicators
- All values can voluntarily be determined (ISO/SAE 12906 doesn‘t require to determine the entire set) and further indicators may be given, of course.

Performance indicators

Recharged range for DC in 10 minutes and for AC in 60 minutes *(further DC-values after 5 and 20 minutes recommended)*	**Charging duration** for DC 10% to 80% SOC and AC full charge	**Peak Power** for 30 seconds	**Charging efficiency** for DC 10% to 80% SOC and AC full charge

Framework conditions

- Preconditioning to optimize the operation temperature is allowed
- SOC at the beginning of the measurement < 10% (15–60 km remaining range, ≤ 9% SoC respectively)
- Soaking @ 23°C
- Environmental temperature during preparation phase and charging phase: 0°C to 30°C

DIN

DKE VDE DIN

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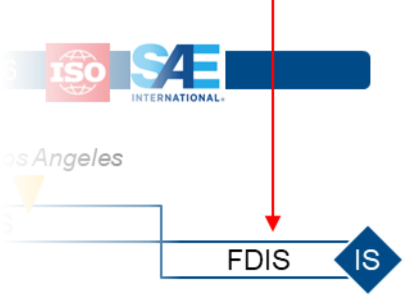
Outlook

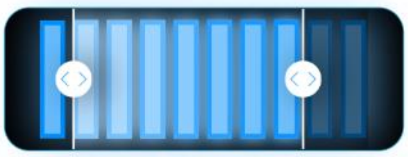


We have started to plan for a 2nd Edition 2. A catalogue of potential work items has been established (e.g. high temperature procedure).

China is more than welcome to use the 1st Edition and to participate in the development of the 2nd Edition of ISO/SAE 12906.

Many OEMs already apply the performance indicators of ISO/SAE 12906

10 - 80 %



0:32 h

DC Schnellladestation (bis 350kW)

Values for recharged range in 10 min under preparation.

Nachgeladene Reichweite von bis zu	Aufgeladene Kapazität von 10% auf 80% in ca.
255 km	21 Min.[5]
in 10 Min.[5]	bei maximaler DC-Ladeleistung von bis zu 270 kW[5]

PORSCHE

Maximale Ladeleistung für Gleichstrom (DC)	270 kW
Ladezeit für Wechselstrom (AC) mit 11 kW (0 auf bis zu 100%)	10,00 h
Ladezeit für Gleichstrom (DC) mit maximaler Ladeleistung (10-80 %)	21 min
Nachgeladene Reichweite (WLTP) in 10 min bei maximaler Ladeleistung	240 km

Ford

Ladezeit von 10% auf 80%[6]

26 min

	Reichweite nach 10 Minuten High-Power-Laden (HPC) in km[2] 156 - 196
Maximale Ladeleistung AC in kW 11 / 22[3]	Minimale Ladedauer AC 0–100 % Ladezustand in h 8:30 / 4:15[3]
Maximale Ladeleistung DC in kW 205	Minimale Ladedauer DC 10–80 % Ladezustand in h 0:30

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Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Status charging infrastructure for ships

Ms. Liu Lifang
SPIC

Ms. Liu Minming
SUNGROW

启源芯动力
QIYUAN GREEN POWER

中国船舶低碳发展实践及思考
Low-Carbon Development Practice and Reflection of Chinese Ships

Ms. Lifang Liu (SPIC) / 刘丽芳（国家电投启源芯动力）
Ms. Liu Minmin (SUNGROW)/刘敏敏（阳光电源）

2024.10

启源芯动力
QIYUAN GREEN POWER

目 录 Contents

船舶低碳化发展国际趋势

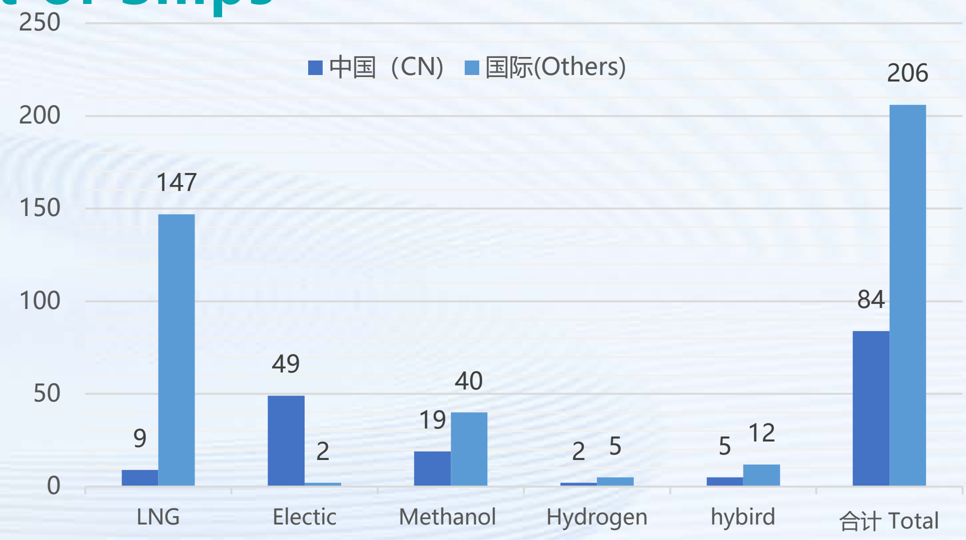
International Trends in Low-Carbon Development of Ships

