SOLAR PRO.

Primary frequency regulation of independent energy storage power station

What is primary frequency regulation (PFR)?
Primary frequency regulation (PFR) is a crucial operating condition for Power System Stabilizers (PSPs)to achieve frequency modulation. Its effectiveness is significant to the stability of power system frequency.

Are PSPS effective in regulating system frequency?
The effectiveness of PSPS in regulating system frequency is verified in actual generation systems such as hydro-wind [8],hydro-photovoltaic [9],and hydro-wind-solar hybrid power systems [10]. The flexibility and reliability of PSPS in this regard are also confirmed.

How are power regulation performance and operation stability measured?
To measure the power regulation performance and operation stability of a variable,four indicators were introduced: standard deviation of power difference and power delay for power regulation performance,and settling time and overshoot of frequency for frequency stability.

What are the advantages of F-vpsp in rapid and stable frequency regulation?
The advantages of F-VPSP in rapid and stable frequency regulationare revealed in Figure 8 b. As Tw increases from 2.7 s to 3.3 s,the settling time increases from 15.4 s to 27.3 s and the maximum of frequency deviation rises from 0.143 Hz to 0.361 Hz.

What is the maximum frequency deviation for F-vpsp?
The maximum frequency deviation for F-VPSP is 0.361 Hz. Although F-VPSP has superior primary frequency regulation performance,similar oscillation is observed in the rotational speed of a pump-turbine in VSU,with an amplitude of 0.032 pu and frequency of 0.04 Hz.

Does dfim sensitivity index affect PFR performance of F-vpsp system?
The sensitivity index of the DFIM frequency controller is the highest for both indicators,indicating that VSU (Variable Speed Unit) is more crucial for the PFR performance of F-VPSP (Flexible-Variable Power System with Supervisory Control) system. The effects of water inertia and pump-turbine parameters on regulation performance are more noticeable,while their impact on system stability is minimal.

Capacity configuration is an important aspect of BESS applications. [3] summarized the status quo of BESS participating in power grid frequency regulation, and pointed out the idea for BESS capacity allocation and economic evaluation, that is based on the capacity configuration results to analyze the economic value of energy storage in the field of auxiliary ...

An preventive adjustment scheme is proposed to dynamically determine the primary frequency response

parameters (PFRP) of energy storage system (ESS), like deadband and droop slope, in order to further exploit the capability of ESS in improving post-disturbance frequency performance for power systems with high renewable penetration.

1 ??· The large-scale development of battery energy storage systems (BESS) has enhanced grid flexibility in power systems. From the perspective of power system planners, it is essential ...

In this paper, the primary task is to conduct a comprehensive assessment for PFR performance of VSPSPs in isolated power systems. Initially, the ...

New energy storage methods based on electrochemistry can not only participate in peak shaving of the power grid but also provide inertia and emergency power support. It is necessary to analyze the planning problem of ...

In this paper, an adaptive control strategy for primary frequency regulation of the energy storage system (ESS) was proposed. The control strategy combined virtual droop control, virtual inertial control, and virtual negative inertial control.

[1] Huang J. Y., Li X. R. and Chang M. 2017 Capacity allocation of BESS in primary frequency regulation considering its technical-economic model Transactions of China Electrotechnical Society 32 112-121 Google Scholar [2] Li J. H. and Wang S. 2017 Optimal combined peak-shaving scheme using energy storage for auxiliary considering both ...

1 ??· The large-scale development of battery energy storage systems (BESS) has enhanced grid flexibility in power systems. From the perspective of power system planners, it is essential to consider the reliability of BESS to ensure stable grid operation amid a high reliance on renewable energy. Therefore, this paper investigates BESS models and dynamic parameters used in ...

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