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Rural solar energy storage and direct flexible utilization

Overview

To accelerate the green transformation of power grids, enhance the accommodation of renewable energy, reduce the operational costs of rural distribution networks, and address voltage stability issues caused by supply-demand fluctuations, this study proposes an optimization method for distributed energy storage systems in rural distribution networks integrated with renewable energy.Can solar energy be used in rural areas?

Due to the generally larger land area and relatively fewer building obstructions in rural areas, the photovoltaic, storage, direct current (PSDF) system can effectively utilize solar energy, providing clean energy for rural buildings.

What happens if a rural PV system is not equipped with energy storage?

The results show that: When the rural household PV system is not equipped with energy storage, the PV local consumption rate is 34.58%, and 65.42% of PV power still has to be connected to the grid for consumption, posing a threat to the safe and stable operation of the distribution network.

Can rural photovoltaics achieve dynamic supply-demand matching?

While the grid-connected capacity of rural household photovoltaics is increasing rapidly, achieving dynamic supply-demand matching despite fluctuations in solar energy is challenging.

What is a design standard for energy-efficient rural housing?

Design Standard for Energy-Efficient of Detached Rural Housing. China Association for Engineering Construction Standardization. (in Chinese) Elkadeem MR, Abido MA (2023). Optimal planning and operation of grid-connected PV/CHP/battery energy system considering demand response and electric vehicles for a multi-residential complex building.

What is the SOC of energy storage system in power system?

Refer to the “General Technical Requirements for Electrochemical Energy Storage System in Power System” (National Power Energy Storage Standardization Technical Committee, 2018), the SOC of energy storage is 0.05–0.95, and the charging and discharging efficiency is 90%. The discharge depth of energy storage system is 30%.

Is residential load scheduling based on cost efficiency and consumer preference?

A residential load scheduling based on cost efficiency and consumer’s preference for demand response in smart grid. Electric Power Systems Research, 186: 106410. Li B, You L, Zheng M, et al. (2020). Energy consumption pattern and indoor thermal environment of residential building in rural China. Energy and Built Environment, 1: 327–336.

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