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Technical Specification for Centralized Monitoring and Control System of Distributed Energy Storage

分布式储能集中监控系统技术规范

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1 Scope

This document specifies the system structure, normal operating conditions, functional requirements, performance requirements, test and inspection of the centralized monitoring and control system of distributed energy storage.

This document is applicable to the design, manufacturing, testing, operation, maintenance and overhaul of the centralized monitoring and control system of distributed energy storage.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 13729 Remote Terminal Unit Equipment

GB/T 36572 Guidelines of Cyber Security Protection for Electric Power System Supervision and Control

GB 50229 Code for Design of Fire Protection for Fossil Fuel Power Plants and Substations

DL/T 634.5101 Telecontrol Equipment and Systems - Part 5-101: Transmission Protocols - Companion Standard for Basic Telecontrol Tasks

DL/T 634.5104 Telecontrol Equipment and Systems - Part 5-104: Transmission Protocols - Network Access for IEC 60870-5-101 Using Standard Transport Profiles

DL/T 860 (all parts) Communication Networks and Systems for Power Utility Automation

DL/T 2528 Basic Terminology of Electrical Energy Storage

DL/T 5149 Code for Design of Substation Monitoring and Control System

3 Terms and Definitions

What is defined in DL/T 2528, and the following terms and definitions are applicable to this document.

3.1 centralized monitoring and control system of distributed energy storage

A system that performs centralized and real-time monitoring and control of one or above distributed energy storage based on the application of computers, networks and communication technologies.

4 Overall Requirements

4.1 The centralized monitoring and control system of distributed energy storage shall be equipped with the application functions of data collection, real-time communication, operation monitoring and operation control, etc.

4.2 The centralized monitoring and control system of distributed energy storage shall adopt a hierarchical, classified and open system structure, and have scalability.

4.3 The centralized monitoring and control system of distributed energy storage shall have redundancy configuration in key equipment and links, such as: servers, switches and communication channels, etc.

4.4 The centralized monitoring and control system of distributed energy storage under the dispatching command management by the power grid shall have the capability of exchanging real-time information with the power grid dispatching system, and its security protection shall satisfy the requirements of GB/T 36572.

5 System Structure

5.1 The centralized monitoring and control system of distributed energy storage consists of the front-end convergence layer, the business processing layer and the resource storage layer. A typical structure is shown in Appendix A. The functions of each layer are as follows:

a) The front-end convergence layer, which realizes the prepositive communication function, includes prepositive servers and security gateway servers;

b) The business processing layer, which realizes application functions, such as: operation monitoring and operation control, includes application servers and workstations;

c) The resource storage layer, which realizes data storage function, includes database servers.

5.2 The centralized monitoring and control system of distributed energy storage shall support wired and wireless access. Those under wired transmission and configured with longitudinal encryption devices shall be connected to the security zone I; those under wired public network, wireless private network or wireless public network shall be connected to the security zone IV, and a security access gateway should be set up.

storage system. For the content of information collection, see Appendix B.

7.1.2 The centralized monitoring and control system of distributed energy storage shall support various types of communication protocols and the reception of multiple data types.

7.2 Alarm

7.2.1 The centralized monitoring and control system of distributed energy storage shall realize hierarchical processing of alarm information in accordance with alarm levels, such as: accidents, abnormalities, threshold-crossing, displacements and notifications, etc.

7.2.2 The centralized monitoring and control system of distributed energy storage shall be equipped with the function of real-time alarm display. The display content should include level, time, equipment, behavior and reasons.

7.2.3 The centralized monitoring and control system of distributed energy storage shall be equipped with the function of retrieving alarm signals based on conditions.

7.3 Operation Monitoring

7.3.1 The operation monitoring content of the centralized monitoring and control system of distributed energy storage shall include, but not be limited to the operation information of equipment, such as: transformers, switches, knife switches, busbars, energy storage body and energy storage converters, etc.

7.3.2 The centralized monitoring and control system of distributed energy storage shall be equipped with the functions of dynamic coloring of graphics elements, dynamic flashing and network topology, so as to realize intuitive monitoring of the operating status of distributed energy storage.

7.3.3 The operation monitoring diagram of the centralized monitoring and control system of distributed energy storage should include index diagram, main wiring diagram, interval diagram, light plate diagram and network communication status, etc.

7.4 Operation Control

7.4.1 The centralized monitoring and control system of distributed energy storage shall be equipped with the functions of controlling the start / stop / reset of energy storage converters, adjusting the charging and discharging power of energy storage converters, connecting and disconnecting grid switches, and adjusting the main transformer tap, etc.

7.4.2 The centralized monitoring and control system of distributed energy storage shall be equipped with the function of active power adjustment and be able to issue active power control commands in accordance with the demands for power grid dispatching.

7.4.3 The centralized monitoring and control system of distributed energy storage shall be equipped with the function of reactive power adjustment, execute voltage adjustment strategies in accordance with the voltage of the grid connection point, and issue reactive power control

commands.

7.4.4 The centralized monitoring and control system of distributed energy storage should be equipped with the function of sequence control and cluster control.

