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**General technical requirements for electrochemical energy
storage system of power system**

电力系统电化学储能系统通用技术条件

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1 Scope

This document specifies the technical requirements for the working and storage environment conditions, power control, operational adaptability, energy conversion efficiency, fault ride-through, primary frequency modulation, inertia response, black start, power quality, etc. of the electrochemical energy storage system of electric power system, as well as the technical requirements for energy storage equipment such as lithium-ion battery, flow battery, lead-acid/lead-carbon battery, water electrolysis hydrogen generation/fuel cell, battery management system, power conversion system, monitoring and control system, protection, metering, and auxiliary system.

This document applies to the design, manufacture, testing, inspection, operation, maintenance and overhaul of electrochemical energy storage system of power system that uses lithium-ion batteries, flow batteries, lead-acid/lead-carbon batteries, sodium-ion batteries, and water electrolysis hydrogen generation/fuel cells as energy storage carriers.

2 Normative references

GB 2894

GB/T 12325

GB/T 12326

GB 14050

GB/T 14285

GB/T 14549

GB/T 15543

5.1.1 The electrochemical energy storage system mainly includes energy storage battery,

battery management system, power conversion system, monitoring and control system, relay protection and safety automatic devices, metering system and related auxiliary system and other equipment.

5.1.2 Under normal working conditions, the charge and discharge energy and power of

the electrochemical energy storage system shall not be lower than the rated charge and discharge energy and rated power; the system shall have one or more application functions of system peak regulation, frequency regulation, emergency power support, voltage control, tracking plan curve, smooth power output, voltage sag support, and backup power supply.

5.1.3 The voltage level of the electrochemical energy storage system connected to the

power grid shall be determined after economic comparison based on the system's rated installed capacity, application functions, and the grid structure of the access point.

5.1.4 The electrochemical energy storage system connected to the grid shall meet the

relevant requirements of GB 38755 and GB/T 31464.

5.1.5 The electrochemical energy storage system shall be able to receive and execute

remote or local power control instructions and shall have four-quadrant power control function.

5.1.6 The grid-related protection configuration and setting of the electrochemical

energy storage system shall be coordinated with the protection of the connected power grid.

5.1.7 The information security protection of the electrochemical energy storage system

connected to the dispatching automation system shall comply with the provisions of GB/T 36572.

5.1.8 The grounding method of the electrochemical energy storage system shall

be

compatible with the grounding method of the connected power grid; lightning protection and grounding shall comply with the relevant provisions of GB 14050, GB 50057 and GB/T 50065.

5.1.9 The electrochemical energy storage system connected to the grid at a voltage level of 10 kV and above shall establish electromagnetic transient, electromechanical transient and medium- and long-term dynamic simulation models in accordance with the requirements of GB/T 42716.

5.2.1.1 When the electrochemical energy storage system responds to the local active

power control command, the charge/discharge response time shall not exceed 500 ms, the charge/discharge adjustment time shall not exceed 2 s, the charge-to-discharge conversion time and the discharge-to-charge conversion time shall not exceed 500 ms, and the active power control deviation shall not exceed $\pm 1\%$ of the rated power.

5.2.1.2 Electrochemical energy storage systems connected to the grid at a voltage level

of 10 kV and above shall have the ability to respond to automatic generation control (AGC) instructions, and the power regulation rate and regulation accuracy shall meet the relevant regulations of the power grid dispatching agency.

5.2.1.3 Electrochemical energy storage systems connected to the grid at a voltage level

of 10 kV or above shall have the capability of emergency power support and shall reach the maximum dischargeable or rechargeable power within 200 ms.

5.2.1.4 For electrochemical energy storage systems participating in the electricity

market, the control method, response capability and response performance shall meet the requirements of electricity market rules.

5.2.2.1 The electrochemical energy storage system shall have control modes for power

factor, reactive power and voltage control, and be capable of online switching of control modes.

5.2.2.2 The power factor of the electrochemical energy storage system shall be

continuously adjustable within the range of 0.9 (leading) ~ 0.9 (lagging).

5.2.2.3 Electrochemical energy storage systems connected to the grid at voltage levels

of 10 kV and above shall have the ability to respond to automatic voltage control (AVC) instructions and automatically adjust the reactive power of the electrochemical energy storage system. The adjustment rate and control accuracy shall meet the relevant regulations of the grid dispatching agency.

6.1.4 The operating environment conditions such as temperature and relative humidity

of each compartment of the electrochemical energy storage system shall meet the technical requirements of the equipment and facilities.

6.1.5 The selection and laying of AC and DC cables for connecting electrochemical

energy storage systems shall meet the requirements of GB 50217.

6.1.6 Prohibition, warning, instruction, reminder and other markings shall be placed in

obvious locations on electrochemical energy storage equipment and facilities. The marking style shall comply with the relevant provisions of GB 2894.

6.2 Lithium-ion battery

The technical requirements for lithium-ion batteries under the specified test methods, such as appearance, size and quality, electrical properties, environmental adaptability, durability, safety performance, as well as coding, normal working environment, inspection rules, marking, packaging, transportation and storage, shall meet the relevant requirements of GB/T 36276.

6.3 Flow battery

The appearance, rated watt-hour capacity, rated power, rated energy efficiency, capacity retention capability, low-temperature storage performance, high-temperature storage performance, over-charge protection, over-discharge protection, charge characteristic curve, discharge characteristic curve, flame retardant performance, hydrogen concentration, insulation resistance, etc. of the all-vanadium liquid flow battery system under the specified test methods shall meet the relevant requirements of GB/T 32509.

6.4 Lead-carbon battery