Solar energy is the most abundant source of energy on the earth and considered as an important alternative to fossil fuels. Solar energy can be converted into electric energy by using two different processes: photovoltaic conversion and the thermodynamic cycles. Lifetime and efficiency of PV power plant is lesser as compared to the CSP technology. CSP technology is viewed as one of the most promising alternative technology in the field of solar energy utilization. A 100 MW Linear Fresnel Reflector solar thermal power plant design with 6 hours of thermal energy storage has been evaluated for thermal performance using NREL SAM. A location receiving an annual DNI of 2248.17 kWh/m$^2$/year in Rajasthan is chosen for the technical feasibility of hypothetical CSP plant. The plant design consists of 16 numbers of solar collector modules in a loop. HITEC solar salt is chosen as an HTF due to its excellent thermodynamic properties. The designed plant can generate annual electricity of 263,973,360 kWh with the plant efficiency of 18.3%. The capacity utilization of the proposed LFR plant is found to be 30.2%. The LFR solar thermal power plant performance results encourage further innovation and development of CSP plants in India.