7.4.5 The centralized monitoring and control system of distributed energy storage should be equipped with the function of responding to and dispatching emergency control commands, and be able to receive dispatching commands and issue remote charging and discharging commands.

7.5 Human-computer Interface

7.5.1 The real-time monitoring screen of the centralized monitoring and control system of distributed energy storage shall support plant station diagrams, single-line diagrams, network diagrams, geographical distribution diagrams, operating condition diagrams and communication network diagrams, etc.

7.5.2 The centralized monitoring and control system of distributed energy storage shall support the management and monitoring of the operating status of application software and communication networks and be equipped with the function of self-diagnosis.

7.5.3 The centralized monitoring and control system of distributed energy storage shall be equipped with the alarm function in the form of graphics, voice, text and printing, etc., and support functions, such as: alarm query, customized alarm levels, alarm statistical analysis, alarm confirmation and clearing, and sequence display of major events, etc.

7.5.4 The operation and control of the centralized monitoring and control system of distributed energy storage shall be able to realize the functions of manual setting, signboard operation, lock and unlocking operations, remote control and adjustment, and have corresponding authority control.

7.5.5 The centralized monitoring and control system of distributed energy storage shall be equipped with the functions of querying and accessing data, as well as the query function in the mode of combined conditions.

7.6 Communication

7.6.1 The centralized monitoring and control system of distributed energy storage shall be equipped with the function of communicating with the monitoring system of distributed energy storage power station or the collection terminal.

7.6.2 The centralized monitoring and control system of distributed energy storage should be equipped with the function of real-time communication with the power grid dispatching system.

7.6.3 The centralized monitoring and control system of distributed energy storage shall support DL/T 634.5104, DL/T 634.5101, Modbus and DL/T 860 (all parts) protocol communication.

7.7 Security Protection

accordance with the demands, and support data export and printing.

7.11 Database Management

7.11.1 The database management of the centralized monitoring and control system of distributed energy storage shall be equipped with the functions of database maintenance, database synchronization, offline file saving, database backup and database recovery, etc.

7.11.2 The database of the centralized monitoring and control system of distributed energy storage shall support providing a unified real-time or quasi-real-time data service interface to the outside world in accordance with visitor permissions and access types.

7.12 Permission Management

7.12.1 The user permission management of the centralized monitoring and control system of distributed energy storage shall grant personnel different permissions and permission validity periods in accordance with different job functions and nature of work, including hierarchical permission management, permission binding and permission configuration.

7.12.2 The user permissions of the centralized monitoring and control system of distributed energy storage shall adopt hierarchical management. User passwords can be set, and permissions can be assigned. In addition, based on the business demands, and in accordance with the involved content of business, it shall perform password restrictions.

7.12.3 All operators logging into the system shall be authorized, authenticated for identity and permissions, and use the specified system functions and scope of operations.

7.13 Equipment Management

7.13.1 Equipment management shall include ledger management, such as: item information, public connection point, grid connection point, energy storage converter parameters, installation capacity, item category, operation mode, and construction and operation information, etc. of the distributed energy storage system.

7.13.2 Equipment management shall be equipped with the functions of recording and performing statistics of the maintenance and failure times of the distributed energy storage system.

7.14 Network Publishing

The centralized monitoring and control system of distributed energy storage should be equipped with the functions of network publishing, such as: information release, browsing and downloading of relevant data of the distributed energy storage system.

7.15 Equipment Status Analysis

7.15.1 The centralized monitoring and control system of distributed energy storage should be equipped with the function of performing statistics and evaluation of the operation data, charge

and discharge times, depth of charge and discharge, and economic indictors of energy storage equipment.

7.15.2 The centralized monitoring and control system of distributed energy storage should be equipped with the function of analyzing and diagnosing the status of energy storage equipment.

7.15.3 The centralized monitoring and control system of distributed energy storage should be equipped with the function of intelligent operation analysis.

7.15.4 The centralized monitoring and control system of distributed energy storage should be equipped with the function of configuring operation, maintenance and overhaul strategies.

8 Performance Requirements

8.1 System Indicators

8.1.1 System availability

The availability indicator of the centralized monitoring and control system of distributed energy storage shall satisfy the following requirements:

a) Annual availability rate of system equipment: ≥ 99.9%;

b) Mean time between failures (MTBF) of system equipment: ≥ 20,000 h.

8.1.2 Computer resources

The computer resources of the centralized monitoring and control system of distributed energy storage shall satisfy the following requirements:

a) Average CPU load rate when the system is normal: ≤ 30%;

b) Average CPU load rate when the system fails: ≤ 70%;

c) Historical data retention period: ≥ 3 months;

d) Accident forwarding screen response time: < 2 s.

8.2 Performance Indicators

8.2.1 Telemetry

The telemetry performance indicator of the centralized monitoring and control system of distributed energy storage shall satisfy the following requirements:

a) Comprehensive error rate of telemetry: ≤ 1.5%;

b) The time for telemetry refresh to be transmitted to the master station: optical fiber

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