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Technical Specification for Monitoring and Control System of Microgrids

微电网监控系统技术规范

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Standardization Administration Committee of the People's Republic of China.

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1 Scope

This Standard specifies the technical requirements of monitoring and control system of microgrids, such as working environment, structure, configuration, system functions and performance indexes, etc.

This Standard is applicable to the construction, reconstruction and expansion of microgrids (voltage level: 35 kV and below).

2 Normative References

The following documents are indispensable to the application of this Standard. In terms of references with a specified date, only versions with a specified date are applicable to this Standard. The latest version (including all the modifications) of references without a specified date is also applicable to this Standard.

GB/T 2887 General Specification for Computer Field

GB/T 20270 Information Security Technology - Basis Security Techniques Requirements for Network

GB 50174 Code for Design of Data Centers

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

DL/T 634.5103 Tele-control Equipment and Systems - Part 5-103: Transmission Protocols - Section 103: Relay Protection Equipment Information Interface Supporting Standard

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

DL/T 860 (all the content) Communication Networks and Systems in Substations

DL/T 5136 Technical Code for Designing of Electrical Secondary Wiring in Fossil Fuel Power Plants and Substations

4.3 Microgrid monitoring and control system shall comply with stipulations of safety protection of power monitoring and control system.

4.4 Microgrid monitoring and control system shall adopt an open system and structure and be equipped with standard interfaces and satisfying expandability.

5 Working Environment and Conditions

5.1 Power Supply

5.1.1 Energy management system for microgrids (voltage level: 10 kV and above) shall adopt dual power-supply; energy management system for microgrids (voltage level: 380 V) shall adopt single power-supply.

5.1.2 Microgrid monitoring and control system shall be equipped with uninterrupted power supply (UPS) that can maintain normal system operation for ≥ 2 h.

5.2 Computer Room

5.2.1 Microgrid monitoring and control system shall be installed through group screens and deployed in the control room and computer room in accordance with its functional division.

5.2.2 The structure of various screens and the layout of screens under microgrid monitoring and control system shall comply with stipulations in DL/T 5136.

5.2.3 The computer room shall be equipped with waterproofing, fireproofing and accident lighting facilities; its setting shall comply with stipulations in GB/T 2887.

5.2.4 Isolation and lightning protection measures adopted in the computer room shall comply with stipulations in GB/T 2887.

5.2.5 Grounding design of the computer room shall comply with stipulations in GB 50174.

5.3 Field and Environment

5.3.1 Maximum relative humidity:

a) Daily average value: 95%.

b) Monthly average value: 90%.

5.3.2 Working environment and temperature:

a) Outdoor: -25 °C ~ 55 °C.

b) Indoor: -5 °C ~ 45 °C.

e) Statistics of the accuracy of remote control and adjustment;

f) Statistical analysis of voltage and current limit, power factor power quality qualification rate.

7.1.3 Microgrid monitoring and control system shall be equipped with the function of reasonably examining the acquired data and information, and initiating over-limit alarm, which includes, but is not limited to:

a) Examination of data integrity: automatically filter bad data and set up data quality labels;

b) Set up limits: support the adoption of different limits in different time slots;

c) Alarm: the definition, action, diversion and information storage of alarm, and frame invoking, etc.

7.1.4 Microgrid monitoring and control system shall be equipped with the function of storing the acquired data and information, which includes, but is not limited to:

a) Storage and management of raw data and application data by classification;

b) Storage of the sequence and operation record.

7.2 Database Management

7.2.1 Microgrid monitoring and control system shall be equipped with the function of database maintenance, synchronization, back-up and recovery, etc.

7.2.2 Microgrid monitoring and control system shall provide unified real-time or quasi-real-time data interfaces to external sources; implement access control in accordance with the limit of authority and classification.

7.3 Human-computer Interface

7.3.1 Microgrid monitoring and control system can include, but shall not be limited to:

a) Real-time monitoring frame shall support system main wiring diagram, network diagram, geographical diagram, operating-condition diagram and communication network diagram, etc. The mode of diagram demonstration includes tendency chart, histogram and pie chart, etc.

b) It shall support multi-screen display, graphical multi-window, step-less zoom, roaming, hauling and hierarchical display, etc.

7.3.2 Microgrid monitoring and control system shall be equipped with graphical modeling tool that can facilitate graphic library integration; network topology management tool. It shall also support customized equipment primitive and interval

7.7.2 There shall be two modes of control: automatic control and manual control. The level of control operation shall be on-the-spot monitoring and control, internal monitoring and control, and remote control from top to the bottom.

7.7.3 In terms of manual control of equipment breaking, microgrid monitoring and control system shall be equipped with the function of operation, monitoring and guarding. Guardians can implement monitoring and guarding in the local computer or other operators' stations.

7.7.4 In microgrid monitoring and control system, three steps shall be adopted in the breaking equipment: selection, proofreading and execution. The implementation shall be operated step by step.

7.8 Authority Management

7.8.1 In users' authority management under microgrid monitoring and control system, personnel shall be provided with different authorities and validity periods in accordance with different job duties and natures, including hierarchical authority management, authority binding and configuration.

7.8.2 In microgrid monitoring and control system, hierarchical management shall be implemented in users' authority. Password setting and authority allocation can be executed; password limitation can be executed in accordance with the content of business.

7.8.3 All the operators logging in microgrid monitoring and control system shall be authorized; identity and authority authentication shall be executed. Stipulated system functions and scope of operation shall be adopted in accordance with the limit of authority.

7.9 Microgrid Operating Mode Control

7.9.1 Microgrid monitoring and control system shall be equipped with the function of microgrid-connect/grid-disconnected switching; the function of issuing mode switching instructions to certain devices, such as distributed power and grid-connected interface device, etc.

7.9.2 In normal grid-connect/grid-disconnected switching, microgrid monitoring and control system shall provide two optional modes: power-off switching and smooth switching.

7.9.3 In case of malfunction of the microgrid, microgrid monitoring and control system shall automatically switch from grid-connected operating control mode to grid-disconnected mode.

7.9.4 When microgrid switches from grid-disconnected operation to grid-connected operation after the malfunction recovers, microgrid monitoring and control system shall

a) Relative error of current and voltage measurement: ≤ 0.2%.

b) Relative error of active and reactive measurement: ≤ 0.5%.

c) Error of grid frequency measurement: ≤ 0.01 Hz.

8.3 System Timeliness

The requirements of system timeliness include:

a) The delay time from telemetry dead zone to the display in operating workstation is: ≤ 2 s.

b) The delay time from remote signal displacement to the display in operating station is: ≤ 2 s.

c) The duration of controlling and adjusting command transmission (from pushing the execution button to output): ≤ 1 s.

d) Response time of whole-frame dispatching:

1) Real-time frame: ≤ 2 s.

2) Other frames: ≤ 3 s.

e) Real-time data refresh cycle: ≤ 3 s.

f) Sequence of event (SOE): ≤ 2 ms.

8.4 System Resources

8.4.1 The requirements of CPU average load rate of various workstations include:

a) Under normal condition (within any 30 min): ≤ 30%.

b) During microgrid failures (within 10 s): ≤ 70%.

8.4.2 The requirements of network load rate include:

a) Under normal condition (within any 30 min): ≤ 20%.

b) During microgrid failures (within 10 s): ≤ 40%.

8.4.3 The requirements of capacity include:

a) Analog quantity: ≥ 8,000 points.

b) Status quantity: ≥ 10,000 points.

c) Remote control: ≥ 500 points.

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