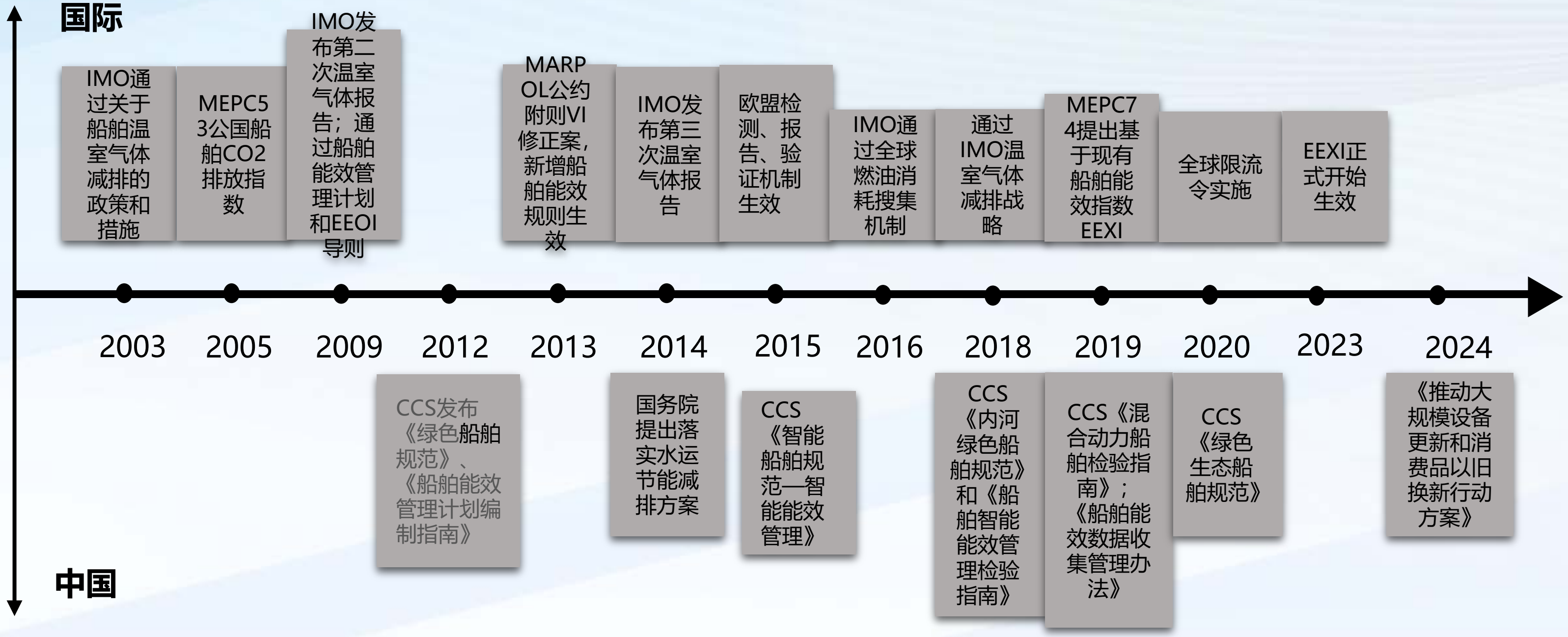
- 国际海事组织 IMO 规定，自 2023 年 1 月 1 日起，船舶必须获得现有船舶能效指数（EEXI）能效认证，同时还需收集 CO_2排放数据， 报告年度运营碳强度指标（CII）

The International Maritime Organization (IMO) stipulates that from January 1, 2023, ships must obtain an Energy Efficiency Existing Ship Index (EEXI) certification, collect CO2 emission data and report the annual operational Carbon Intensity Indicator (CII).

- 新加坡海事及港务局于2023年初宣布，从2030年起，在新加坡港口运营的新港口船舶须完全电动化，或可采用净零排放的燃料驱动。

The Maritime and Port Authority of Singapore announced in 2023，from 2030, new ships operate must be electrified or powered by net-zero emission fuels.





- 中国政府正在加快高耗能高排放老旧船舶报废更新，大力支持新能源动力船舶发展，完善新能源动力船舶配套基础设施和标准规范，逐步扩大电动、液化天然气动力、生物柴油动力、绿色甲醇动力等新能源船舶应用范围……

China accelerate the scrapping and renewal of old ships with high energy consumption and high emissions, support new energy powered ships, improve infrastructure and standards for new energy powered ships, gradually expand the application scope of new energy ships such as electric power, liquefied natural gas power, biodiesel power, and green methanol power...

中国低碳交通革命
Low-Carbon Transportation Revolution in China

01 环境保护 Environmental protection requirement

交通运输碳排放量约占中国碳排放量的10%。

CO_2 emissions from transportation sector account for about 10% in China。

其中，船舶占非道路移动源排放总量的21.2%（2020年）。

Among them, ships account for 21.2% of the total emissions from non-road mobile sources (as of 2020).

02 能源安全 Energy security demand

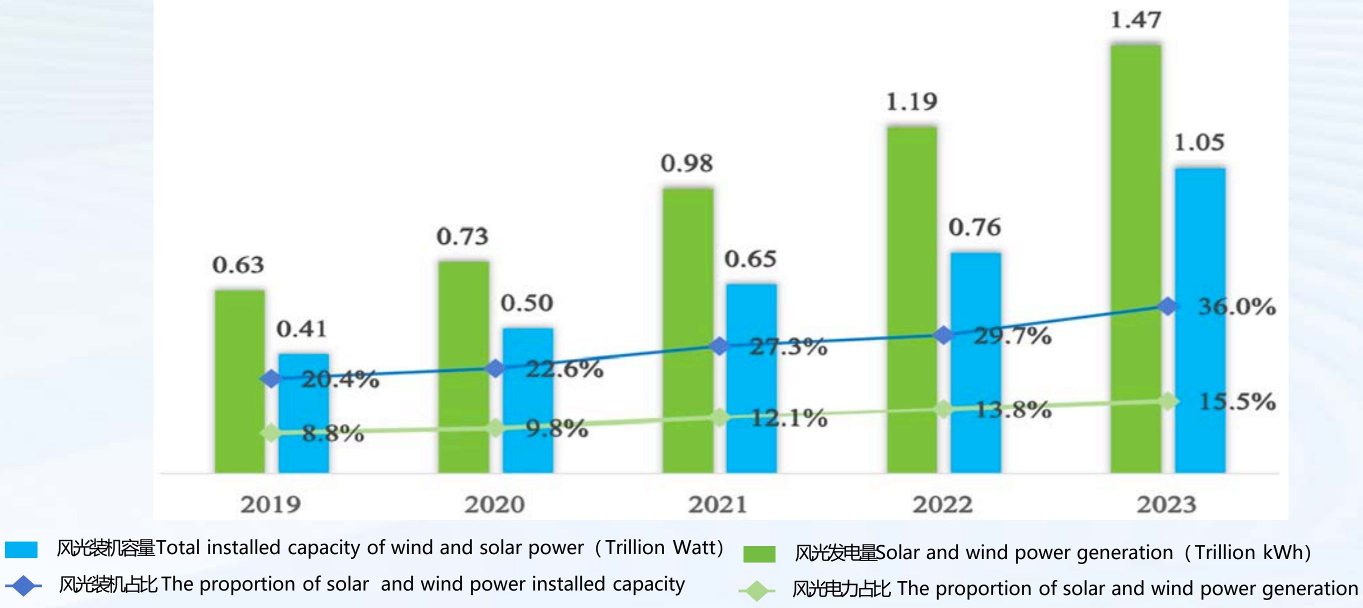
原油和天然气进口依赖度高。

High degree of crude oil and natural gas importation.

