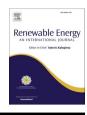
ELSEVIER

Contents lists available at ScienceDirect

## **Renewable Energy**



journal homepage: www.elsevier.com/locate/renene

## Introducing and assessment of a new wind and solar-based diversified energy production system intergrading single-effect absorption refrigeration, ORC, and SRC cycles

Soheil Mohtaram<sup>a,\*</sup>, Weidong Wu<sup>a,\*\*</sup>, Yashar Aryanfar<sup>b</sup>, Qiguo Yang<sup>a</sup>, Jorge Luis García Alcaraz<sup>c</sup>

<sup>a</sup> School of Energy and Power Engineering, University of Shanghai for Science and Technology, Shanghai, 200093, China

<sup>b</sup> Department of Electric Engineering and Computation, Autonomous University of Ciudad Juárez, Av. Del Charro 450 Norte. Col. Partido Romero. Juárez, Chihuahua,

Mexico

<sup>c</sup> Department of Industrial Engineering and Manufacturing, Autonomous University of Ciudad Juárez, Av. Del Charro 450 Norte. Col. Partido Romero. Juárez, Chihuahua, Mexico

ARTICLE INFO

Keywords: Multiple energy production Exergy Solar system Absorption refrigeration Reverse osmosis

## ABSTRACT

This paper proposes and evaluates an integrated energy production system using two forms of renewable energy, solar and wind, in order to deliver cooling, heating, electricity, and water desalination. Along with organic Rankine cycle components (ORC), this diversified energy system includes an absorption refrigeration system, steam Rankine cycle (SRC), thermoelectrics, reverse osmosis, wind turbines, and parabolic-linear solar collectors. This study contains several innovations, including using thermoelectrics in the Rankine organic cycle instead of a condenser that gives the system a high capacity, utilizing parabolic solar collectors, and implementing wind energy as the direct source of electricity for such system. Energy, Exergy, and Exergoeconomic analysis approach is performed for the evaluation approach. EES software is used to model and analyze the data. As part of the validation process, the results are compared with those published previously and are found to be relatively consistent. The research results revealed four points. First, with the increase in solar radiation, the amount of freshwater produced for the system increased from 69.15 to 75.23 m<sup>3</sup>/h. Second, the total exergy efficiency increased from 77.27 to 28.30 \$/h with increasing ambient temperature. Fourth, the highest exergy loss is associated with solar energy with a central receiver. Based on exergy losses, it was determined that a solar system with 60% and a wind turbine with 17% have the highest losses.

\*\* Corresponding author. E-mail addresses: s.mohtaram@usst.edu.cn (S. Mohtaram), usstwwd@usst.edu.cn (W. Wu).

https://doi.org/10.1016/j.renene.2022.08.069

Received 13 May 2022; Received in revised form 16 July 2022; Accepted 15 August 2022 Available online 3 September 2022 0960-1481/© 2022 Elsevier Ltd. All rights reserved.