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**GB/T 42716-2023**

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**Guide for modeling of electrochemical energy storage power  
station**

电化学储能电站建模导则

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### Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

### 1 Scope

GB/T 42716-2023 covers how an electrochemical energy storage station is represented in power system simulation, giving a model per class of study rather than one model for every purpose. The overall requirements fix what any such model has to reproduce - the electrical characteristics of the station, the energy state of the batteries, and the charging and discharging behaviour. Four model classes follow: the load flow calculation model, built to follow the topology of the primary system inside the station and taking in both the storage system and the in-station power collection network; the electromagnetic simulation model, for dynamic behaviour on time scales from microseconds to seconds; the electromechanical transient simulation model; and the mid- to long-term dynamic simulation model. Informative annexes give a typical structure for the station model and an

electromechanical transient model of the storage battery itself. A grid planner studying stability, fault behaviour or dispatch sees a storage station only through the model handed over with it, and a model that ignores state of charge or the limits on charging and discharging returns a plant that behaves on screen as it never would on the day, hiding the case the study was run to find. Written for storage station developers, grid planning and simulation departments, and the equipment suppliers who deliver model parameters.

This document specifies the technical requirements for the electrochemical energy storage station modeling for power system load flow calculation, electromagnetic transient, electromechanical transient and mid-long term dynamic simulation.

This document is applicable to electrochemical energy storage power stations connected to the

power grid with a voltage level of 10(6) kV and above. Other electrochemical energy storage

power stations may refer to it for 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 38755 Code on Security and Stability for Power System

GB/T 40581 Calculation Specification for Power System Security and Stability

DL/T 2528 Basic Terminology of Electrical Energy Storage

## 3 Terms and Definitions

What is defined in DL/T 2528, and the following terms and definitions are applicable to this document.

### 3.1 electrochemical energy storage station model

Electrochemical energy storage station model refers to a simulation model of electrochemical

energy storage power station for power system load flow calculation, and the calculation and

analysis of electromagnetic transient, electromechanical transient and mid-long term dynamic

process.

NOTE: generally, it includes one or multiple sets of electromechanical energy storage system

model, electrochemical energy storage station control model and in-station power collection and boosting system model.

### 3.9 mid-long term dynamic simulation model

Mid-long term dynamic simulation model refers to a model used for the simulation of the long-

term dynamic process in the power system, which mainly reflects the dynamic characteristics

of each component of the power system from tens of seconds to tens of minutes.

## 4 Overall Requirements

4.1 The electrochemical energy storage station model shall be able to reflect the electrical characteristics, battery energy state, and charging and discharging characteristics of the electrochemical energy storage power station, and satisfy the requirements for power system

simulation analysis and calculation specified in GB 38755 and GB/T 40581.

4.2 The electrochemical energy storage station model shall be constructed in accordance with

the actual electrical structure of the power station, and include one or multiple sets of electrochemical energy storage system model, electrochemical energy storage station control

model and in-station power collection and boosting system model. See Appendix A for the typical structure of the electrochemical energy storage station model.

4.3 For multiple electrochemical energy storage systems in the station consisting of energy storage batteries and converters of the same specification and model, and the same topological

structure, they can be equivalent to the same electrochemical energy storage system for modeling. The electrochemical energy storage systems with different specifications, models and topological structures should be respectively modeled. When the mode of equivalent modeling is adopted, influencing factors, for example, the impedance of the converging circuits

should be considered.

4.4 The electrochemical energy storage station model should adopt measured parameters. When

the measured parameters cannot be obtained, parameter identification shall be performed based

on exit-factory parameters and experimental curves or digital-analog hybrid simulation models.

4.5 The electrochemical energy storage station model shall be subject to simulation tests in accordance with the actual working conditions, so as to verify the validity of the model.

## 5 Load Flow Calculation Model

5.1 The load flow calculation model of the electrochemical energy storage power station shall

be constructed in accordance with the topological structure of the primary system in the station,

and include electrochemical energy storage system model and in-station power collection and

boosting system model, etc. See Appendix B for the model structure.

5.2 The electrochemical energy storage system should set the type of load flow calculation nodes in accordance with the control mode and the demands for load flow calculation, and include the node types of constant active and reactive power (PQ node), and constant active

voltage (PV node), etc.

5.3 The parameters of the load flow calculation model of the electrochemical energy storage

station shall include the active power and reactive power limits of each electrochemical energy