



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 36548-2024

Replacing GB/T 36548-2018

**Test code for electrochemical energy storage stations
connected to the power grid**

电化学储能电站接入电网测试规程

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1 Scope

GB/T 36548-2024 is the test code for electrochemical energy storage stations connected to the power grid, the companion to the grid connection requirements of GB/T 36547. A grid code is only as good as the tests that verify compliance with it, and for a battery station those tests are demanding because they have to be done on a live installation connected to a real network. This standard specifies them: the test conditions and the instrumentation and its accuracy, the tests of the active and reactive power capability and of the power factor range, the active power control and ramp rate tests, the frequency and voltage regulation tests including primary frequency response, the low and high voltage ride-through tests and the test equipment required for them, the power quality

measurements, the protection and anti-islanding tests, the charge and discharge response and efficiency tests, the communication and dispatch signal verification, and the evaluation of the results and the test report. The 2024 edition replaces GB/T 36548-2018. For a station owner, an EPC contractor or a grid company in China, this is the commissioning protocol.

This document describes the test methods for power control, charge and discharge time, rated energy, rated energy efficiency, power quality, primary frequency modulation, inertia response, operation adaptability, fault ride-through, overload capability, automatic generation control (AGC), automatic voltage control (AVC) and emergency power support, etc. of electrochemical energy storage station (hereinafter referred to as "energy storage station") connected to power grid, as well as the requirements for the test conditions, and test instruments and equipment, etc. This document is applicable to the commissioning, grid connection detection, operation and maintenance of newly constructed, renovated and expanded electrochemical energy storage stations connected to the power grid through voltage levels of 10 (6) kV and above. The energy storage stations connected to the power grid through other voltage levels may take this as a reference in implementation.

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 12325 Power Quality - Deviation of Supply Voltage

GB/T 12326 Power Quality - Voltage Fluctuation and Flicker

GB/T 14549 Quality of Electric Energy Supply - Harmonics in Public Supply Network

GB/T 15543 Power Quality - Three-phase Voltage Unbalance

GB/T 15945 Power Quality - Frequency Deviation for Power System

GB/T 20840 (all parts) Instrument Transformers

GB/T 24337 Power Quality - Interharmonics in Public Supply Network

GB/T 36547 Technical Rule for Electrochemical Energy Storage System Connected to Power Grid

GB/T 42288 Safety Code of Electrochemical Energy Storage Station

GB/T 43526 Technical Requirements for Connecting User-side Electrochemical Energy Storage System to Distribution Network
DL/T 2528 Basic Terminology of Electrical Energy Storage

3 Terms and Definitions

The terms and definitions defined in GB/T 36547 and DL/T 2528 are applicable to this document.

4 Overall Requirements

4.1 The test results of the energy storage station connected to the power grid shall be determined in accordance with the requirements of GB/T 36547 and GB/T 43526.

4.2 Before the energy storage station is connected to the power grid for testing, the technical information of the energy storage station shall be collected; a test scheme shall be prepared and submitted to the power grid dispatching institution for approval within 30 days before the test, then, it can be implemented. The technical information collected before the energy storage station is connected to the power grid for testing shall comply with the provisions of Appendix A.

4.3 Before the energy storage station is connected to the power grid for testing, an emergency plan shall be prepared, and safety measures shall be formulated. The safety of the test work shall comply with the provisions of GB/T 42288, and temporary fire-fighting facilities and emergency supplies shall be equipped.

4.9 The energy storage station shall select the energy storage station or energy storage system as the test object in accordance with the grid conditions of the access point and the requirements of the power grid dispatching institution. For test projects carried out with an energy storage system as the test object, the test results shall be evaluated in combination with energy storage station model simulations. See Appendix B for the wiring of energy storage station and energy storage system connected to the grid for testing.

4.10 The test point for the energy storage station connected to the power grid shall select a grid connection point.

4.11 If an abnormality occurs during the test of the energy storage station connected to the power grid, the test shall be immediately stopped, and the abnormal information shall be recorded. After the processing is completed, the test shall be re-performed.

4.12 When renovation (expansion) or equipment modification, software upgrade, network-related parameter modification and control logic change of the energy storage station may affect the performance of grid connection of the energy storage station, such as. fault ride-through, power control, rated energy, operation adaptability and power quality, etc., the affected items shall be re-tested within 3 months of completion of the replacement or update.

5 Test Conditions

5.1 During the test, the main equipment of the energy storage station shall be in normal working conditions.

5.2 The harmonic voltage of the power grid, to which, the energy storage station is connected, shall satisfy the requirements of GB/T 14549; the inter-harmonic voltage shall satisfy the requirements of GB/T 24337; the grid voltage deviation shall satisfy the requirements of GB/T 12325; the voltage fluctuation and flicker values shall satisfy the requirements of GB/T 12326; the three-phase voltage unbalance shall satisfy the requirements of GB/T 15543; the grid frequency deviation shall satisfy the requirements of GB/T 15945.

6 Test Instruments and Equipment

6.1 Test Instruments The test instruments shall satisfy the following requirements.

6.2 Test Equipment

6.2.1 Power grid simulation device The power grid simulation device shall satisfy the following requirements.

7.1 Active Power Control

7.1.1 Charging state The active power test of the energy storage station in the charging state is carried out in accordance with the following steps.

7.1.2 Discharging state The active power test of the energy storage station in the discharging state is carried out in accordance with the following steps.

7.2 Reactive Power Control

7.2.1 Charging state The reactive power control test of the energy storage station in the charging state is carried out in accordance with the following steps.

- a) The data acquisition device is connected to the voltage transformer (PT) and current transformer (CT) at the test point. The specific wiring is shown in Figure B.1;
- b) Issue active power control instructions through the monitoring system and set the energy storage station to charge at PN;
- c) Issue reactive power control instructions through the monitoring system and set the inductive reactive power of the energy storage station to start from 0, and increase step by step with an amplitude of 10% PN, until the inductive reactive power of the energy storage station reaches the maximum, then, stop increasing the inductive reactive power, and continuously operate for 30 seconds at each reactive power control point;
- d) Utilize the data acquisition device to record the voltage and current of each reactive Active Power Time/s power control point, in a period of 20 ms, calculate the average value