UNIVERSITI TEKNOLOGI MARA

OPTIMAL DEMAND RESPONSE OF SOLAR ENERGY GENERATION USING GENETIC ALGORITHM

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ABSTRACT

The aim of this study is to optimize the demand response of solar energy generation using Genetic Algorithm (GA) to minimize the daily yield loss caused by load shedding. The growing demand for renewable energy, especially solar energy, poses a challenge when it comes to balancing energy supply and demand, as energy is not constant and weather-dependent. The integration of solar energy into existing power grids is often hindered by fluctuations in solar radiation, unpredictable demand and inefficiencies in energy use. Without an effective optimization method, there is instability in the output and efficiency of the solar energy generated. To address this problem, a GA-based optimization model has been developed to improve the efficiency of energy generation by reducing wastage due to load shedding. The method involves collecting data from the solar energy project of UiTM Kampus Dungun, implementing GA for optimization, and evaluating its performance based on the fitness value and convergence trends. The objective function of the algorithm minimizes the daily losses due to load shedding while ensuring a balanced and stable energy distribution to the end users. The experimental results show that GA effectively reduces the energy losses and achieves an improvement of about 99% in demand side management. This study shows that GA is a viable tool for optimizing energy production from the sun and thus contributes to good energy management.

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