

Solar energy cross-season soil heat storage function

Can solar thermal energy be used for cross-seasonal heating?

The increase in the tank temperature at the end of the heating period was beneficial for shortening the duration of the heat storage period for the following year. The feasibility of utilizing solar thermal energy and cascaded phase change heat storage for cross-seasonal heating has been demonstrated in this study.

What are heat storage methods for solar-driven cross-seasonal heating?

Heat storage methods for solar-driven cross-seasonal heating include tank thermal energy storage (TTES), pit thermal energy storage (PTES), borehole thermal energy storage (BTES), and aquifer thermal energy storage (ATES) 14, 15, 16. As heat storage volume increases, hot water preparation costs and heat loss per unit volume decrease.

Can solar energy be used for cross-seasonal heating in highland areas?

Thus, the solar-driven cascaded phase change heat storage system for cross-seasonal heating holds significant application value in highland areas. The system utilizes solar energy as the primary energy source, which is abundant in the plateau region, effectively reducing reliance on traditional fossil energy sources and mitigating carbon emissions.

Why is cross-seasonal heat storage important?

The mismatch between solar radiation resources and building heating demand on a seasonal scale makes cross-seasonal heat storage a crucial technology, especially for plateau areas. Utilizing phase change materials with high energy density and stable heat output effectively improves energy storage efficiency.

How does a solar energy storage system work?

At the beginning of the heat storage period, high-temperature nonfreezing liquid heated by the solar collector passes through the heat exchanger, exchanging heat with low-temperature water drawn from the cascaded PCM energy storage tank. This warmed hot water is then circulated back into the tanks.

Does a cross-seasonal heat storage system reduce fuel consumption?

Heat transferred by the cross-seasonal heat storage system accounts for up to 61.2% of the total heating load. Therefore, the system reduces fuel consumption by 77.6% compared to conventional fossil fuel heating systems.

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an active solar heating system with soil heat storage for a plastic greenhouse located Buildings 2022, 12, 405 3 of 24 in Jinan city, and comprehensively monitored the experiment, including ...

A major challenge facing BTES systems is their relatively low heat extraction efficiency. Annual efficiency is a measure of a thermal energy storage system's performance, ...

the feasibility of solar energy in non-heating season soil heat storage, indicating that the heat storage effect is ... for the design and operation management of solar cross-seasonal heat ...

A low cost Seasonal Solar Soil Heat Storage (SSSHS) system used for greenhouse heating was invented and investigated. With soil heat storage technology, the solar energy stored...

This system uses Fluent simulation software to perform research on the thermal storage and release characteristics of the composite thermal storage system and the change law of the ...

By applying soil heat storage, solar energy stored in the soil under the greenhouse can be transferred and utilized in winter to realize the utilization of cross-seasonal energy. TRNSYS is ...

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An analytical and computational model for a solar assisted heat pump heating system with an underground seasonal cylindrical storage tank is developed. The heating system consists of ...

capacity determination of solar-assisted heat source and heat balance calculation of solar-soil compound system. Moreover, annual rate of heat balance in a solar-soil source heat pump ...

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