风光资源丰富，开发能力及开发力度逐年增强。

China is rich in solar and wind resources, and its capabilities and development efforts have increased year by year.

- 相比传统燃油货船，一条1800吨级电动货船每年可节省燃油10万升，降低二氧化碳排放260吨。相当于57台乘用车的排放量；
Compared to a traditional fuel-powered cargo ship, an 1800-ton electric cargo ship can save 100,000 liters of fuel and reduce carbon dioxide emissions by 260 tons annually. This is equivalent to the emissions of 57 passenger cars.

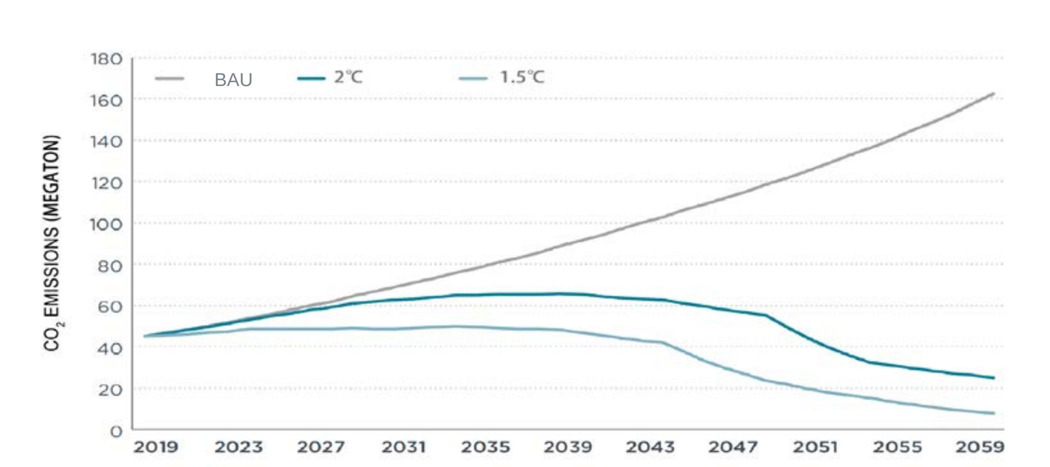


*根据美国环保署（EPA）数据，一个典型的乘用车每年大约排放4.6吨二氧化碳（基于行驶15000英里，每加仑汽油行驶22英里计算）。
*According to data from the U.S. Environmental Protection Agency (EPA), a typical passenger car emits about 4.6 tons of carbon dioxide per year (calculated based on driving 15,000 miles with a fuel efficiency of 22 miles per gallon).

低碳交通发展愿景
Low-Carbon Transportation Vision

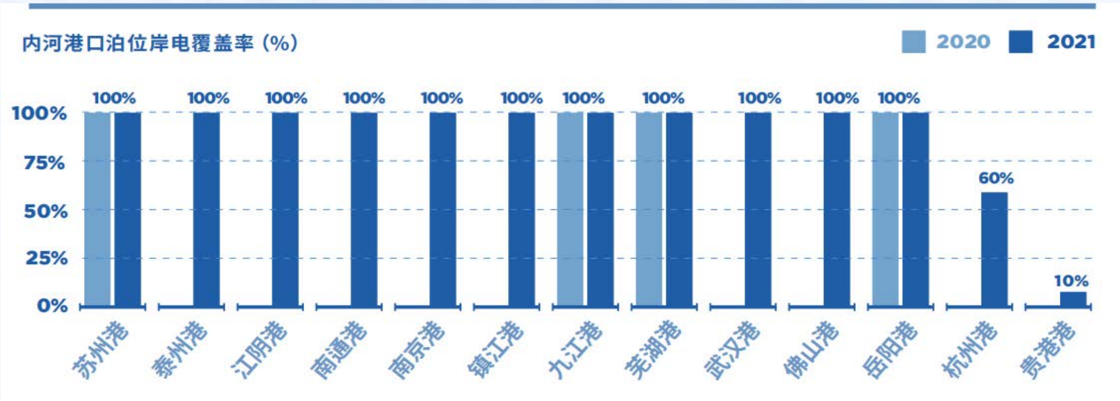
中国船舶低碳发展基础及措施
The Foundation and Measures for Low-Carbon Development of Chinese Ships

启源芯动力 QIYUAN GREEN POWER



中国典型内河港口岸电覆盖率(2021/2022)

Typical inland river port shore power coverage in China (2021/2022)



- 研究表明，在非低碳转型发展模式下，中国船舶行业2060年整体的二氧化碳排放量将是2019年的三倍以上。低碳转型控制下2040-2050年将达峰，碳排放逐步降低。
Under BAU mode, the carbon dioxide emissions of China's shipbuilding industry in 2060 will be more than three times that of 2019. Under low-carbon mode, carbon emissions will peak in 2040-2050 and gradually decrease.

*中国沿海航运降碳：燃油效率和低碳燃料的作用
* Decarbonizing China's coastal shipping: The role of fuel efficiency and low-carbon fuels

- 降碳措施 Decarbonization measures：
  - 能源效率标准 Energy efficiency standards
  - 岸电设施电动化 Shore power installation
  - 淘汰老旧船舶 Obsolescence of old ships
  - 大型船舶趋势 Trend of larger-sized vessel
  - 低碳燃料 Low-carbon fuel

01 船舶数量

2023年底，中国水路运输船约12.66万艘，90%以上为内河运输船。
By the end of 2023, there were approximately 126,600 ships in China, with over 90% being inland waterway vessels.

