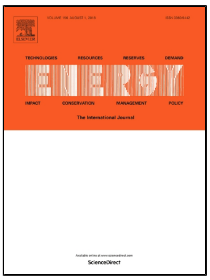
Accepted Manuscript



Analysis of the influence of heat loss factors on the overall performance of utility-scale parabolic trough solar collectors

Li Xu, Feihu Sun, Linrui Ma, Xiaolei Li, Guofeng Yuan, Dongqiang Lei, Huibin Zhu, Qiangqiang Zhang, Ershu Xu, Zhifeng Wang

PII:	S0360-5442(18)31362-8
DOI:	10.1016/j.energy.2018.07.065
Reference:	EGY 13330
To appear in:	*Energy*
Received Date:	25 September 2017
Accepted Date:	11 July 2018

Please cite this article as: Li Xu, Feihu Sun, Linrui Ma, Xiaolei Li, Guofeng Yuan, Dongqiang Lei, Huibin Zhu, Qiangqiang Zhang, Ershu Xu, Zhifeng Wang, Analysis of the influence of heat loss factors on the overall performance of utility-scale parabolic trough solar collectors, *Energy* (2018), doi: 10.1016/j.energy.2018.07.065

Analysis of the influence of heat loss factors on the overall performance of utility-scale parabolic trough solar collectors

Li Xu, Feihu Sun, Linrui Ma, Xiaolei Li, Guofeng Yuan, Dongqiang Lei, Huibin Zhu, Qiangqiang Zhang*, Ershu Xu, Zhifeng Wang

Key Laboratory of Solar Thermal Energy and Photovoltaic System of Chinese Academy of Sciences, Beijing Engineering Research Center of Solar Thermal Power, Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing 100190, China

Abstract:

For parabolic trough solar collectors, several factors (such as the amount of the gas in the evacuated annulus, the absorber emissivity, the wind speed and temperature distributions of the absorber, the glass envelope and the heat transfer fluid) are critical to influence their heat losses and consequently their overall performance. Therefore, this study develops a mathematical model for thermal behaviors of parabolic trough solar collectors in consideration of these impact factors. Additionally, to validate this model, experimental data were measured for a test facility. This facility includes a utility-scale loop of parabolic trough solar collectors which can be applicable to solar thermal power plants. The comparison indicates a good agreement between predicted and measured temperatures of the heat transfer fluid at the outlet of the collectors. Using this model, parametric studies were conducted for impact factors. These factors are the pressure of the H_2 or air from 0.01 to 1E5 Pa, the absorber emissivity from a measured basis to its four times, the wind speed from 2 to 12 m/s, and temperature distributions with and without the concentrated solar flux. Consequently, several conclusions were drawn by analyzing how they influence heat losses and further overall performance under specified boundary conditions.

* Corresponding author. Tel: +86 10 82547268. E-mail address: zqq_different@126.com