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C3Po1E-05 [28]: Theoretical investigation of a closed wind-solar-liquid CO2 energy storage system

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In order to overcome the disadvantages of uncertainty, randomness and intermittency brought by wind and solar energy, different energy storage systems were put forwarded. Liquid air energy storage is an important technology in solving the grid connection problem of large-scale renewable energy. However, the production of liquid air needs a cryogenic liquefaction technology below a temperature of -150℃, which has a high facility cost and cold loss. Therefore a closed hybrid wind-solar-liquid CO2 energy storage (WS-LCES) system was proposed. In the WS-LCES system, wind power was used to liquefy CO2 and the CO2 was stored in liquid phase with different pressures (8-80 bar) and temperatures (-50-20℃) at both energy storage and release stages. Also, the solar power was stored to increase the round trip efficiency. For the high density of liquid CO2, the system has a large storage capacity and no geographic constraints. A thermodynamic and parametric analysis was conducted to investigate the optimum system performance.

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