02 岸电设施

长江内河21个港口，基本实现岸电全覆盖。沿海港口专业化泊位岸电覆盖率平均达84%，其中7个港口高达100%。
21 ports along the Yangtze River achieved full coverage of shore power, and shore power coverage for coastal ports is about 84%, with 7 ports reaching as high as 100%..

03 替代能源

纯电动充电、纯电动换电、混合动力、内燃机动力、氢燃料动力等
Charging, Battery Swapping, Hybrid Power, Internal Combustion Engine Power, Hydrogen Power, etc.

04 以旧换新

政策驱动设备更新：大规模设备以旧换新、交通强国试点
Policy-driven equipment renewal: large-scale equipment replacement with old for new, pilot projects for strong transportation industry of China

以电动化为主的船舶低碳化能发展路径

The low-carbon shipping development with mainly focused on electrification.

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集装箱船
Container ship


散货船
Bulk cargo ship


游船/客船
passenger ship


拖轮
tug

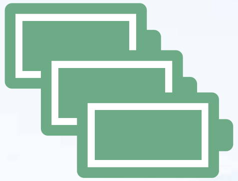

渡轮
ferryboat

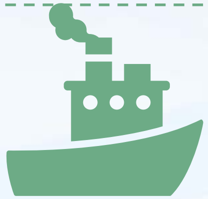

执法船
Public Service Ship


清漂船/监测船
Monitoring ship


工程船
Engineering Ship


充换电站建设
Battery-swap station


电池银行
Battery bank


船舶租赁
Ship leasing

- **电驱动为最优驱动方案：直接转化效率高**
  Electric power is the optimal propulsion solution with high direct conversion efficiency.
- **增程式混动兼顾效率和运营里程：甲醇、氢、LNG**
  Range-extended hybrid systems balance efficiency and operational mileage: methanol, hydrogen, LNG.
- **能源集约化运营：从船电分离过渡到能源模块和船舶分离**
  Energy-intensive operation: transitioning from ship and power separation to energy modules and ship separation.
- **宜充则充、宜换则换：利用沿江电厂充换电，减少岸电资源挤占。**
  Adapt charging or swapping modes to different scenarios: utilize power plants along the river for electric ship, reducing the occupation of power facilities.

补能方式 Energy supplementation	纯电动 Electric	增程式混合动力 Extended Hybrid	混合动力 Hybrid
动力源 Power Source	锂电池 lithium battery	柴油机+锂电池 Diesel engine + battery	柴油机+锂电池 Diesel engine + battery
推进方式 Propulsion	电力推进 Electric	电力推进 Electric	柴油机或电力推进 Diesel Or Electric
噪音 Noise	极低 Very low	低 Low	较低 Low
排放 Emission	零排放、无污染 Zero	较低 Low	一般 Medium
续航里程 Mileage	较短 Short	中长距离 Medium to long distance	较长 Long distance
初始投资 Initial Investment	较高 High	一般 Medium	较低 Low
适用船型 Applicable ship types	内河景区游船、观光船、短途/近海渡船、港作拖轮、内河船型短途集装箱船、散货船等 Pleasure-boat、Short distance ferry、Inland bulk cargo and container ships	科考船、工程作业平台、内河/近海邮轮、风电运维船、内河集装箱等 scientific research ship、Engineering ship、Cruise、Inland River Container Ship	近远海集装箱船、散货船、油船、化学品船等 Sea container ship、Bulk cargo ship、Oil tanker、Chemical Tanker

世界首艘120标箱集装箱换电船舶

The world's first 120-TEU container ship with battery swapping technology.

启源芯动力 QIYUAN GREEN POWER

- **行业首创**：**首艘**换电商业运营集装箱船；

The First Battery-Swap Commercial Container Ship in Operation;

- **高效补能：** “即插即拔”换电模式，单次换电仅需 20分钟，满电续航里程可达220公里；

Efficient Recharging, B-S mode, each swap taking only 20 minutes and a full charge range up to 220 kilometers;

- **最高标准：**建造等级满足“绿色船舶3”标准（内河船舶最高等级）；

The Highest Standard：The construction class meets the “Green Ship 3” standard.

- **清洁运输：**每年可替代160吨柴油，减少约500吨碳排放。

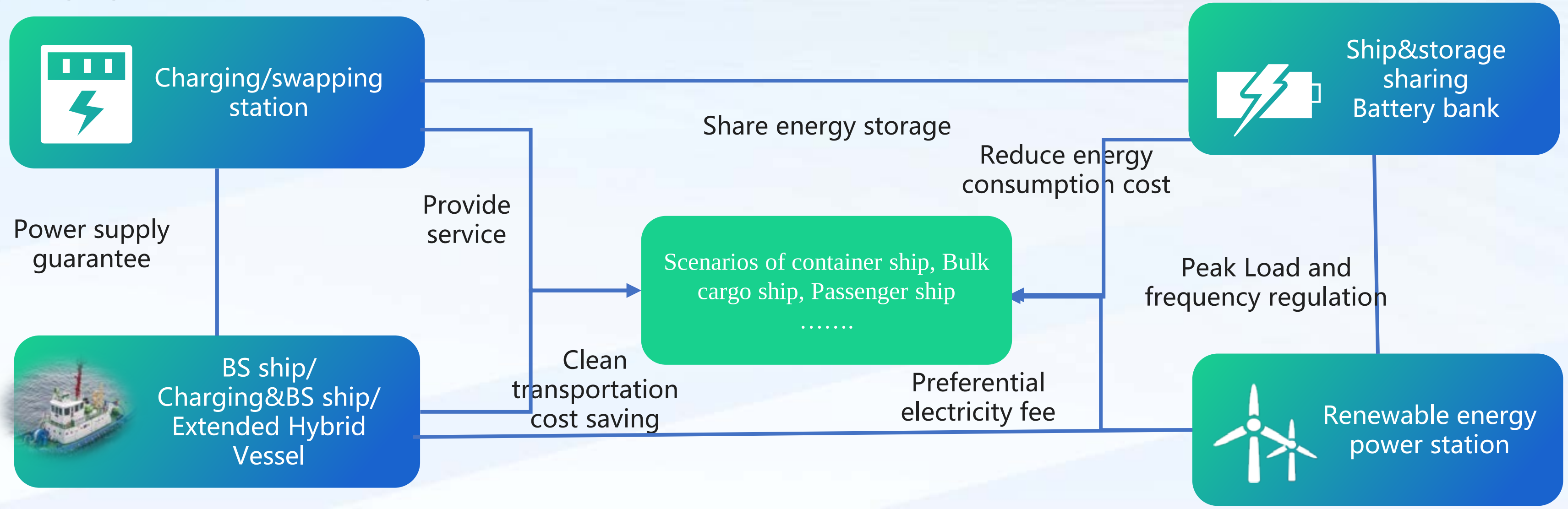
Clean Transportation, it can replace 160 tons of diesel fuel and reduce approximately 500 tons of carbon emissions.

