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Technical guidelines for the construction and operation of coordinated charging systems for electric vehicles

电动汽车有序充电系统建设运行技术导则

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4 System Architecture

4.1 System Composition An orderly charging system for electric vehicles may include an orderly charging cloud-side management system, an orderly charging edge-side management system, orderly charging equipment, and electric vehicles. Automotive/power batteries, etc. The overall system architecture is shown in Figure

1.The configuration scheme can be selected according to the actual application scenario. A typical architecture is shown in Appendix A.

4.2 Control Architecture

4.2.1 Cloud-based ordered control architecture The cloud-based ordered control architecture mainly includes the following approaches.

a) Cloud-edge collaboration. The orderly charging cloud-side management system generates orderly charging control strategies, which collaborate with the orderly charging edge-side management system to manage... The orderly charging control strategy is implemented by the orderly charging equipment. A typical system architecture diagram is shown in Figure A.1 in Appendix A.

b) Cloud-based charging pile control. The cloud-based orderly charging management system generates orderly charging control strategies and directly manages and controls the execution of orderly charging equipment. The orderly charging control strategy, and a typical system architecture diagram are shown in Figure A.2;

c) Cloud-based vehicle control. The orderly charging cloud-based management system generates orderly charging control strategies, directly managing and controlling electric vehicles to execute orderly charging. The charging control strategy and typical system architecture are shown in Figure A.3.

4.2.2 Side-Ordered Control Architecture The orderly charging side-side management system generates orderly charging control strategies and directly manages and controls the orderly charging equipment to execute orderly charging control. The strategy and typical system architecture diagram are shown in Figure A.4.

4.2.3 Terminal Ordered Control Architecture The terminal orderly control architecture mainly includes the following methods.

a) Autonomous Charging Station. The orderly charging equipment generates an orderly charging control strategy based on preset or manually input orderly charging requirements, achieving... Pre-charge, typical system architecture diagram is shown in Figure A.5;

b) Vehicle-side autonomy. The electric vehicle's onboard terminal generates an orderly charging control strategy based on preset or manually input orderly charging demands. For sequential charging, a typical system architecture diagram is shown in Figure A.6.

5.1 Orderly Charging Cloud-based Management System

5.1.1 Information Interaction Function The information interaction requirements for the orderly charging cloud-side management system are as follows:

a) It should be able to obtain real-time information on the orderly charging equipment or electric vehicles through direct communication or interaction with the orderly charging side-side management system. Functionality for collecting data related to the car charging process;

b) It should be able to communicate with users through user information interaction systems (such as mobile application terminals), orderly charging equipment, electric vehicle on-board terminals, etc. Electric vehicle users can interact with the system to obtain information about their charging needs, and the system will display the charging power adjustment status and charging progress. Features such as history records;

Note. This does not apply to orderly charging in battery swapping scenarios.

c) It should be able to monitor the network status, equipment operation status, communication channel status, and communication message status of the orderly charging equipment in real time. The system includes the ability to monitor and record anomalies and

implement tiered alerts.

d) It should be capable of exchanging information with external cloud-side systems such as load control systems, new load management systems, and load aggregation systems. Function;

e) It should have the function of connecting to the government's charging facility supervision platform and exchanging information.

5.1.2 Orderly charging control strategy formulation and monitoring function The orderly charging cloud-side management system should be able to adjust charging needs based on electric vehicle users' charging demands, electricity prices, or external cloud-side system requirements. It has the function of formulating orderly charging control strategies based on information such as the number of units and monitoring the accuracy of strategy execution.

5.1.3 Orderly charging control strategy execution and termination function The requirements for the execution and termination functions of the orderly charging control strategy in the orderly charging cloud-side management system are as follows:

a) It should be able to directly manage and control orderly charging equipment or electric vehicles to achieve orderly charging in accordance with the established orderly charging control strategy. Electricity, or the orderly charging control strategy may be distributed to the orderly charging side-side management system, which will then manage and control it. The orderly charging equipment realizes the function of orderly charging;

b) It should have the function of terminating the execution of the orderly charging control strategy when necessary.

5.1.4 Charging load prediction function The cloud-based orderly charging management system should have the function of predicting the charging load of orderly charging equipment or electric vehicles.

5.2 Orderly Charging Side-Side Management System

5.2.1 Information Interaction Function The information interaction requirements for the orderly charging side-side management system are as follows:

a) It should have the function of acquiring relevant data on the charging process of the orderly charging equipment in real time;

b) It can have the function of exchanging information with external side systems or equipment such as integrated energy systems and intelligent converged terminals;

c) When adopting a cloud-edge collaborative control architecture, it should be able to interact with the orderly charging cloud-side management system and receive information from the orderly charging cloud-side system. The function of the orderly charging control

strategy issued by the management system;

d) When adopting a side-by-side ordered control architecture, it can interact with electric vehicle users through ordered charging equipment and other means to obtain information. It collects users' charging needs information and displays charging power adjustment status, charging history, and other functions to users;

e) When adopting a side-side ordered control architecture, it can be integrated with external cloud-side systems such as load control systems, new load management systems, and load aggregation systems. The system's information exchange function.

5.2.2 Orderly charging control strategy formulation and monitoring function The requirements for the orderly charging control strategy formulation and monitoring functions of the orderly charging side-side management system are as follows:

a) When adopting a cloud-edge collaborative control architecture, communication issues arise between the orderly charging edge management system and the orderly charging cloud management system. The fault detection system should ideally include information based on electric vehicle user charging needs, electricity prices, and external side-side system or equipment control requirements. It has the function of formulating orderly charging control strategies and monitoring the accuracy of strategy execution;

b) When adopting a side-side ordered control architecture, it should be able to adjust the charging needs of electric vehicle users according to electricity prices and external cloud-side systems. Based on information such as demand control and external side-side system or equipment regulation requirements, an orderly charging control strategy is formulated, and the accuracy of strategy execution is monitored. The function of monitoring.

5.2.3 Orderly charging control strategy execution and termination function The requirements for the execution and termination functions of the orderly charging control strategy in the orderly charging side-side management system are as follows:

a) It should have the function of directly managing and controlling the orderly charging equipment to achieve orderly charging in accordance with the orderly charging control strategy;

b) It should have the function of terminating the execution of the orderly charging control strategy when necessary.

5.3 Orderly charging equipment

5.3.1 Charging power adjustment function AC charging stations should be able to adjust the pulse width modulation (PWM) duty cycle of the control and guidance circuit output according to the charging power demand. Function. Off-board chargers should be able to adjust the output voltage and power according to information such as the charger's maximum output capacity, vehicle requirements, and power regulation needs. The current