



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

GB/T 51048-2025

Standard for design of electrochemical energy storage station

电化学储能电站设计标准

Issued on: December 10, 2025

Implemented on: April 1, 2026

**Issued by: Ministry of Housing and Urban-Rural Development of the PRC,
jointly with the State Administration for Market Regulation**

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1 Scope

GB/T 51048 is the Chinese national design standard for electrochemical energy storage stations: grid-scale battery installations. China is building more of these than the rest of the world combined, and this is the document a design institute works to. It covers the whole design: site selection; the general plan and layout of the station area; the grid connection system, including grid connection requirements, relay protection and safety automatic devices, dispatch automation and communication; the energy storage system itself, with the battery, the battery management system, the power conversion system and their layout; the electrical design, from the main connection through equipment selection and layout, station service supply, overvoltage protection and earthing, cabling, monitoring and control, the DC and UPS systems and video and environmental monitoring; buildings and structures; heating, ventilation and air conditioning; water supply and drainage; a long clause on fire protection; and energy saving, environmental protection and soil and water conservation. The 2025 edition takes effect on 1 April 2026. For anyone designing, financing or permitting a battery storage station in China, this is the governing text.

1.0.1 This Standard is formulated to standardize the design of electrochemical energy storage stations, ensuring safety, reliability, energy conservation, environmental protection, advanced technology, and economic rationality.

1.0.2 This Standard applies to the design of newly built, expanded, and renovated stationary electrochemical energy storage stations with a rated power of 500 kW and above and a rated energy of 500 kW·h and above, using lithium-ion batteries, sodium-ion batteries, flow batteries, lead-acid/lead-carbon batteries, water electrolysis hydrogen production/fuel cells as energy storage carriers.

1.0.3 The design scheme for electrochemical energy storage stations shall be based on a holistic approach, taking into account engineering requirements, power development plans, and grid conditions, and determined through technical and economic comparisons.

1.0.4 In addition to complying with this Standard, the design of electrochemical energy storage stations shall also comply with the provisions of relevant current national standards.

2 Terms

2.0.1 electrical energy storage equipment A combination of devices in the energy storage system, capable of storing, converting and releasing electrical energy.

2.0.2 battery cluster A battery assembly consisting of battery modules connected in series, parallel, or series- parallel configurations.

2.0.3 electrochemical energy storage unit A minimal combination of devices capable of independently storing, converting, and releasing electrical energy. It typically consists of electrical energy storage equipment, energy storage converters, transformers, and auxiliary facilities.

2.0.4 electrochemical energy storage system A device system consisting of one or more electrochemical energy storage units, capable of storing, converting, and releasing electrical energy.

2.0.5 electrochemical energy storage station Energy storage power stations that use electrochemical energy storage media for electrical energy storage.

2.0.6 installed capacity of energy storage station A parameter used to identify the charging and discharging capabilities of energy storage power stations, including rated charging power/rated charging energy and rated discharging power/rated discharging energy. The units are kW/kW · h or MW/MW · h.

2.0.7 rated charging power of energy storage station The guaranteed value of active power that the energy storage power station can sustainably and stably absorb from the power system throughout its entire life cycle.

2.0.8 rated discharging power of energy storage station The guaranteed active power output to the power system that the energy storage power station can sustainably and stably meet throughout its entire life cycle.

2.0.9 rated charging energy capacity of energy storage station The rated input energy of an energy storage power station is the amount of electrical energy it can continuously and stably absorb from the power system at the grid connection point using its rated charging power throughout its entire lifespan. It is the product of the rated charging power and the nominal charging time, and is also known as the rated input energy of the energy storage power station.

2.0.10 rated discharging energy capacity of energy storage station The rated output energy of an energy storage power station is the electrical energy that it can sustainably and stably output to the power system at the grid connection point with its rated discharge power throughout its entire life cycle. It is the product of the rated discharge power and the nominal discharge time, and is also known as the rated output energy of the energy storage power station.

2.0.11 battery room A room in the energy storage power station building specifically used for arranging energy storage batteries.

3 Basic requirements

3.0.1 The design of electrochemical energy storage stations shall take into account factors such as the development level of electrochemical energy storage technology, application scenarios, planning, construction conditions, land availability, fire and rescue capabilities, and building conditions. It shall meet the requirements of safety and reliability, economic efficiency, energy conservation and environmental protection, and ease of installation and maintenance.

3.0.2 The rated installed capacity of an electrochemical energy storage station shall be determined based on the application scenarios of power system peak shaving, frequency regulation, emergency power support, voltage control, tracking of planned curves, smoothing of power output, and backup power supply, combined with the site construction and grid connection conditions, and through technical and economic comparison.

3.0.3 The rated power of an electrochemical energy storage station shall be determined based on factors such as the efficiency of the energy storage system, the efficiency of the power distribution equipment, cable losses, and the power consumption of the station's auxiliary power supply facilities.

3.0.4 The rated charging and discharging energy of an electrochemical energy storage station shall be determined based on factors such as battery charging and discharging characteristics, battery system energy efficiency, battery energy decay characteristics, energy storage converter efficiency, transformer efficiency, total station cable loss, power consumption of auxiliary power supply facilities for the energy storage system, and station power loss.

3.0.5 The types of electrochemical energy storage stations shall be classified according to the rated discharging power of energy storage station, and shall comply with the provisions of Table 3.0.5. Table 3.0.5 -- Types of electrochemical energy storage stations

4 Site selection

4.0.1 The site selection for electrochemical energy storage stations shall be based on factors such as the network structure, load distribution, target users, and application location in the power system planning and design, as well as land use planning, land acquisition and resettlement, etc. Conduct a technical and economic comparison to determine.

4.0.2 Electrochemical energy storage stations shall ideally be located independently. When serving power plants or substations, they can be located in conjunction with them.