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# 1 Developing a grid-connected power optimization strategy for the 2 integration of wind power with low-temperature adiabatic 3 compressed air energy storage

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## 11 Abstract

12 Compressed Air Energy Storage (CAES) is considered as one of the key solutions to handle  
13 intermittent and random wind power. However, limited energy conversion efficiency and  
14 high capital cost of energy storage have restricted significantly the integration of wind power  
15 with CAES. In this study, a grid-connected power optimization strategy based on piecewise  
16 averaging of real-time wind power and electricity price data is developed to ensure  
17 continuous and stable power outputs to the grid using modified profit-maximizing algorithm.  
18 Thermodynamic analysis on the performance of low-temperature adiabatic CAES, energy  
19 conversion, and economic evaluation were carried out for a hybrid wind/low-temperature  
20 adiabatic CAES system. The proposed optimization strategy reduced the required capacity of  
21 CAES and the levelized cost of electricity (LCOE) significantly with greater utilization of  
22 wind power and operation profitability. The findings presented in this study is of significant  
23 reference value to future development of large-scale wind power integrated with CAES.

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25 **Keywords:** Compressed air energy storage; Large-scale wind power; Grid-connected power  
26 optimization; Thermodynamic analysis; Levelized cost of electricity

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