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Solar energy potential and performance assessment of CSP plants in different areas of Iran

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Abstract

Concentrating solar power (CSP) plants only exploit direct beam solar radiation in order to generate electricity. It is generally assumed that CSP systems are economic only for locations with direct normal irradiation (DNI) above 1800 kWh/m²/year (about 5 kWh/m²/day). In the present study, talented regions of Iran to install CSP plants are identified by using the available measured data of global horizontal irradiation (GHI) from 21 cities. A computational code converts the measured GHI to DNI and by comparing the calculated data, six most talented city area of Iran are selected as the case study. By applying geographical, radiation and meteorological parameters to SAM software, the generation of electricity for a typical CSP plant for these locations are evaluated. The selected CSP plant is a parabolic trough (PT) power plant with capacity of 100 MW and 6 hour thermal storage. Results show that areas around the cities of Bandar-e Abbas, Bushehr, Esfahan, Kerman, Shiraz, and Yazd have more solar energy potential to establish CSP plants in Iran. Annual electricity power for these cities are calculated to be about 234 GWh, 245 GWh, 283 GWh, 318 GWh, 321 GWh and 318 GWh, respectively. Furthermore, employment of solar energy in these areas for electricity generation, considerably conserve fossil fuels and reduces CO₂ emission. Also, a comparison of DNI and power plant electricity generation in the 6 talented cities of Iran and 4 cities of Algeria are performed.

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