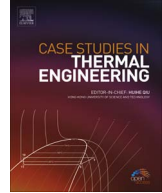




Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Case Studies in Thermal Engineering

journal homepage: www.elsevier.com/locate/csite



Modeling and performance simulation of 100 MW PTC based solar thermal power plant in Udaipur India



Deepak Bishoyi^{a,*}, K. Sudhakar^{a,b}

^a Energy Centre, Maulana Azad National Institute of Technology, Bhopal, India

^b Faculty of Mechanical Engineering, Universiti Malaysia, Pahang, 26600 Pahang, Malaysia

ARTICLE INFO

Keywords:

Parabolic trough
Solar thermal power
SAM (System Advisor Model)
Simulation
India

ABSTRACT

Solar energy is a key renewable energy source and the most abundant energy source on the globe. Solar energy can be converted into electric energy by using two different processes: by means of photovoltaic (PV) conversion and the thermodynamic cycles. Concentrated solar power (CSP) is viewed as one of the most promising alternatives in the field of solar energy utilization. Lifetime and efficiency of PV system are very less compared to the CSP technology. A 100 MW parabolic trough solar thermal power plant with 6 h of thermal energy storage has been evaluated in terms of design and thermal performance, based on the System Advisor Model (SAM). A location receiving an annual DNI of 2248.17 kW h/m² in Rajasthan is chosen for the technical feasibility of hypothetical CSP plant. The plant design consists of 194 solar collector loops with each loop comprising of 8 parabolic trough collectors. HITEC solar salt is chosen as an HTF due to its excellent thermodynamic properties. The designed plant can generate annual electricity of 285,288,352 kW h with the plant efficiency of 21%. The proposed design of PTC based solar thermal power plant and its performance analysis encourages further innovation and development of solar thermal power plants in India.