

Feasibility study of linear Fresnel solar thermal power plant in Algeria

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Abstract

Because of clean renewable electric power technologies is the human's future, a great number of thermal solar power plants with different configurations are being considered for deployment in different locations in Algeria. It is necessary to study the operating performance of the concentrator solar power plant located in typical sites of Algeria, in this work for reference of the feasibility study of this technology in Algeria, it is essential that the plant designs will be optimized for each specific location. The aim of this work is to describe the characteristics of a Fresnel solar power plant at different areas of Algeria Sahara. These areas have been chosen for comparison by shifting the plant to different locations; namely Hassi R'mel, Tamanrasset, Beni-Abbes, and El Oued. A specification has been developed in which plant characteristics namely: direct Normal Irradiance (DNI), solar field surface, block number, have been defined. The block surface, block panels' number, absorber surface, and finally thermal power losses in the absorber have been defined also. The calculation results have been depicted for each site. Indeed, the calculation of performance varies from a site to another with DNI mean values of 788.4W/m², 698.7W/m², 671.7W/m², and 636W/m², respectively for Tamanrasset, Beni-Abbes, El Oued and Hassi R'mel sites. The surface of solar field, block number, absorber surface and power loss have been also evaluated for the same sites.

Keywords: solar energy; solar concentrator mirrors; Fresnel solar thermal power plants; performance; thermoelectric plants