Solar Residential Building China

Overview

Building integrated photovoltaic (BIPV) is a promising solution for providing building energy and realizing net-zero energy buildings. Based on the developed mathematical model, this paper assesses the solar irradiation resources and BIPV potential of residential buildings in different climate zones of China. It is found that roofs are the first ch. ••The solar irradiation resources of building façades including the north façade are examined.••The photovoltaic contributions to net zero energy residential buildings are assessed in China.••Partial shading is considered for modeling the building integrated photovoltaic (BIPV) system.••A research framework for assessing the potential of residential BIPV system is proposed.Building integrated photovoltaicsResidential buildingEnergy consumptionEnergy potentialAbbreviationsBHI beam horizontal irradiance (W/m2)BIPV building integrated photovoltaicDHI diffuse horizontal irradiance (W/m2)GHI global horizontal irradiance (W/m2)GIS geographic information systemNOCT normal operating cell temperature (°C)NZEB net-zero energy buildingPV photovoltaicSCR self-consumption ratioSF shading factorSTC standard test conditionSSR self-sufficiency ratioZEB zero energy buildingLatin symbolsAPV active PV area (m2)D north-south distance between adjacent buildings (m)Eload building load (kWh)EPV PV generation (kWh)EPV-load PV generation directly supplies the load (kWh)h solar altitude angle (°)H building height (m)H1 distance from windowsill bottom to ground (m)I solar irradiance on the inclined plane (W/m2)Ib beam irradiance on the inclined plane (W/m2)Id diffuse irradiance on the inclined plane (W/m2)Ir reflected irradiance on the inclined plane (W/m2)Is solar irradiance under shading effects (W/m2)n date number in a yearPPV PV power output (W)Rb ratio of beam irradiance on the inclined plane to horizontal planeSFb shading factor for beam irradianceSFd shading factor fo. To limit the global temperature rise to 1.5 °C, emission reductions are imminent issues over the world (Li et al., 2021). In 2020, China, as the world's largest energy consumer, announced its goal to reach t...

Article Content

Integrating active and passive solar strategies in modular residential ...

The building sector has a significant impact on global energy consumption and CO_2 emissions, accounting for 26 % of energy-related CO_2 emissions and nearly 30 % of total energy use worldwide (International Energy Agency, 2019) the context of Morocco, buildings in both the residential and commercial sectors are among the largest energy consumers, representing ...

Harvesting Sunlight: The Dynamics of Rooftop Solar ...

Solar photovoltaic (PV) technology is emerging as a key component of China''s strategy to bridge its electricity gap and achieve its “dual carbon” goals, according to a new AIIB report and forecasts from energy ...

Potential of residential building integrated photovoltaic systems in ...

Building integrated photovoltaic (BIPV) is a promising solution for providing building energy and realizing net-zero energy buildings. Based on the developed mathematical model, this paper assesses the solar irradiation resources and BIPV potential of residential buildings in different climate zones of China. It is found that roofs are the first choice for BIPV ...

Energy Performance of a Residential Zero Energy Building R ...

Keywords: Energy performance, Zero energy building (ZEB), Solar Decathlon China (SDC), Energy system, Off grid . NONMENCLATURE . Abbreviations . AC Alternating Current ASHP. Air Source Heat Pump: ... R-CELLS is a single-story residential building with a gross floor area of 146m2. It is constructed using a three -

Integration of passive double-heating and double-cooling system ...

The summer hot and winter cold (SHWC) climate zone, in the southeast of China, is characterized by a high residential building density (Xu et al., 2013).There is approximately 6 billion m 2 of building stock in this region, accounting for 47% of the total national built floor area (Tsinghua University Building Energy Research Center, 2013).Due to absence of the district ...

Solar energy potential using GIS-based urban residential ...

Effective planning crucial to harness solar potential. This study examines Shenzhen''s potential for utilizing photovoltaics (PV) on buildings in terms of residential ...

A comprehensive comparison study on household solar-assisted ...

Distributed solar heating systems have high energy-saving potential as clean and energy-efficient production units in residential building applications. Solar energy resources are weak in hot summer and cold winter zone in China, which makes it difficult to completely rely on solar energy to heat residential buildings.

China''s Wuhan residents pioneer a winning formula for rooftop solar ...

Technicians test solar panels on a residential building in Yiwu, east China''s Zhejiang province. In Hubei province''s Wuhan, residents of Beihu have assigned their rooftop solar rights to a power firm. In return, they get a large discount on their service charge and improvements to their communal rooftop space (Image: Xu Yu / Xinhua / Alamy)

(PDF) Heating solutions for residential buildings in China: Current ...

Heating solutions for residential buildings in China: Current status and future outlook. ... nuclear, wind or solar. Particularly for China, different types of heat pumps have its own 286 .

Net-Zero Energy Consumption Building in China: An …

The purpose of this study is to review the basic status of the development of building-integrated photovoltaic (BIPV) technologies in China, to identify and analyze the existing problems and challenges, and to propose …

China''s Photovoltaic Installation Data and Residential Market ...

Recently, the National Energy Administration released data on photovoltaic (PV) power construction for the first half of 2024. As of June 30, 2024, China added 102.48 million kilowatts of new PV installations, an increase of 24.057 million kilowatts compared to the 78.423 million kilowatts added in the first half of 2023, representing a year-on-year growth rate of ...

