

How can a prediction model improve solar energy utilization?

The interpretative analysis of the prediction model provides a scientific basis for understanding and optimizing solar energy utilization, helping to reveal the variation patterns of solar radiation under different conditions and guiding the optimization of practical applications.

What is exergy analysis of energy conversion mechanisms?

Exergy analysis of energy conversion mechanisms can help find out the point of optimization of the electrical and thermal efficiency for solar utilization systems, and it is also a good supplement to energy analysis methods for evaluating the performance of solar energy utilization systems.

How a thermal energy storage system can be improved?

The cost of thermal energy storage system can be reduced and the system performance can be improved. One of the active direct systems is the two-tank direct storage system, which consists of a hot and a cold storage tank, as shown in Figure 7 (a).

What is solar thermal energy storage?

For some period of a year, solar thermal production exceeds the demand for heating or cooling, while in other periods the production is less than the demand. Seasonal thermal energy storage would be a solution to store heat at the time that is not needed and use it for the time that is required.

What is the solar radiation utilization efficiency of the south facade?

After accounting for obstructions, the annual solar radiation received amounts to 64.66 TWh, with an average annual solar irradiation of 1172.66 kWh/(m²·a). This makes them a priority for utilization. The solar radiation utilization efficiency of the south facade is second only to the roof and also deserves attention.

How does LBT implement solar radiation analysis?

The implementation of solar radiation analysis by LBT relies on Radiance, a highly specialized software package for ray tracing and illumination simulation, extensively used in the fields of architecture and urban planning for lighting analysis and visualization.

4 ???; The global energy crisis necessitates enhancing energy independence for regions and countries by advancing the utilization of renewable energy sources. Solar energy offers a sustainable method for enhancing energy efficiency in buildings through the integration of solar greenhouses or sunspaces. These passive solar systems play a vital role in reducing the ...

In this study, we aimed to verify the performance of a PVT system, a combined solar/thermal power generation system, through experiments to check the improvements in its solar energy utilization efficiency

over that of a conventional PV system. In our literature review, we identified the features, advantages, and disadvantages of air PVT ...

3 ???· One such efficient method is through the use of solar thermoelectric generators, which transform thermal energy into electricity, offering a wide range of applications, such as heating water and ...

3 The perspective of solar energy. Solar energy investments can meet energy targets and environmental protection by reducing carbon emissions while having no detrimental influence on the country's development [32, 34] countries located in the "Sunbelt", there is huge potential for solar energy, where there is a year-round abundance of solar global horizontal ...

Energy and exergy performances of these three solar utilization systems were all calculated and analyzed. Moreover, two typical evaluation methods, i.e. semi-empirical system efficiency model method and input-output method, were also used for evaluating the performances of these systems.

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Li et al. [19] proposed a thermal design method that utilize solar energy to decide the optimal wall thermal resistance and heat capacity by using the harmonic response method. These design ...

To eliminate its intermittence feature, thermal energy storage is vital for efficient and stable operation of solar energy utilization systems. It is an effective way of decoupling the energy demand and generation, while plays an important role on smoothing their fluctuations.

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Based on the analysis, integrating PETS techniques has the potential to improve solar PV efficiency by a range of 1% to 50%, coinciding with a surface temperature decrease of 1.8 °C to 50 °C in PV panels. Strategies that work well include spectrum filtering, radiative cooling, jet impingement, and rendering Perovskite materials. For future research, ...

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3 ???· The use of PVT collectors, which combine photovoltaic and thermal technologies, allows for efficient utilization of solar energy by generating both electricity and heat. The implementation of an absorption chiller, which utilizes waste heat or low-grade heat, further enhances energy efficiency by reducing the reliance on electricity for cooling purposes. In ...

Attached sunspace as a passive solar energy utilization method has been widely used in rural areas in northern China. However, the attached sunspace cannot meet the residents' requirements for a comfortable indoor thermal environment. In order to promote building energy efficiency, a method of joint utilization of solar air collector and attached sunspace is ...

Solar thermal energy utilization in buildings is another historic and important field. High efficiency, low cost, and robust reliability are the objects of continuous pursuit for all solar thermal utilization products. Paper [15] proposed a new flat-plate solar thermal air collector prototype. The novelty of this device is reflected in the ...

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