- **综合能效高**：燃料消耗基本接近3度电1升油，船舶能源费用具备较大节省空间。

High Comprehensive Energy Efficiency：The fuel consumption is essentially equivalent to 3 kWh of electricity per liter of fuel oil, indicating a significant potential for cost savings on the ship's energy expenses.

- **经济性问题**：船电分离有效降低了船东投资成本，但是电动船数量少导致充电运营企业经济性受限。

The separation of ship and power supply reduces the investment for ship owners, but economic viability of charging operators for the stage of BS industrial promotion



虞山尚湖智能充电游艇项目

Yushan Shanghu Intelligent Charging Yacht Project

场景介绍 Scene Introduction：

项目在虞山尚湖景区投放6条8客位智能无人驾驶船舶。自动靠离泊位，游客拥有高度安静私密舒适的游玩体验。该项目于2024年7月1日正式运营。

The project deploys six intelligent unmanned yachts with a capacity of eight passengers each in the Yushan Shanghu scenic area. The yachts automatically dock and undock, providing visitors with a highly quiet, private, and comfortable experience. The project officially began operation on July 1, 2024.

技术方案 Technical Solution：

全智能无人驾驶船舶，船上无需驾驶船员，单次充电续航时间16小时。

Fully intelligent unmanned vessels, no crew members required on board, with a battery life of 16 hours on a single charge.

商业模式 Business Model：

船身金融采购出租给景区运营、充电桩运营商建设并向景区提供补能服务，长期合作经营分成的模式。

The yachts are financially procured through leasing and rented out to the scenic area operators, and charging pile operators construct the infrastructure and provide energy replenishment services to the scenic area, with a long-term cooperative operating revenue-sharing model.

充换结合油改电集装箱船“珠江001”

An oil-to-electric conversion container ship with charging & BS power supply

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场景介绍 Scene Introduction：服务于 “广州南沙-东莞石龙”货运航线，船总长49.95米，船宽13米，航速15公里/小时，2023年12月正式载货投入运营，率先开启珠江内核航运货船“电动时代”。

Serving the "Guangzhou Nansha - Dongguan Shilong" freight route, the ship has an overall length of 49.95 meters, a width of 13 meters, and a speed of 15 kilometers per hour. It officially began cargo operations in December 2023, taking the lead in opening the "electric era" for core Pearl River shipping cargo vessels.

技术方案 Technical Solution：采用“油改电”技术改造的首艘电动集装箱船，以箱式电池为推进电源，动力系统基于直流组网技术的S-Renewable新能源动力系统和移动集装箱式电源系统，配置2个集装箱式电源，每个容量为1935kWh，整船锂电池容量共计3870kWh，兼顾充电或换电两种运营模式。

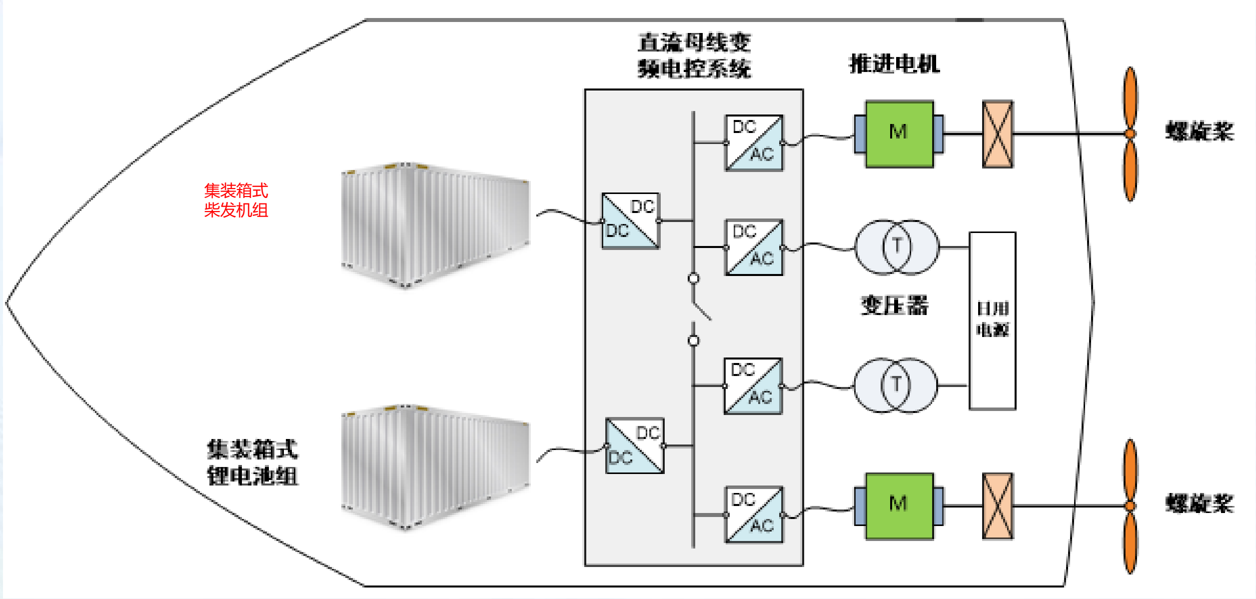
As the first electric container ship transformed using "oil-to-electric" technology, it uses box-type batteries as the propulsion power source. The power system is equipped with the S-Renewable new energy power system and the mobile container power supply system based on direct current networking technology by CSSC. It is configured with two container-type power sources, each with a capacity of 1935kWh, and the total lithium battery capacity of the ship is 3870kWh, accommodating both charging and battery swapping operational modes.

