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Wind solar and energy storage power station configuration

Overview

This article takes four renewable energy sources (solar energy, wind resources, hydro energy, and energy storage) as the research basis, optimizes the energy storage configuration of their comprehensive energy bases, constructs an energy storage configuration optimization model, and verifies the feasibility of the model and algorithm through case analysis, providing positive impetus for sustainable energy development.How to optimize wind and solar energy integration?

The optimization uses a particle swarm algorithm to obtain wind and solar energy integration's optimal ratio and capacity configuration. The results indicate that a wind-solar ratio of around 1.25:1, with wind power installed capacity of 2350 MW and photovoltaic installed capacity of 1898 MW, results in maximum wind and solar installed capacity.

What is the maximum wind and solar installed capacity?

The results indicate that a wind-solar ratio of around 1.25:1, with wind power installed capacity of 2350 MW and photovoltaic installed capacity of 1898 MW, results in maximum wind and solar installed capacity. Furthermore, installed capacity increases with increasing wind and solar curtailment rates and loss-of-load probabilities.

What is the maximum integration capacity of wind and solar power?

At this ratio, the maximum wind-solar integration capacity reaches 3938.63 MW, with a curtailment rate of wind and solar power kept below 3 % and a loss of load probability maintained at 0 %. Furthermore, under varying loss of load probabilities, the total integration capacity of wind and solar power increases significantly.

Are wind-photovoltaic-storage hybrid power system and gravity energy storage system economically viable?

By comparing the three optimal results, it can be identified that the costs and evaluation index values of wind-photovoltaic-storage hybrid power system

with gravity energy storage system are optimal and the gravity energy storage system is economically viable.

How to improve the friendliness of wind and solar power generation?

It also studies the control method of energy storage system to improve the friendliness of wind and solar power generation, based on the control strategies such as smoothing new energy output fluctuations, tracking planned power generation, peak shaving and valley filling, and participation in system frequency modulation.

What is the optimal capacity configuration of on-grid WPS-HPS?

For the optimal capacity configuration (OCC) of on-grid WPS-HPS, Sharafi et al. optimized the capacity of WPS-HPS to minimize operating costs and carbon dioxide emissions. The model considered the randomness of wind speed and illumination and used a stochastic optimization method, which was closer to the reality.

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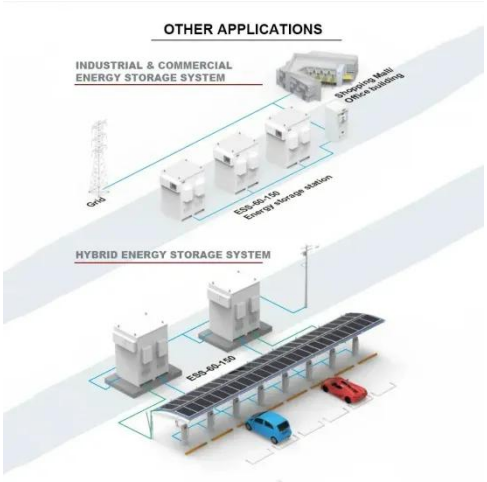

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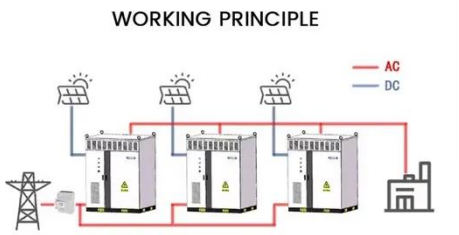

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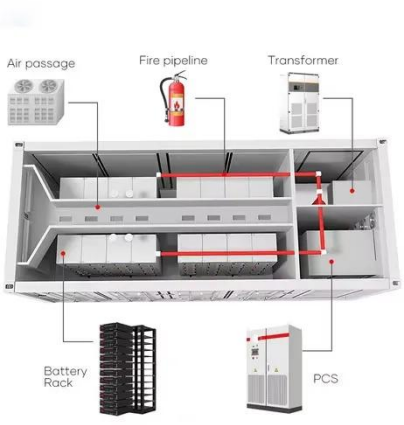

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