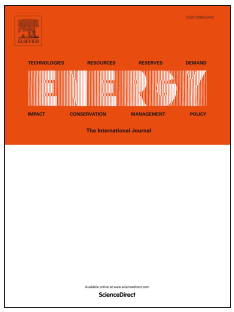
Accepted Manuscript



Effects of geometric parameters on the performance of solar chimney power plants

Davood Toghraie, Amir Karami, Masoud Afrand, Arash Karimipour

PII: S0360-5442(18)31622-0

DOI: 10.1016/j.energy.2018.08.086

Reference: EGY 13562

To appear in: *Energy*

Received Date: 10 November 2017

Revised Date: 17 July 2018

Accepted Date: 11 August 2018

Please cite this article as: Toghraie D, Karami A, Afrand M, Karimipour A, Effects of geometric parameters on the performance of solar chimney power plants, *Energy* (2018), doi: 10.1016/j.energy.2018.08.086.

Effects of geometric parameters on the performance of solar chimney power plants

Davood Toghraie[1], Amir Karami[1], Masoud Afrand[2,*], Arash Karimipour[2]

[1]Department of Mechanical Engineering, Khomeinishahr Branch, Islamic Azad University, Khomeinishahr, Iran

[2] Department of Mechanical Engineering, Najafabad Branch, Islamic Azad University, Najafabad, Iran

* Corresponding Author

Email: masoud.afrand@pmc.iaun.ac.ir

Abstract

In this study, the influences of geometrical properties on a solar chimney were investigated numerically by applying the $\kappa-\varepsilon$ turbulence model, continuity, momentum, and energy equations in the 3D finite volume approach inside a solar chimney power plant. The following variables should be involved: collector radius (R_{cl}), collector height (H_{cl}), chimney height (H_{ch}), chimney radius (R_{ch}), and heat flux (q''). The effects of changes in these variables on temperature, velocity, pressure distributions, efficiency, and output power were investigated. The results indicated that output power and solar chimney efficiency have positive relationships with chimney height and collector radius but a negative one with collector height. In addition, it was found that the parameter of chimney radius has an optimum range which has the maximum values for efficiency and output power.

Keywords: Solar chimney; Efficiency; Output power; Numerical simulation; Renewable energy;