电动湘江-增程混动船舶示范应用

Electric Xiangjiang - Range-Extended Hybrid Vessel Demonstration Application

口技术方案：2条208TEU电动集散两用船+ 2座船舶充换电站
Technical Solution: 2 electric 208TEU multi-purpose container ships + 2 vessel charging and battery swapping stations

口整船电驱动，降低油耗：2块集装箱船用电池,1935kWh×2,续航300km。
Entire vessel is electrically driven to reduce fuel consumption: 2 container ship batteries, 1935kWh×2, capable of supporting a range of 300km.



口解决里程焦虑和安全性问题：2个集装箱燃油增程动力单元。400kw柴油发电机，集装箱加船舱配置7吨柴油箱，总续航里程超1500公里。电池失电故障后船舶仍有动力，拓展适用范围。
Addressing range anxiety and safety issues: 2 container fuel range extender power units. 400kw diesel generator, 2-ton diesel tank built into the container, and a 5-ton backup diesel tank in the ship's hold, with a total cruising range of over 1500 kilometers. Even if the battery fails, the vessel still has power, expanding its scope of application.

口经济性更优、可灵活调节，适用性广： 增程混动大大降低单次电池投资，经济性远好于纯电动船舶，具备盈利性。可根据动力电池成本、补电成本灵活调节油电比例、规模化应用潜力大。
More economical and adjustable, with a wide range of applicability: The range-extended hybrid system greatly reduces the initial battery investment, making it far more economical than pure electric vessels, and it is profitable. The ratio of oil to electricity can be flexibly adjusted based on the cost of power batteries and charging costs, and it has great potential for large-scale application.

船舶电动化运营优势

Advantages of Electric Vessel Operation

启源芯动力
QIYUAN GREEN POWER

环保节能、静音

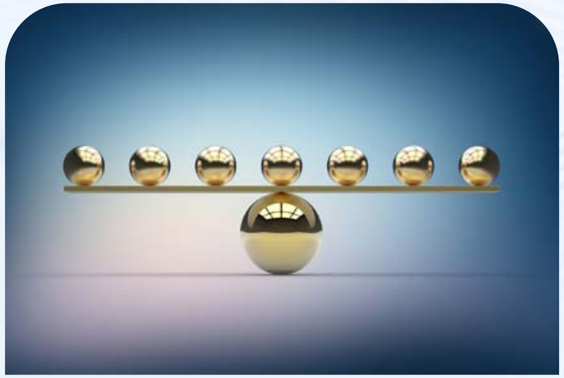
动力响应零延迟
纯电动零排放
混动降低30%以上排放
航行过程舱内噪音不超过60分贝

Environmental protection and energy saving, silence: zero delay in power response, zero emissions with pure electricity, hybrid reduces emissions by more than 30%, cabin noise does not exceed 60 decibels during navigation.

高安全性

船级社型式认可
通过行业GB38031、UN38.3、GB/T36276、UL9540A、IEC 62619等安全、性能测试
安全可控

High safety, classification society type approval, passed industry GB38031, UN38.3, GB/T36276, UL9540A, IEC 62619 and other safety, performance tests, safety is controllable.



低成本

全生命周期内的使用成本低:
维护成本低
船员可节省1-2人/船
度电成本为燃油发电的40%左右
能效较燃油动力提升50%以上

Low cost: The cost of use over the entire lifecycle is low, with low maintenance costs, 1-2 crew members can be saved per vessel, the cost per kilowatt-hour of electricity is about 40% of that of fuel power generation, and the energy efficiency is increased by more than 50% compared to fuel power.

数智化管理

为数控化提供能源基础
为智能化提供数据支持
在线管理
在线预警
云检验

Digital and intelligent management: Provides the energy foundation for digital control, offers data support for intelligent operations, online management, online early warning, and cloud inspection.

船舶电动化产业链优势

Advantages of the Electric Shipbuilding Industry Chain.

启源芯动力 QIYUAN GREEN POWER

能源补给网络投建&运营

Energy Refueling Network Construction and Operation.

- 充换电场站设计、勘验、建设
- 充换电场站运营

Design, survey, and construction of charging and battery swapping stations; operation of charging and battery swapping stations.

船舶动力系统研制

Development of Marine Power Systems.

- 电机
- 电控
- 电池系统

Motor, Electric Control, Battery System.

电池银行运营

Operation of battery banks.

- 需求侧响应
- 调频调峰
- 电力现货交易
- V2G

Demand response, frequency regulation, peak load adjustment, electricity spot market trading, V2G (Vehicle-to-Grid).

整船制造与销售

Complete Ship Manufacturing and Sales.

- 新能源船舶设计
- 新能源船舶监造

Design of New Energy Vessels, Supervision of New Energy Vessel Construction.

产业发展趋势
Industrial Development Trends.

启源芯动力
QIYUAN GREEN POWER

2023年市场较快发展，2022年到2025首批示范省市合计最低6900多艘，千亿规模；延续发展，万船万亿。

The market developed rapidly in 2023, with a minimum of over 6,900 vessels in the first batch of demonstration provinces and cities from 2022 to 2025, reaching a scale of hundreds of billions; continuing development, tens of thousands of vessels and trillions of scale.

Cargo Ship

货船

20%

散货船，集装箱船等。

Bulk Carriers, Container Ships, etc.

大宗货物、集装箱等内河、近海、远洋运输

Bulk Cargo, Container transportation in inland rivers, coastal, and ocean-going scenarios.

Official Vessel

公务船

30%

海事船、渔监船

Maritime Vessels, Fisheries Surveillance Vessels.

海上巡逻、检查、护渔等公务用船

Maritime patrol, inspection, fishery protection, and other official marine uses.

Working Boat

工作船

40%

拖轮、救助船、航道疏浚 船、PSV（平台守护船）

Tugboats, Rescue Vessels, Dredgers, PSVs (Platform Supply Vessels).

港口、河道等场景

Harbor, river, and other related scenarios.

Passenger Ship & Passenger-Cargo Ship

客船&客货船

60%

城市渡轮、 观光游船、汽渡船

Urban Ferries, Sightseeing Cruise Ships, Car Ferries.

有江河的城市，人与车辆的水陆转运

Cities with rivers for the waterborne transportation of people and vehicles.

