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**Technical Requirements for
Connecting Microgrid to Power System**

微电网接入电力系统技术规定

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuer of this document shall not be held responsible for identifying any or all such patent rights.

This Standard was proposed by and shall be under the jurisdiction of China Electricity Council.

The drafting organization of this Standard: China Electric Power Research Institute.

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Technical Requirements for Connecting Microgrid to Power System

1 Application Scope

This Standard specifies the general principles and technical requirements for connecting microgrid to power system.

This Standard applies to newly-built, rebuilt and extended grid-connected microgrid which is connected to the grid through the voltage level of 35 kV and below.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to this Standard.

GB 2894, *Safety Signs and Guideline for the Use*

GB/T 12325, *Power Quality – Deviation of Supply Voltage*

GB/T 12326, *Power Quality – Voltage Fluctuation and Flicker*

GB/T 14285, *Technical Code for Relaying Protection and Security Automatic Equipment*

GB/T 14549, *Quality of Electric Energy Supply – Harmonics in Public Supply Network*

GB/T 15543, *Power Quality – Three-phase Voltage*

GB/T 15945, *Power Quality – Frequency Deviation for Power System*

GB/T 17215.322, *Electricity Metering Equipment (A.C.) – Particular Requirements – Part 22: Static Meters for Active Energy (Classes 0.2 S and 0.5 S)*

GB/T 19862, *General Requirements for Monitoring Equipment of Power Quality*

GB/T 24337, *Power Quality – Interharmonics in Public Supply Network*

DL/T 448, *Technical Administrative Code of Electric Energy Metering*

DL/T 584, *Code for Setting of 3 kV~110 kV Relaying Protection Equipment*

DL/T 614, Multifunction Electricity Metering Equipment (A.C.)

DL/T 634.5101, *Telecontrol Equipment and Systems – Part 5-101: Transmission Protocols – Section 101: 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 645, *Multi-function Watt-hour Meter Communication Protocol*

NB/T 32015, *Technical Specification for Distributed Resources Connected to Distribution Network*

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1

distributed resources

A power supply which is connected through the voltage class of 35 kV and below, located near users and mainly for local consumption, including distributed electricity generation and energy storage.

3.2

microgrid

A small power supply and consumption system which consists of distributed electric power generation, power consumption load, monitoring, protection and automation equipment and others (including energy storage equipment if necessary) and is capable of achieving internal balance of electric power and energy. Microgrids are classified into grid-connected microgrids and independent microgrids.

3.3

grid-connected microgrid

The microgrid which is capable of operating in connection with external power grids or operating independently and is mainly for grid-connected operation.

3.4

point of interconnection

For the microgrid having a booster station, it refers to bus bar or node on the high-voltage side of the booster station. For the microgrid without a booster station, it refers

$110\%U_N \leq U < 135\%U_N$	Not exceeding 2.0 s
$135\%U_N \leq U$	Not exceeding 0.2 s
NOTE U_N is the grid rated voltage of the point of common coupling of the microgrid.	

5.6.4 The microgrid connected through the voltage class of 380 kV shall be capable of switching to the independent mode within 0.2 s when the frequency of the point of common coupling exceeds the operation range of 49.5 Hz ~ 50.2 Hz; for the microgrid connected through the voltage class of 10(6) kV ~ 35 kV, the frequency protection shall be as specified in 5.4.2 of this Standard.

5.6.5 For the microgrid connected through the voltage class of 10(6) kV ~ 35 kV, the interconnection line may be provided with two-section current protection. When the requirements for reliability, selectivity, sensitivity and quickness cannot be met, it is preferably to use distance protection or optical fibre current differential protection.

5.6.6 The microgrid shall be capable of detecting islands rapidly and switching to the independent operation mode immediately. The mode switching shall not malfunction and lower the load power supply reliability.

5.7 Communication and information

5.7.1 The microgrid connected through the voltage class of 10(6) kV ~ 35 kV shall be capable of data communication with the grid dispatcher, acquiring the electrical operation conditions of the microgrid, uploading to the grid dispatcher and receiving the control and adjustment instructions of the grid dispatcher. The microgrid connected through the voltage class of 380 V shall be capable of monitoring and recording the operation conditions.

5.7.2 The communication mode and information between the microgrid connected through the voltage class of 10(6) kV ~ 35 kV and the grid dispatcher shall be as specified in relevant standards, including remote measurement, remote signaling, remote control and remote adjustment signals and the method for providing signals and real-time requirements; the communication protocols based on DL/T 634.5101 and DL/T 634.5104. For the microgrid connected through the voltage class of 380 V, the wireless or optical fibre public network communication method may be used, but the information security protection measures shall be taken.

5.7.3 The microgrid connected through the voltage class of 380 V shall be capable of uploading energy.

5.7.4 For the microgrid connected through the voltage class of 10(6) kV ~ 35 kV, under normal operation circumstances, the signals provided by the microgrid to the grid dispatcher shall at least include:

- a) the voltage and current of the point of common coupling of the microgrid;
- b) the active power, reactive power, energy and others exchanged between the

7 Switching of Operation Mode

7.1 Switching of independent to grid-connected operation mode

7.1.1 When the frequency and voltage on the grid side at the point of common coupling are as specified in GB/T 15945 and GB/T 12325, then the microgrid may start the switching to grid-connected mode.

7.1.2 Before the microgrid is switched from the independent to the grid-connected mode, synchronization control shall be carried out; when the voltage, frequency and phase angle of the microgrid and point of interconnection meet the synchronization conditions, then the switching to the grid-connected mode may be carried out.

7.1.3 For the microgrid connected through the voltage class of 10(6) kV ~ 35 Kv, the switching to the grid-connected mode shall be carried out in accordance with the instructions from the grid dispatcher during the interconnection.

7.1.4 When the microgrid is switched from the independent operation to the grid-connected operation, it shall not cause that the power quality at the point of common coupling exceeds the range specified.

7.1.5 When the microgrid is switched from the independent to the grid-connected mode, it is preferably to use the switching method without power outage and the switching transient process time is preferably not greater than 20 ms.

7.2 Switching of grid-connected to independent operation mode

7.2.1 The switching of the grid-connected operation to the independent operation of the microgrid includes planned switching and unplanned switching caused by external disturbances.

7.2.2 For the microgrid connected through the voltage class of 10(6) kV ~ 35 kV, planned switching shall be carried out in accordance with the instructions of the grid dispatcher.

7.2.3 When the voltage, frequency or power quality of the point of common coupling of the microgrid exceeds the range specified in Sub-article 5.4 of this Standard, the microgrid may be switched to the independent operation mode.

7.2.4 When the microgrid is switched from the grid-connected to the independent mode, it is preferably to use the switching method without power outage and the switching transient process time is preferably not greater than 20 ms.

8 Grid-connected Testing

8.1 The requirements for testing shall include the following content:

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