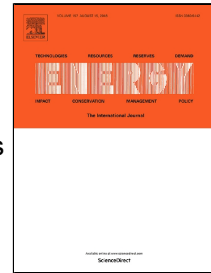


# Accepted Manuscript

Development and Assessment of Integrating Parabolic Trough Collectors with Gas Turbine Trigeneration System for Producing Electricity, Chilled Water, and Freshwater



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1 *Development and Assessment of Integrating Parabolic Trough Collectors with Gas*  
2 *Turbine Trigeneration System for Producing Electricity, Chilled Water, and*  
3 *Freshwater*

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11  
12 **ABSTRACT**

13 The main objective of the present work is to investigate the possible modifications of a gas turbine  
14 trigeneration plant via integrating it with a parabolic trough collector (PTC) technology. This plant  
15 produces 45461 m<sup>3</sup>/day of freshwater and 2300 kg/s of chilled water in addition to producing 360  
16 MWe of electricity (the steam turbines yield 110 MWe). The annual performance of an integrated  
17 solar gas turbine trigeneration power plant (ISGTPP) with different sizes of gas turbine and solar  
18 collector's area have been examined using Thermoflex software under Al-Hodeidah (Yemen)  
19 weather conditions. This study revealed that the ISGTPP results in a minor increase in levelized  
20 electricity cost (LEC) compared to the conventional trigeneration plant, nevertheless it reduces the  
21 LEC by 62–71.5% relative to the fully-solar-powered PTC power plants. Moreover, the study  
22 identified the configuration of ISGTPP with a gas turbine of 130 MWe capacity and 39.7 hectares of  
23 PTC's total aperture area as the most optimal engine configuration. It reduces the annual CO<sub>2</sub>  
24 emissions by 385 k-tonne (30.2%) in comparing with that emitted by the reference plant with a gas  
25 turbine of 250 MWe size and 100 k-tonne (10%) compared with that emitted by the corresponding  
26 conventional plant with 130 MWe size.

27

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