Cruise Ship

游船

80%

画舫船、游船

Houseboats,Cruise Ships.

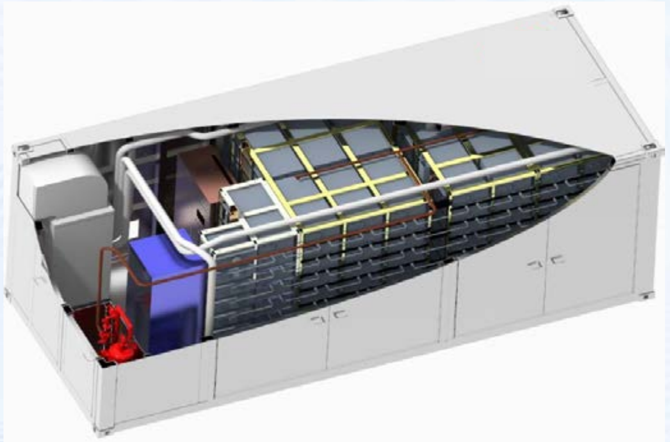
西湖、秦淮河等河流湖泊景区

Scenic areas of rivers and lakes such as West Lake and Qinhuai River.

电动船舶规模化应用挑战

Challenges in the Scale-up Application of Electric Vessels.

- **电池降本：**电池成本占电动船整体成本的50%
  Battery accounts for 50% of the total cost of an electric ship.
- **充电降本：**充换电基础设施完善及共享、源网荷储
  Improvement and sharing of battery swapping infrastructure to reduce charging cost
- **标准化、模块化：**降低建造和审批成本
  Standardization and modularization: Modular and standardized manufacturing for ships with strong commonality to reduce construction and approval costs.
- **无人/辅助驾驶：**电动化在无人驾驶领域具有天然优势
  Unmanned/assisted driving: Electrification has inherent advantages in the field of unmanned driving.
- **数字化：**提升船舶的调度、航行效率
  Digitalization: Improve the dispatching and navigation efficiency of ships.



谢谢
Thanks！

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

BREAK – 20 Minutes

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Review of draft SWG report

Mr. LIU Yongdong

CEC

Joint Report

Sino-German Standardisation Cooperation Commission

Annual meeting of Sub-Working Group Electromobility

14th October 2024

The 11th Plenary Meeting of the Sino-German Sub-Working Group Electromobility was held in Bonn, Germany on 14th October 2024. German and Chinese related government bodies and standardization organisations, including SAMR, CEC, CATARC and BMWK, DIN and VDA attended the meeting. Mr. Thomas Zielke (BMWK), Mr. Wang Yu (SAMR) and Dr. Michael Stephan (DIN) gave respective speeches. The delegations were headed by Mr. Wang Yu (SAMR), Director, Division for Standardization of Information Technology and Automation, and Dr. Michael Stephan (DIN), Member of the Management Board, Chief Operations Officer (COO). About 50 representatives from ministries, standardization bodies and industry from both, China and Germany, attended this meeting.

Both delegations affirmed the purpose of the activities within the Sino-German Sub-Working Group Electromobility aiming on technical harmonization of standards in order to reduce development efforts for the industry and their products to comply with different market requirements. This is also in the interest of sustainability and the improvement of the environmental footprint since it lowers the costs for users and supports the proliferation of Electromobility.

Both delegations exchanged information and continued their harmonization efforts on various topics in the context of the Sino-German cooperation on electric vehicle standardization. Chinese and German representatives conclude to continue and strengthen the cooperation on bilateral and international level. This includes a continued cooperation and information exchange regarding the work on the following topics and standardization projects:

Bidirectional charging

– A report was given regarding the status of Vehicle-to-Grid (V2G) and Vehicle-to-Load (V2L) activities in China
– Furthermore, German and Chinese experts presented a status regarding V2G (with a focus on AC) and V2L in a virtual Workshop on 29th August 2024
– Based on that comprehensive collaboration efforts in the context of V2G and V2L it was agreed to continue the exchange of information and experiences regarding these both topics
– In particular, it was agreed to arrange a follow-up meeting to continue the exchange on V2L aspects and developments

Battery Technology

– Germany gave a presentation regarding “Deep discharge in the recycling process”
– China gave a presentation regarding the “Progress on EV battery recycling standards in China” and the “Application of retired battery energy storage system”

- A continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts

Charging Technology (several topics)
- Germany gave a presentation regarding the “Charging Performance of EV - Testing procedure ISO/SAE 12906”
- China gave an overview about the current status of the “Charging infrastructure for ships”
- A continuation of the information exchange and discussions for these topics on expert level will take place accordingly to the needs of both, Chinese and German experts

Loaddump (GB/T 18487.1 and ISO 21498)
- An overview has been given concerning the “Current status on developments regarding GB/T 18487.1 / ISO 21498”
- A continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts and according to the informal exchange as it has taken place in the past

Further relevant topics according to the workshop report
- Based on the Sino-German Workshop on 29thAugust 2024 the results of these workshop were introduced in the annual meeting of the Sub-Working Group Electromobility
- Regarding Megawatt Charging System (MCS) a status report has been given concerning the progress of MCS projects in China, Germany and on international level
- Regarding AC/DC Overlay China gave an overview regarding concepts and developments in China.
- Regarding vehicle adapter German and Chinese experts exchanged their experiences made in the field.
- The given overview could serve as a basis for a further exchange of experiences. Following, regarding all topics a continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts

Regarding the next steps, Chinese and German representatives conclude to coordinate mutually the implementation of the conclusions. This comprises the management and distribution of relevant information to pursue the cooperation regarding international standardization activities and to support the initiation of bilateral collaborations, e.g. the arrangement of dedicated workshops. For further details please see the **attached work plan**.

