

How to calculate the benefits of wind and solar complementary technology for communication base stations

Can a multi-energy complementary power generation system integrate wind and solar energy?

Simulation results validated using real-world data from the southwest region of China. Future research will focus on stochastic modeling and incorporating energy storage systems. This paper proposes constructing a multi-energy complementary power generation system integrating hydropower, wind, and solar energy.

What are the complementary characteristics of wind and solar energy?

The complementary characteristics of wind and solar energy can be fully utilized, which better aligns with fluctuations in user loads, promoting the integration of wind and solar resources and ensuring the safe and stable operation of the system.

1. Introduction

How to integrate wind and solar power?

When considering the integration of wind and solar power, increasing the installed capacity of renewable energy while maintaining a certain wind-solar ratio can effectively match the power generation with the user load within a specific range. In engineering design, it is essential to address the issue of ensuring supply from 16:00 to 22:00.

Which region has the most complementarity in wind power generation?

Concerning other regions, the complementarity levels reach 40 % in the South, Southeast, and the remainder of the Northeast. Moreover, the Brazilian Northeast stands out as the country's most advantageous location for wind power generation.

Do wind and solar power complement each other well?

It is clear that regardless of the wind and solar curtailment rate, the optimal installed capacity ratio is close to 1:1. This indicates that wind power and solar power complement each other well based on typical daily output data selected from the entire year, thereby demonstrating the necessity of simultaneous development of wind and solar power.

What percentage of solar energy is complemented by wind?

The level of complementarity may vary according to the region and the time of year. For example, according to Nascimento et al., wind resources complement solar energy by 40 %-50 % in the Brazilian Northeast along the coastline, reaching up to 60 % in Rio Grande do Norte state.

How to reasonably distribute the benefits obtained by each subject is the key to realize solid cooperation and stable alliance among all interested subjects. Therefore, ...

He et al. (2023) proposed a novel capacity allocation model for a hydro-wind-solar complementary system

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considering the connection of cascade hydropower stations, aimed at ...

To address this challenge, this article proposes a coupled electricity-carbon market and wind-solar-storage complementary hybrid power generation system model, aiming ...

The resulting green electricity supply of 10.4 PWh per year help secure China's carbon-neutral goal and reduces 2.08 Mt SO₂ and 1.97 Mt NO_x emissions annually. Our ...

Lv et al. [15] proposed a dual-layer planning model for a hydropower-wind-solar complementary system, with an outer layer maximizing wind-solar capacity and an inner-layer ...

To address this challenge, this article proposes a coupled electricity-carbon market and wind-solar-storage complementary hybrid power ...

This paper describes the design of an off-grid wind-solar complementary power generation system of a 1500m high mountain weather station in Yunhe County, Lishui City.

This paper develops a method to consider the multi-objective cooperative optimization operation of 5G communication base stations and Active Distribution Network ...

This work proposes a stochastic simulation model of renewable energy generation that explores several complementary effects between wind and photovoltaic resources in ...

Due to the strong complementarity of solar and wind energy, the wind and solar complementary power generation system makes up for the defects of wind power and ...

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The cascade hydro-wind-photovoltaic complementary generation system is considered to be an effective approach to solve the output fluctuation of renewable energy. ...

technologies that combine wind and solar energy, are particularly important because they improve the stability and efficiency of energy supply. Through the analysis of technological innovation ...

policies for clean technologies such as wind and solar PV affect innovation in complementary technologies such as battery storage. We present a qualitative study from the German power ...

Through the analysis of technological innovation and system optimization strategies, this study explores ways

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to enhance system performance and economy by relying ...

This article briefly analyzes the technical advantages of the wind-solar hybrid power generation system, builds models of wind power generation systems, photovoltaic systems, and storage ...

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