



# Outdoor solar power generation in buildings

A total of 30 papers have been accepted for this Special Issue, with authors from 21 countries. The accepted papers address a great variety of issues that can broadly be classified into five categories: (1) building integrated photovoltaic, (2) solar thermal energy utilization, (3) distributed energy and storage systems (4), solar energy ...

Fig. 1 illustrates the fundamental configuration of the entire system, which can be mainly divided into three processes: energy production, energy distribution and energy consumption. In the energy production process, the PV arrays harness solar energy for electricity generation and supply power to the energy loads. The grid serves as a ...

This paper aims at evaluating the impact of energy efficiency measures as well as various solar strategies selection that maximize onsite energy generation, in ...

The Percentage of Solar power generation in the world . Though solar power generated only 2% of the world's electricity in 2019, its potential is beyond these initial numbers. Luckily, that percentage is growing dramatically, thanks to the massive solar farms and large-end solar projects.

By normalizing the measured electricity generation rate and the measured solar irradiance, the average power conversion efficiency of the solar cell was 14.5%. Our experiment for the first time shows that subambient daytime radiative cooling and photovoltaic power generation can be achieved simultaneously and from the same area.

Building integrated photovoltaics (BIPV) has enormous potential for on-site renewable energy generation in urban environments. However, BIPV systems are still in a relatively nascent stage with few commercial installations. Therefore, applied evaluation ...

Elements that contribute to passive solar heating include orientation, building shape, buffer spaces and double facades, space planning, etc. Passive ventilation: Passive ventilation strategies use naturally occurring air flow patterns around and in a building to introduce outdoor air into the space. Buildings can be designed to enhance natural ...

Recent theories have shown that using both the cold universe and the sun points to an untapped opportunity for harvesting renewable energy at a level that is not possible by using either resource alone. 28, 29 Simultaneous ...

The goal: expanding solar power's reach beyond flat land. "There is a huge market where classical photovoltaics do not work," says Jan Birnstock, Heliatek's chief technical officer. Organic photovoltaics (OPVs) such as Heliatek's are more than 10 times lighter than silicon panels and in some cases cost just half



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as much to produce.

As of 2021, solar power generation accounted for approximately 56% of the newly installed renewable power capacity globally, and the solar power capacity has continued to increase in 2022, with a ...

(a) Outdoor hybrid solar air-conditioner (Ningbo Yoton Industrial & Trade Co., 2021), (b) Schematic drawing of the system loops. +15 Cooling systems powered by solar thermal energy (Rafique, 2020).

The building sector is significantly contributing to climate change, pollution, and energy crises, thus requiring a rapid shift to more sustainable construction practices. Here, we review the emerging practices of integrating renewable energies in the construction sector, with a focus on energy types, policies, innovations, and perspectives. The energy ...

The purpose of this study is to review the deployment of photovoltaic systems in sustainable buildings. PV technology is prominent, and BIPV systems are ...

The annual sunshine hours in the region are 4380 h and the cumulative solar radiation throughout the year is about 7318 MJ/(m<sup>2</sup>·a). Based on the Meteonorm Database, the PV power generation in the region is modelled with PVsyst software, which demonstrates reliable performance in solar system architecture and modelling ...

Sustainable buildings have become a key issue for many developing and developed countries in the twenty-first century. The global population is expected to rise from 7.7 billion in 2019 to 9.7 billion in 2050 and will reach more than 10.9 billion by the end of this century [1]. This increase in the global inhabitants will correspondingly increase the ...

2 ·; The researchers find that the combination of rooftop with shading photovoltaics can generally better match the daily energy load of a building as the two photovoltaic ...

Solar photovoltaic (PV) systems contribute to buildings' sustainability by reducing the need for electricity from the grid. However, the diffusion of PV systems ...

Conversely, the efficiency of the production of solar energy was affected negatively by higher outdoor temperatures. U-shaped correlation line between outside temperature (T) and electricity ...

Building-integrated photovoltaics is a set of emerging solar energy applications that replace conventional building materials with solar energy ...

In an uncertain environment from wind and solar power generation, and outdoor temperature, the ACs' operation flexibility based on the building thermal inertia can be fully used to obtain the optimal strategy that



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considers both the operation economy of the buildings and the consumers' comfort through the CCP method.

The assessment of solar energy potential for buildings is by converting the available solar radiation on building surfaces into power generation capacity. ... The results are expected to enable a rapid evaluation of solar power generation and installation strategies for the roofs and facades of residential buildings at the beginning of the ...

In this case, solar building envelopes, also known as building-integrated photovoltaics (BIPV), a multifunctional technology, can simultaneously function as ...

Nature Energy - Recent developments in photovoltaic technologies enable stimulating architectural integration into building facades and rooftops. Upcoming ...

A PVT system combines solar-light and solar-thermal power generation within a single module. It has the potential to enhance the efficiency of PV systems with at a relatively low cost. ... of three different configurations of a translucent CdTe-bonded building-integrated glazing system in an office building using outdoor experimental ...

Main text. Since the inception of daytime radiative cooling technology, as highlighted in seminal work, a significant attention has been drawn to its potential in addressing challenges associated with global warming. This innovative technology enables sub-ambient cooling by emitting infrared radiation through the atmosphere's ...

How does PV power generation work? A PV system uses solar panels that contain semi-conductor material (often silicon) which creates an electrical current when the sun shines on it. Ideally, panels should face north and not be shaded for the majority of the day, but especially around noon. ... with compliance with the Building Act, it is ...

Building energy intensity (BEI) of typical office buildings in Malaysia ranges from 200 to 250 kWh/m<sup>2</sup>/year, wherein a substantial portion is due to the cooling system. This study evaluates the performance and suitability of double-laminated monocrystalline solar photovoltaic (PV) glass in comparison to traditional solar PV ...

The emerging concept of smart buildings, which requires the incorporation of sensors and big data (BD) and utilizes artificial intelligence (AI), promises to usher in a new age of urban energy efficiency. By using AI technologies in smart buildings, energy consumption can be reduced through better control, improved reliability, and ...

This study examines the applications of photovoltaic and solar thermal technologies in the field of architecture, demonstrating the huge potential of solar energy in building applications. To ensure a ...



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3.1 Rooftop Area of the Commercial Building and the Electricity Consumption. The case study commercial building is located at the latitude of  $12^{\circ}34'7''\text{N}$  and longitude of  $99^{\circ}57'28''\text{E}$ . According to the data on solar irradiation, the total solar irradiation in 2020 was at  $1,731.5 \text{ kWh/m}^2$  [] was found that the existing roof structure ...

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