

核能与可再生能源发电

抛物槽式太阳能热发电系统的模拟分析

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摘要: 抛物槽聚焦式太阳能发电有着广阔的发展前景,有必要通过系统仿真的方法对其在中国典型地区的运行性能进行分析,以便为该项技术在中国的可行性研究提供参照。运用STEC模块在TRNSYS环境下,按照朗肯循环原理建立35 MW槽式电站的仿真模型,在中国3个典型地区:西藏、新疆和内蒙古,选取9个地点对电站运行进行模拟。模拟结果表明,由于全年直射辐射强度较高,西藏和新疆地区更适合于建设该类电站,拉萨电站年发电量相对于位于内蒙古奈曼旗的电站要高出101.6%;作为衡量聚焦式太阳能电站系统性能的重要参数,电站的年光电转化效率可达9%~14%。同时提出了最佳集热器阵列面积的概念,模拟计算表明,该最佳面积随着直射太阳辐射通量的降低逐渐增大。

关键词: 聚焦式太阳能发电 抛物槽 直射辐射强度 选址 可行性研究

Simulation of Parabolic Trough Solar Power Generating System for Typical Chinese Sites

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Abstract: Parabolic trough concentrating solar power (CSP) has great potential in China, and it is necessary to study the operation performance of the CSP plant located in typical sites of China, for reference of the feasibility study of this technology in China. A parabolic trough CSP plant of 35 MW was simulated with Solar Thermal Electric Components(STEC) model in the environment of TRNSYS (version 16) for nine sites in three typical Chinese regions, respectively. The system model was established according to Rankine principle. The simulation results indicate that Tibet and Xinjiang are more suitable for locating the CSP plant due to their high direct normal insolation(DNI). The annual electricity output of the Lhasa project is 101.6% higher than that of Naiman. As a critical factor to evaluate the system performance, the annual solar-electricity efficiency in the range of 9%~14%, can be realized with the simulated 35 MW plants in 9 selected sites. Also the influence of solar field size to the system performance was studied, and the result reveals that the optimal field size shifts to a higher value with decreasing DNI.

Keywords: concentrating solar power parabolic trough direct normal insolation site selection feasibility study

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