Comparative Performance Analysis of Photovoltaic (PV) and Concentrated Solar Power (CSP) Plants in the Saharan Region of Southwest Algeria

Glaoui Hachemi
University of Tahri Mohamed Bechar, Algeria
Dehini Rachid
University of Tahri Mohamed Bechar, Algeria

Abstract:

The increasing demand for renewable energy in Algeria, particularly in the Sahara region, has led to significant investments in solar power technologies. Among these, Photovoltaic (PV) and Concentrated Solar Power (CSP) systems are the most widely adopted solutions for large-scale energy production. This study presents a comparative analysis of PV and CSP technologies at the Zaouiet Kounta 6 MWc power plant, focusing on their efficiency, environmental adaptability, installation and operational costs, and overall performance in the challenging Saharan climate. The analysis examines key factors such as high solar irradiation, extreme temperatures, and dust accumulation, which significantly impact system efficiency and durability. Additionally, this research highlights the economic and technical feasibility of each technology, providing valuable insights into the optimal selection of solar power solutions for sustainable energy development in desert environments.

Keywords:

Renewable Energy, Photovoltaics (PV), Concentrated Solar Power (CSP), Solar Power, Saharan Environment, Energy Efficiency, Economic Feasibility, Solar Tracking, Dust Accumulation, Thermal Management, Hybrid Solar Systems, Photovoltaic Performance.