

What is solar powered desalination?

With solar irradiation ample in regions that heavily rely on desalination, solar powered desalination provides a sustainable solution to meeting water needs. The compatibility of each desalination process with the solar technology is driven by whether the kind of energy needed is thermal or electrical, as well as its availability.

Why is solar thermal powered desalination important?

Solar thermal systems were previously considered costly as they first require energy conversion from solar thermal to electricity. Thus the optimization of power cycle units which convert solar thermal energy to electricity is a crucial component of solar thermal powered desalination.

How can a battery-based solar system improve solar desalination?

To overcome it and introduce flexibility into solar desalination, battery storage systems and water storage tanks are employed [53]. The PV system in a battery-based system has a higher solar energy to electricity efficiency (8.8%) than a battery-less system (5.5%), whereas the SEC of both systems are relatively the same [54].

What is the future outlook for solar powered desalination systems?

Future outlook considers the use of hybrid renewable energy systems as well as solar powered forward osmosis and dew vaporization. Solar powered desalination systems have been analysed with emphasis on technological and energy consumption aspects.

1. Introduction

1.1. Water scarcity

Can solar energy be used to drive desalination?

The application of solar energy to desalination processes demonstrates potential for further growth, in terms of enhanced performance, energy savings and/or cost reduction. In particular, the use of hybrid RE systems to drive desalination has garnered significant interest among the research community.

4.1.1. PV-wind-RO

How do you decarbonize a desalination system?

Decarbonizing desalination systems requires combining renewable energy technologies with desalination systems. Solar thermal desalination, which combines a thermal desalination system (e.g., distillation, multistage flash, etc.) with a concentrated solar system is attractive in geographic regions with an abundance of saline water and solar energy.

A comprehensive review of major desalination methods has been conducted, with a particular focus on the application of solar and wind energy. Additionally, the challenges associated with renewable energy-powered ...

On the basis of the management of solar energy, the desalination process is broadly classified into direct and indirect techniques as shown in Fig. 1. In direct mode, solar ...

The growing interest in combining solar energy with desalination with an emphasis on increasing energy efficiency has been sparked by the rapid advancements in solar energy technology ...

Although studies on various aspects of ROD-based hybrid renewable energy system (HRES) and various approaches used for optimization of HRES have been reported in ...

A better understanding of solar desalination systems requires an analysis of their uncertainties. ... However, due to their thermal energy storage capacity, the MSS + G ...

Interest in the area of solar energy for desalination has drastically increased in the last 25 years, as is indicated by the sharp increase in number of publications on this topic (Fig. ...

Solar distillation systems with a variety of energy storage media have been analyzed for their energy and exergy efficiency. To increase the performance of solar ...

Financial aspects in establishing solar desalination plants were highly country or region dependent. The economic challenges will be less in richer developed countries ...

Desalination technologies that utilize thermal energy and thus require thermal energy storage for uninterrupted process operation are MED, MSF, low temperature MED ...

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Also, lithium-ion batteries, as a key energy storage medium in the solar desalination systems for solar power when there are excess PV energy production, highlight ...

Solar energy, as a renewable and inexhaustible source of energy, might be one of the most feasible solutions to derive the desalination plants, especially in isolated communities ...

CSP can either be used to produce heat for direct solar desalination in a way similar to solar stills or be used to convert solar energy into electricity to support electricity ...

Dhivagar et al. 29, crushed granite stone was used as an energy storage medium, significantly enhancing the thermal storage capacity and overall efficiency of solar desalination ...

The outcomes displayed that the productivity and exergy efficiency of the solar desalination with energy storage media was raised by 78.5 % and 251.5 %, respectively. The ...

Moreover, in order to improve solar still energy absorption and increase water evaporation, sponges, rubber, aluminum plate or fins, and solar collector were added [5]. ...

Properties of the most commonly used sensible heat storage material are tabulated in Table 1, which provides the essential information for the judicious selection of sensible heat ...

Desalination has become imperative as a drinking water source for many parts of the world. Owing to the large quantities of thermal energy and high-quality electricity ...

Solar-powered freshwater harvesting is one of the accelerating trends today. Thanks to those who have developed efficient light-absorbing materials, latent heat energy ...

Solar desalination offers a promising solution to the global water shortage, yet it is underutilized compared to traditional fossil fuel-driven methods. Past solar desalination...

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