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8 Abstract:

9 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 10 distributions of the absorber, the glass envelope and the heat transfer fluid) are critical 11 to influence their heat losses and consequently their overall performance. Therefore, 12 13 this study develops a mathematical model for thermal behaviors of parabolic trough solar collectors in consideration of these impact factors. Additionally, to validate this 14 model, experimental data were measured for a test facility. This facility includes a 15 utility-scale loop of parabolic trough solar collectors which can be applicable to solar 16 thermal power plants. The comparison indicates a good agreement between predicted 17 and measured temperatures of the heat transfer fluid at the outlet of the collectors. Using 18 this model, parametric studies were conducted for impact factors. These factors are the 19 20 pressure of the H₂ or air from 0.01 to 1E5 Pa, the absorber emissivity from a measured 21 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 22 drawn by analyzing how they influence heat losses and further overall performance 23 under specified boundary conditions. 24

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