Solar energy potential using GIS-based urban residential …

This study examines Shenzhen''s potential for utilizing photovoltaics (PV) on buildings in terms of residential electricity consumption. Based on its geographic information system (GIS) data, typical local meteorological data, and electricity demand, the solar potential of Shenzhen has been thoroughly studied, critically analyzed, and compared with different urban …

China begins building first GW-scale residential VPP

China is building its first gigawatt-scale residential virtual power plant (VPP) in Jiangsu province. The project will connect millions of high-power household appliances to a cloud-based energy ...

Multi-Objective Optimization for the Energy, Economic, and ...

In this paper, high-rise residential buildings in the cities of Xi''an and Yulin, which have differences in solar radiation, in the western solar enrichment area of China are taken as the research objects. The four objectives of building energy consumption, thermal comfort, life-cycle cost, and life-cycle carbon emissions are weighed using the ...

Photovoltaic technology in rural residential buildings in …

China imported 513 million tons of oil and 120 million tons of natural gas, with the proportion of external dependence of 72% and 45%, respectively (Huang 2022). In contrast, China is a vast country with abun-dant solar, hydro, wind and other renewable energy resources. Under such circumstances, the Chinese

Optimization of design parameters and operation conditions of solar ...

Meanwhile, public and residential buildings account for the largest proportion of building energy consumption . Because of the demand for heating in winter, civil buildings in northern China have much higher energy usage than the south. ... Fig. 1 shows that up to the end of 2021, the solar power generation in China has become 306.54 GW ...

Green retrofit of existing residential buildings in China: An ...

which residential buildings accounted for 78.7% with huge energy-saving potential. 14 Many residential buildings built decades ago in China failed to consider the energy-saving issues, and had ...

Photovoltaic technology in rural residential buildings in ...

China''s rural residential photovoltaic system has been greatly developed in recent years. However, most existing researches, are difficult to reflect the real development situation of the whole system.

Investigating effective parameters for enhancing energy efficiency ...

The findings reveal that a residential building without a solar greenhouse consumes 3261.5 kWh annually for heating and 1535.5 kWh for cooling. ... Ji, Y., Wang, Z., Ning, H., & Zhang, X. (2015). Field investigation on indoor thermal environment at a rural passive solar house in severe cold area of China. Procedia Engineering, 121, 596–603 ...

Energy use in residential buildings for sustainable development: ...

From the building aspect, buildings were responsible for 34 % of energy demand globally and 37 % of energy and process related CO 2 emissions in 2021 .Even under COVID-19 in the last few years, global energy demand and emissions have declined .However, there is still considerable potential for less energy use in buildings, in terms of reducing energy ...

A study of thermal comfort in residential buildings on the Tibetan ...

Meanwhile, the annual total solar radiation is more than 5000 MJ/m 2, which represents a very rich solar resource. 2.2. Residential buildings types. The research team carried out a large number of surveys by visiting local residential buildings in Tibet. ... China Building Industry Press, Beijing (2012) Google Scholar ANSI/ASHRAE Standard 55.

Towards zero-energy buildings in China: A systematic literature ...

Although China is a developing country, its energy consumption has exceeded that of the USA and is now the highest in the world. The primary energy consumption in China reached 3.86 × 10 7 GWh in 2018, accounting for 22% of the world''s total primary energy consumption and being 1.42 times that of the USA (IEA, 2019).The energy consumption in the ...

The evolution of residential PV in China

In the first seven-months of 2021, China installed 7.66 GW of residential solar, with close to 1.8 GW installed in July alone. The market is taking advantage of the relatively generous and...

Impact of urban form on building energy consumption and solar ...

Three optimization objectives were identified: minimum building energy consumption, maximum solar potential and maximum sunlight hours. Then, taking Jianhu in China as an example, the building types are extracted from the actual urban context to create blocks.

Energy Efficiency Retrofit for Existing Residential Buildings in China ...

Retrofitting existing residential buildings in China''s hot summer and cold winter (HSCW) zones significantly improves building energy efficiency. Current studies on retrofitting existing residential buildings mostly concentrate on single scenarios, primarily in the northern region. However, there is a need for better decision-making ...

Energy Utilization and Carbon Reduction Potential of Solar ...

The study results show that at certain floor area ratios, the highest solar power generation can be achieved with a mixture of high-rise slabs and high-rise towers, but the building energy ...

China''s ambitious rooftop solar pilot helps drive ...

On Wednesday, the housing department and the National Development and Reform Commission, which oversees strategic planning, announced a plan for new-build public buildings and factories in town and ...

An Extensive Design Approach Integrating Offshore Residential Buildings ...

Solar water heaters are widely adopted in cities. From the perspective of long-term development of organic integration of solar energy to residential buildings, few solar water heaters have been reasonably integrated into buildings for the time being, and modular design of such integration is yet to be improved.

Energy performance of a residential zero energy building energy ...

The energy system and its energy performance of R-CELLS, a residential zero energy building from team Tianjin U+ in the Solar Decathlon China 2022, is introduced in this ...

Heating load reduction characteristics of passive solar buildings in ...

The analysis of the impact of building type differences indicates that residential buildings have higher Trombe wall-to-wall ratio limits and more significant potential for energy savings than office buildings. ... Liu Y, Yu Z, Song C, et al. Heating load reduction characteristics of passive solar buildings in Tibet, China. Building Simulation ...

Techno-economic-environmental analysis of seasonal thermal ...

Analysis strategy for multi-criteria optimization: application to inter-seasonal solar heat storage for residential building needs. Energy, 171 (2019), pp. 419-434, 10.1016/j.energy.2018.12.181. ... Heating solutions for residential buildings in China: current status and future outlook. Energy Convers Manag, 177 (2018) ...

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