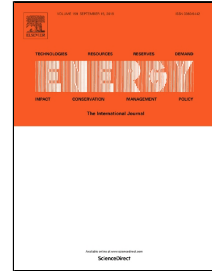


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Off-design thermodynamic performances of a solar tower aided coal-fired power plant for different solar multiples with thermal energy storage



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1 **Off-design thermodynamic performances of a solar tower aided coal-fired power**
2 **plant for different solar multiples with thermal energy storage**

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12 **Abstract:** Solar aided coal-fired power system has been proven to be a promising way to utilise
13 solar energy in large scale. In this paper, the performances of the solar tower aided coal-fired power
14 (STACP) system at 100% load, 75% load, and 50% load for different days are investigated and the
15 maximum solar power that the boiler can absorb under different plant loads are explored. Then, the
16 effects of solar multiple (SM) and the thermal energy storage (TES) hour on the daily performance
17 of STACP system are investigated. Results show that the maximum solar power that a 600 MW_e
18 boiler can absorb at 100% load, 75% load and 50% load are 76.4 MW_{th}, 54.2 MW_{th} and 23.0 MW_{th},
19 respectively. Due to the augmented energy from the solar field, the maximum standard coal
20 consumption rate is reduced by 13.53 g/kWh, 12.81 g/kWh and 8.22 g/kWh at 100% load, 75% load
21 and 50% load, respectively. With an increase of solar power input, the boiler efficiency, overall
22 system efficiency and solar thermal-to-electricity efficiency shown a downward trend. In addition,

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