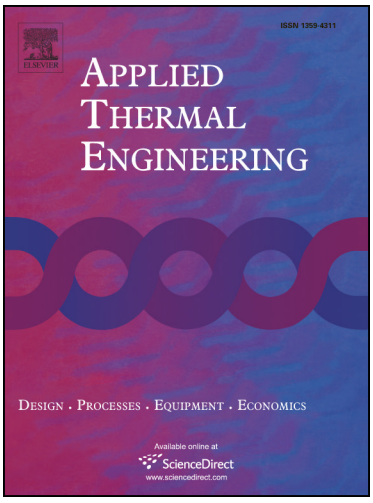

Research Paper

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PII: S1359-4311(17)36063-5
DOI: https://doi.org/10.1016/j.applthermaleng.2018.01.046
Reference: ATE 11700

To appear in: *Applied Thermal Engineering*

Received Date: 20 September 2017
Revised Date: 6 December 2017
Accepted Date: 13 January 2018

Please cite this article as: G. Yang, X. Zhai, Optimization and performance analysis of solar hybrid CCHP systems under different operation strategies, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.01.046

Optimization and performance analysis of solar hybrid CCHP systems under different operation strategies

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Abstract

The hybridization between conventional combined cooling heating and power (CCHP) systems and solar systems has been considered as a good solution to the urgent energy and environment issues. This study develops the mathematical modeling of a CCHP system hybridized with PV panels and solar thermal collectors. The particle swarm optimization (PSO) algorithm is adopted to find the optimum values of design parameters. Based on the energy output characteristics of the solar hybrid CCHP system, five operation strategies of conventional CCHP systems are adjusted and applied for the solar hybrid CCHP system. The simulation work of the hybrid CCHP systems based upon a hotel building in Atlanta is carried out to find an appropriate design scheme. The results show that the hybrid CCHP system under the FEL-ECR mode is the best choice. Besides, its PESR, CO_2ERR and ATCSR can reach 36.15%, 53.73% and 4.16%, respectively. Compared with a conventional CCHP system, the hybrid CCHP system achieves better energy-saving and CO_2 reduction performance. However, the hybrid CCHP system consumes more annual total costs because of its high initial investment.

Keywords: combined cooling heating and power, solar energy, hybrid system, particle swarm optimization algorithm

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