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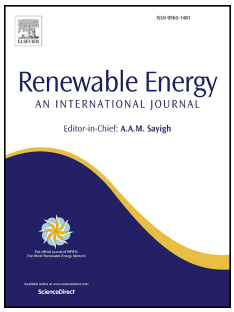

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Design and simulation of a solar double-chimney power plant

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ABSTRACT

The solar chimney power plant (SCPP) is one method of solar thermal utilization with high/super-high chimney. There are few methods to decrease the solar chimney height. One possible method is the sloped solar chimney power plant (SSCPP), which depends on the special geographical condition. In the present paper, another system is proposed to overcome this problem, which is named solar double-chimney power plant (SDCPP). Mathematical models of the SDCPP are established and its performances are analyzed. It is found that, for an SDCPP with 5MW configuration size, the average temperature rises of the horizontal and tilted solar collectors are 5.64K and 7.87K respectively. The highest wind speeds in the inner chimney and in the interlayer of the inner and outer chimney are 15.28m/s and 19.41m/s respectively. The annually average SDCPP power productivity and power efficiency are 4.72 MW and 1.2% respectively. The power productivity of the SDCPP is 1.59 times larger than that of the CSCPP and 2.77 times larger than that of the SSCPP. Through comparing with the CSCPPs in the literature, the SDCPPs can increase their power productivities by 21%-55%. The

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