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Thermodynamic and economic assessments of a novel CCHP cycle utilizing low-temperature heat sources for domestic applications

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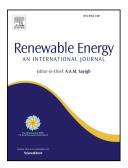
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ACCEPTED MANUSCRIPT

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- 2 utilizing low-temperature heat sources for domestic applications
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7 Abstract

- 8 This paper presents thermo-economic analysis of a novel combined cooling, heating, and power (CCHP) cycle 9 based on the first and second laws of thermodynamics and economic point of view. The proposed CCHP cycle 10 includes an organic Rankine cycle, an ejector refrigeration cycle and a domestic water heater to produce the 11 desired electrical power, cooling and heating, simultaneously. The basic CCHP (BCCHP) system is modified by 12 regenerative method (RCCHP). Four different dry working fluids R123, R236fa, R245fa and R600a are 13 employed. Both systems are analyzed thermo-economically and their performance, total cost rate and unit 14 cost of products are compared. Moreover, parametric study is conducted to investigate the effect of key 15 parameters. Under given condition, thermodynamics analysis of proposed systems is conducted in which the 16 maximum energy and exergy efficiencies corresponded to the BCCHP system using R123 as working fluid. 17 The exergy analysis results show that, vapor generator has a major contribution in the overall exergy 18 destruction, which is followed by the domestic water heater. Also, minimum total cost rate belongs to the 19 proposed RCCHP system utilizing R123. Furthermore, a multi-objective optimization is performed for both 20 systems. The optimization results show that RCCHP system has the smaller total cost rate compare to the 21 BCCHP while their thermodynamic performances are approximately the same.
- 22 **Keywords:** Organic Rankine cycle; Ejector refrigeration cycle; Domestic water heater; Low-temperature
- heat source; Thermo-economic analysis; Multi-objective Optimization.

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