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Mr. Wang Yu Mr. Christoph Winterhalter

Attachment

Sino-German Standardisation Cooperation Commission
Work Plan 2025
Sub Working Group Electromobility

Objective	Harmonise DEU and CHN concepts and relevant standards related to Electromobility nationally and internationally.
Topics of cooperation	Megawatt Charging System (MCS) for Heavy Duty Vehicles (international/ China) • Collaborate and exchange information and experiences regarding the development of a Megawatt Charging System (MCS) for Heavy Duty Vehicles and exploring harmonization potentials • Give a regular update and exchange information regarding the developments of MCS, UltraChaoJi and e.g. GB/T 20234 Charging infrastructure for ships and planes • Providing an overview of current developments in China in order to figure out the potential for a further information exchange AC/DC Overlay • Providing an overview of current developments in China in order to continue the exchange of information and experiences Loaddump • Harmonise loaddump overvoltage protection and limit related requirements in CHN national standard GB/T 18487 and ISO 21498 • Germany will keep China updated regarding relevant developments and continue the information exchange and discussion on expert level Bidirectional Charging • China and Germany well keep each other updated regarding further developments with regard to Vehicle to Grid/ Load (V2G / V2L) • In particular, a further exchange and/or meeting regarding V2L has been agreed Battery Technology/ Recycling • Based on the decision in the SGSCC plenary meeting in 2023 regarding battery recycling this topic is to be covered in the SWG • Based on a first information exchange on aspects regarding battery recycling a continuation of the collaboration, discussions and information exchange will take place accordingly to the needs of both, Chinese and German experts Vehicle Adapter

	• China and Germany well keep each other updated regarding further developments in the field and, based on that, both will continue the exchange of information and experiences
Stakeholders	• German Federal Ministry of Economic Affairs and Climate Action (BMWK) • State Administration for Market Regulation (SAMR), Ministry of Industry and Information Technology (MIIT) • German Institute for Standardisation (DIN) • China Electricity Council (CEC), China Automotive Technology & Research Center (CATARC) • Other relevant industry associations and stakeholders from both sides

Federal Ministry
for Economic Affairs
and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Review of SWG presentation for SGSCC plenary meeting

Mr. Mario Beier

DIN

SGSCC-Meeting October 2024

Results of SWG Electromobility

2024-10-16

Introduction and overview of topics

- Since the last SWG meeting in 2023 it was considered by China and Germany to organize a technical Workshop between experts of both countries based on the topics discussed in 2023.
- Following this considerations, a virtual Sino-German Workshop could be organized on 29th August 2024 to conduct a technical discussion on various topics (Megawatt Charging System, Bidirectional Charging (V2G / V2L), AC/DC Overlay, Adapter Safety).
- In the SWG meeting in October 2024 parts of these topics addressed in the workshop in August as well as further topics have been discussed between experts of China and Germany
  - Bidirectional Charging
  - Battery Technology
  - Charging Technology
  - Loaddump

Workshop on 29th August 2024 - Results

Megawatt Charging System (MCS)

- In 2021 it was agreed to collaborate and to exchange information and experiences regarding the development of a Megawatt Charging System (MCS) for Heavy Duty Vehicles exploring the harmonization potentials

- After further bilateral workshops in 2022 and a status update in the SWG meeting of 2023 a status report has been given in the workshop concerning the progress of MCS projects in China, Germany and on international level

AC/DC Overlay

- Regarding AC/DC Overlay China gave an overview regarding concepts and developments in China

Workshop on 29th August 2024 - Results

Vehicle Adapter

- Regarding vehicle adapter German and Chinese experts exchanged their experiences made in the field

Conclusion for these three topics (MCS, AC/DC Overlay, Vehicle Adapter)

- The given overview could serve as a basis for a further exchange of experiences.
- Following, regarding all topics a continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts

Bidirectional Charging → see separate slides

Results of SWG Electromobility on 14th October 2024

Bidirectional charging

- In 2023 China gave an overview about Vehicle to Grid (V2G) technology, demonstration projects and standardization efforts and a continuation of the information exchange and discussions on expert level accordingly to the needs of both, Chinese and German experts, has been agreed

- German and Chinese experts presented a status regarding V2G (with a focus on AC) and V2L (Vehicle to Load) in a virtual Workshop on 29th August 2024. Main results were presented in the SWG Electromobility meeting in October 2024.

- In the SWG meeting in October 2024 an additional report was given regarding the status of V2G and V2L activities in China

Bidirectional charging

- Based on that comprehensive collaboration efforts in the context of V2G and V2L it was agreed to continue the exchange of information and experiences regarding these both topics

- In particular, it was agreed to arrange a follow-up meeting to continue the exchange on V2L aspects and developments

Battery Technology

- In 2023 Germany and China gave an overview about current developments regarding battery standardization activities in China and Europe and a continuation of the information exchange and discussions on expert level accordingly to the needs of both, Chinese and German experts, has been agreed
- Furthermore, in 2023 is has been agreed in the SGSCC Plenary meeting to integrate topics dealing with battery recycling in the SWG Electromobility
- In the SWG meeting in October 2024
    - Germany gave a presentation regarding “Deep discharge in the recycling process”
    - China gave a presentation regarding the “Progress on EV battery recycling standards in China” and the “Application of retired battery energy storage system”
- A continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts

Loaddump (GB/T 18487.1 and ISO 21498)

- Analog to 2023 and the former exchange regarding loaddump aspects in the SWG meeting in October 2024 an overview has been given concerning the “Current status on developments regarding GB/T 18487.1 / ISO 21498”

- A continuation of the information exchange and discussions on expert level will take place accordingly to the needs of both, Chinese and German experts and according to the informal exchange as it has taken place in the past

Charging Technology

- In the SWG meeting in October 2024 a new topic was addressed as Germany gave a presentation regarding the “Charging Performance of EV - Testing procedure ISO/SAE 12906”

- Furthermore, China gave a status update of the “Charging infrastructure for ships” based on the overview already given in 2023

- A continuation of the information exchange and discussions for these topics on expert level will take place accordingly to the needs of both, Chinese and German experts

Conclusion

- A continuation of the information exchange and discussions will take place accordingly to the individual development of each of the topics and the concrete needs of both, Chinese and German experts (as already conducted in the past)
- This comprises the management and distribution of relevant information to pursue the cooperation regarding international standardization activities and to support the initiation of bilateral actions (e.g. the arrangement of dedicated workshops).

Thank you!

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Closing Remarks

Mr. Florian Spiteller

DKE

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Closing Remarks

Mr. Wang Yu

SAMR

Federal Ministry for Economic Affairs and Climate Action

中国国家标准化管理委员会
Standardization Administration of the P.R.C.

Thank you!
Danke!
谢谢！