

Thermo-economic Assessment of an Integrated Solar Combined Cycle System

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Abstract

The ambitious Algerian program for diversification of electric energy sources is targeting 22 000 MWe from the renewable energy to the horizon of 2030. This study is a thermo-economic assessment of an integrated solar combined cycle system installed in the Saharan region, which during the nights or cloudy days works as a conventional combined cycle and does not need storage or back-up systems. The obtained results show, in one side that the solar electricity ratio may reach about 17 % and the global thermal efficiency up to 63 %, leading to lower fuel consumption and carbon emission. In the other side, the economic assessment depicts that the levelized cost of energy may reach a value of 0.0222 \$/kWh which is about 28 % higher than CC plants. By considering the environment this latter is even more and may reach about 0.0272 \$/kWh, but the annual solar contribution, relatively to that installation site, allows about 18.45 million \$ of fuel saving and avoidance of 0.89 million ton of CO₂ emission over 30 years of operation.

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