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**Specification of operation and controlling for
distributed resources connected to power grid**

分布式电源并网运行控制规范

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Foreword

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

Please note that some of the contents of this document may involve patents. The issuer of this document does not assume responsibility for the identification of these patents.

This standard was proposed by AND shall be under the jurisdiction of the China Electricity Council.

The drafting organizations of this standard: State Grid Corporation, China Electric Power Research Institute, State Grid Zhejiang Electric Power Company, State Grid Jiangsu Electric Power Company.

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Specification of operation and controlling for distributed resources connected to power grid

1 Scope

This standard specifies the operation and controlling requirements for the distributed resources connected to power grid in such aspects as on-grid/off-grid control, active power control, reactive voltage regulation, power grid abnormal response, power quality monitoring, communication and automation, relay protection and safety automatic device, and lightning protection and grounding.

This standard is suitable for the operation and controlling of the newly built, reconstructed, and extended distributed resources which are connected to the 35 kV and below voltage level power grid.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this Standard.

GB/T 12325 Power quality – Deviation of supply voltage

GB/T 12326 Power quality – Power fluctuation and flicker

GB 14050 Types and safety technical requirements of system earthing

GB/T 14549 Quality of electric energy supply – Harmonics in public supply network

GB/T 15945 Power quality – Frequency deviation for power system

GB 26859 Safety code of electric power industry – Part of electric lines

GB 26860 Safety code of electric power industry – Electric part of power plants and transformers

GB 50057 Design code for protection of structures against lightning

GB/T 50064 Code for design of overvoltage protection and insulation coordination for AC electrical installations

GB 50065 Code for grounding design of AC electrical installations

GB/T 33593-2017 Technical requirements for grid connection of distributed resources

NB/T 33011 Technical specification for distributed resources connected to power grid

NB/T 33015 Technical guideline for electrochemical energy storage system interconnecting with distribution network

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Point of interconnection

As for the distributed resources which are connected to the grid through the transformer, it refers to the bus or node at the power grid side of the transformer. As for the distributed resources which are connected to the power grid not through the transformer, it refers to the output collection point of the distributed resources.

3.2

Point of common coupling

It refers to the connection through which the user accesses to the public power grid.

3.3

Unintentional islanding

It refers to the unplanned and uncontrolled occurrence of distributed power islanding.

Note: The distributed resource islanding phenomenon refers to the self-independent operation which is composed of the distributed resources, local loads, and monitoring and controlling device which is independent of the public power grid.

4 Basic requirements

4.1 The distributed resources connected to the power grid shall have the testing report which is issued by the unit or department having corresponding qualifications, the testing items and testing methods shall comply with the provisions of NB/T 33011, AND the test results shall comply with the requirements of GB/T 33593-2017.

4.2 Before the distributed resources connected into the power grid, its operation management party and the power grid enterprise shall, in accordance with the principles of the unified scheduling and leveled

7.6 As for the distributed resources connected to the 10 (6) kV ~ 35 kV user internal power grid AND transmitted electricity to the public power grid, it is preferable for it to have the reactive voltage control function. Under the conditions that the distributed resource satisfies the reactive output range and the public connection point power factor limits, the power factor and voltage at its power grid connection point are controlled; meanwhile, it is preferable to accept the reactive order from the power grid scheduling institute, AND its regulation method, reference voltage, voltage difference regulation rate, and power factor, etc., shall follow the requirements of the scheduling agreement.

7.7 As for the distributed resources connected to the 10 (6) kV ~ 35 kV public power grid, it shall participate in the power grid reactive voltage regulation within its reactive output range, AND it shall have the function of accepting the reactive voltage control order from the power grid scheduling institute. Under the conditions of satisfying with the distributed resource reactive output range AND that the voltage at the power grid connection point is qualified, the power grid scheduling unit shall perform the reactive voltage control against the distributed resources in accordance with the scheduling agreement.

8 Power grid abnormal response

8.1 As for the distributed resource directly connected to the public power grid through the 10 (6) kV voltage level AND the distributed resource connected to the power grid through the 35 kV voltage level, it shall have the low voltage ride through capability, AND the low voltage ride through amplitude and time shall comply with the requirements of GB/T 33593 -2017.

8.2 As for the distributed resource directly connected to the public power grid through the 10 (6) kV voltage level AND the distributed resource connected to power grid through the 35 kV voltage level, when the power grid connection point voltage U is above 110% of the rated voltage, it shall operate in the following methods:

- a) $110\% U_N < U < 135\% U_N$, the distributed resource shall be disconnected from the power grid within 2 s;
- b) $135\% U_N \leq U$, the distributed resource shall be disconnected from the power grid within 0.2 s.

8.3 As for the distributed resource connected to the 220/380 V power grid AND the distributed resource connected to the user side through the 10 (6) kV voltage level, when the power grid connection point voltage U is abnormal, it shall operate in accordance with the methods as listed in Table 1; AND in case of abnormality of any phase of voltage in the three-phase system, it shall also operate in accordance with this method.

Table 1 -- Voltage abnormal response requirements

Voltage at power grid connection point	Requirements
$U < 50\% U_N$	The distributed resource shall be disconnected from the power

upload it regularly; as for the distributed resources connected to the 220/380V power grid, it shall record the power quality indicator statistical value every 10 min, AND it shall store at least 1 month of power quality data.

9.2 After the distributed resource connected to the power grid, when the power quality at the public connection point does not comply with the requirements of GB/T 33593-2017, it shall produce alarm information; as for the distributed resource connected to the 10 (6) kV ~ 35 kV power grid, its operation management party shall report the alarm information to management department of the power grid to which it is connected; AND as for the distributed resources connected to the 220/380 V power grid, its operation management party shall record the alarm information, for the reference of the management department of the power grid to which it is connected.

9.3 When the power quality at the public connection point fails to reach to the requirements of GB/T 33593-2017 due to the connection of distributed resource to the power grid, it shall take measures to improve the power quality. If the power quality still fails to comply with requirements after taking improvement measures, the distributed resource shall be disconnected from the power grid, AND it can only be connected to the power grid again after its power quality reaches to requirements.

10 Communication and automation

10.1 As for the distributed resource connected to the 10 (6) kV ~ 35 kV power grid, its communication method and information transmission with the power grid scheduling institute shall comply with the requirements of GB/T 33593-2017, AND shall comply with the security protection requirements of the power monitoring system.

10.2 As for the distributed resources connected to the power grid, if using the dedicated optical fiber network for communication, the transmission rate shall be not less than 19200 b/s AND the bit error rate shall be better than 1×10^{-9} ; if using the other methods, the transmission rate shall be less than 2400 b/s AND the bit error rate shall be better than 1×10^{-5} .

10.3 As for the distributed resource connected to the 10 (6) kV ~ 35 kV power grid, its communications and automation backup power supply shall ensure that the communication and automation equipment can run at least 2 h in case of loss of external power supply.

10.4 As for the distributed resource connected to the 10 (6) kV ~ 35 kV power grid, the basic information which shall be provided to the power grid scheduling institute shall include but not limit to the following:

- a) Electrical analog: the voltage, current, active power, reactive power, power factor, and frequency at the power grid connection point;
- b) Quantity of state: the power grid connection on/off equipment state, fault information, distributed resource remote terminal state signal, and

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