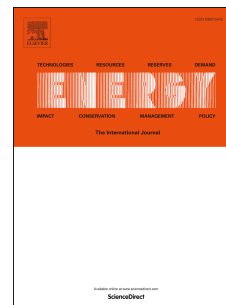


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1 Proposal and assessment of a novel supercritical CO₂ Brayton
2 cycle integrated with LiBr absorption chiller for concentrated
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10 **ABSTRACT**

11 A novel recompression supercritical CO₂ Brayton cycle integrated with an absorption
12 chiller (RSBC/AC) is proposed for air-cooled concentrated solar power (CSP) plants.
13 The residual heat of CO₂ in the cold end of the supercritical CO₂ cycle is utilized to
14 drive the absorption chiller, which chills the CO₂ exiting the precooler further before
15 it enters the main compressor. Parametric analyses and optimizations are performed
16 for the RSBC/AC. Energy and exergy analyses and comparisons are conducted to
17 illustrate the mechanisms of RSBC/AC performance improvement. Sensitivity
18 analyses of pressure drop and ambient temperature are performed to investigate
19 RSBC/AC performance under various working conditions. Economic evaluations of a
20 CSP plant integrated with RSBC/AC are performed to investigate its feasibility as an
21 alternative to the stand-alone supercritical CO₂ cycle. Results show that the optimized
22 thermal and exergy efficiencies of RSBC/AC are 5.19% and 6.12% higher,
23 respectively, than those of the stand-alone supercritical CO₂ cycle. The exergy
24 destruction/loss in the high-temperature recuperator and precooler of RSBC/AC are
25 significantly reduced. The levelized cost of electricity and payback period for the
26 plant integrated with RSBC/AC are reduced by 0.46–0.77 ¢/kWh and 0.67–5.27
27 years, respectively, with an annual full-load hour ranging from 5000 to 8500.

28
29 **KEY WORDS:** Concentrated solar power; Supercritical CO₂ cycles; LiBr absorption
30 chiller; Air-cooled; LCOE

31

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