ABSTRACT

Renewable energy is one of the most promising energy sources of present day as well as for the future. Solar, wind, bio mass are the major sources of renewable energy. Among the sources of renewable energy solar plays a prominent role in facing the energy challenges of today's world. Solar power is the utilization of sunlight into electricity either directly by using PhotoVoltaics (PV) or using concentrated solar power. The solar power though it is abundant in nature the method to harness is difficult due to various reasons like obstruction of cloud over the solar panels, shadows due to buildings etc., Power obtained from PV is not sufficient to meet the energy needs either the solar panel are partially shaded or completely shaded, also other factors like solar insolation, temperature, configuration of PV array affects the performance of solar PV.

The severity of the partial shading can be reduced significantly by altering the array configuration. The main objective of the work is to develop a best suited strategy to minimize the effect of partial shading in solar PV array and to propose a fixed configuration method for PV arrays. The proposed method improves the power extraction from PV under different shading conditions in order to reduce the disparity losses without the physical movement of panels with just one time renumbering concept in order to improve the power extraction from the PV panel. The maximum power which is extracted can be tracked effectively using artificial intelligence based approach which adapts drop out algorithm.

To enhance the efficiency of the solar power plants, five methods are proposed namely Fair Division Method (FDM), Index Squaring Method (ISM) and Calcudoku Method (CM) Sequential Twirling Approach (STA), Pythagoras Theorem Approach (PTA). In these proposed methods the dispersion of shade is distributed within the PV array and the best suited configuration is analysed with respect to conventional methods. In order to compute the performance based on various irradiance and array current values, Monte Carlo Estimator (MCE) which is used for random sampling has been adopted, it calculates the mean and variance of the sampled data and the method with least variance value will have the better the performance.

It further deliberates the Artificial intelligence based Maximum Power Point Tracking (MPPT) which eliminates the demerits of conventional Perturb and Observe (P&O) based MPPT. They have the disadvantage of inaccuracy in tracking the maximum power when it has multiple peaks. It entails oscillatory power output even under constant irradiance. The proposed neural network based MPPT which utilizes dropout algorithm eliminates the difficulty in identifying the multiple peaks from the P&O method. Dropout refers to ignoring units (i.e. neurons) during the training phase of certain set of neurons which is chosen at random, this averaging based model can determine the actual location of MPPT. The effective implementation of dropout algorithm is done for Single Ended Primary Inductor Converter (SEPIC) Converter. The integration of converter is done using Dual Active Bridge (DAB) topology in order to understand the effective energy storage.