STAND ALONE PHOTOVOLTAIC ARRAY WITH PERTURB AND OBSERVE TECHNIQUE

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ABSTRACT
Stand alone photo voltaic array simulation model is presented in this paper. As the cost of solar panel is high so an efficient battery charger is required. In this paper Maximum power point tracking is implemented. The model is developed using single diode model and effect of solar irradiation and temperature are also included. Here perturb and observe technique is also implemented. [1]

Keywords: PV-Array, PV-Stand Alone System, Circuit Equivalent Model, Modeling.

I INTRODUCTION
Thermal power plant is mainly used to produce electricity, but the problem with them is the pollution. The excessive use of thermal power plant causes the reduction in air quality. An clean and green alternate to this problem is solar power. This can be harvested in two ways, one is solar thermal power plant and simple other one is solar cell or photovoltaic cell.

A photo voltaic cell converts solar energy directly into electricity. The basic of this device is when irradiation fall on it voltage is generated. These cells can be grouped in array or panel to get desired voltage and currents. When these panels are arranged in a particular form they are called photovoltaic array. Most of the people interested in modeling of photo voltaic panels. This paper focus on modeling photo voltaic modules or panels.

The electricity generated from the array can be feed directly to small dc loads like motors. Some application are required electronic converters to process electricity from PV array.
II MODELING OF PV PANEL

Fig 1. shows the equivalent circuit of the ideal photo voltaic cell. The basic equation from the theory of semiconductor that mathematically describe the I-V characteristics of the ideal photo voltaic cell is given by equation (1). This basic equation is used to simulate the solar cell.

\[ I = I_{ph} - I_D \]  \hspace{1cm} (1)

Fig. 1. Single-Diode Model of the Theoretical Photovoltaic Cell and Equivalent Circuit of a Practical Photovoltaic Device Including The Series And Parallel Resistances.

III NOMENCLATURE

- \( I_{PV}, V_{PV} \) - Solar cell current and voltage
- \( I_D, V_D \) - Diode current and voltage
- \( I_{ph} \) - Irradiation current (generated by solar light)
- \( G \) - Solar Irradiance (W/m\(^2\))
- \( T \) - Temperature
- \( a \) - Diode ideality factor
- \( K \) - Boltzmann’s constant
e - Electron charge

Ir - Reverse saturation current

Rsh, Rse - Shunt and series resistance

Vt - Thermal voltage (= nkT/q)

δV, δI - Ripple voltage and current

Ts, fs - Switching period & Frequency

D - Duty ratio

IV THE MPPT CONTROL ALGORITHMS

Perturb and Observe: The P&O method gets its name from how it works. The algorithm will change (perturb) the voltage of the PV panel (by changing the duty cycle), and then measure (observe) how the power changes. If the power increases, the voltage will continue to be changed in this direction. If a change in voltage causes a decrease in power, the voltage will then be changed in the other direction.

![Diagram](image-url)
V SIMULATION & RESULTS

Fig. 3. Current Vs Voltage curve

Fig. 4. Curves between power and voltage

Fig. 5. Simulation Model of P N O in MATLAB
VI CONCLUSION

All the curves and waveforms are drawn and studied to see the working of perturb and observe technique. It is also observe that this technique improves the power output but also increases the oscillation in output. But if we consider the cost of photovoltaic array its efficient to use any MPPT technique.
REFERENCES


