

MATLAB BASED STUDY OF PHOTOVOLTAIC CELLS AND ARRAY IN DIFFERENT OPERATING REGIMES

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Solar radiant energy accounts for most of the usable renewable energy on this earth. Photovoltaic cell is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductor that exhibit the photovoltaic effect [1]. In this research, MATLAB used to get the power-versus-voltage characteristics curves for photovoltaic cells. These curves used to calculate the specifications of a photovoltaic cell system such as short circuit current, open circuit voltage, power and maximum power [2]. Equivalent circuit of photovoltaic cell and mathematical model for photovoltaic cell and array are examined in this research [3].

Nevertheless, the current-voltage equation is a transcendental expression. It has no explicit analytical solution. The analytical methods give exact solutions by means of algebraic equations. However, due to implicit nature and nonlinearity of photovoltaic cell or module characteristics, it is hard to find out the analytical solution of all unknown parameters. Analytical methods have also some limitations and could not give exact solutions when the functions are not given. Thus numerical methods preferred in this case. It is because of the fact that numerical methods give approximate solution of the nonlinear problems without searching for exact solutions [4].

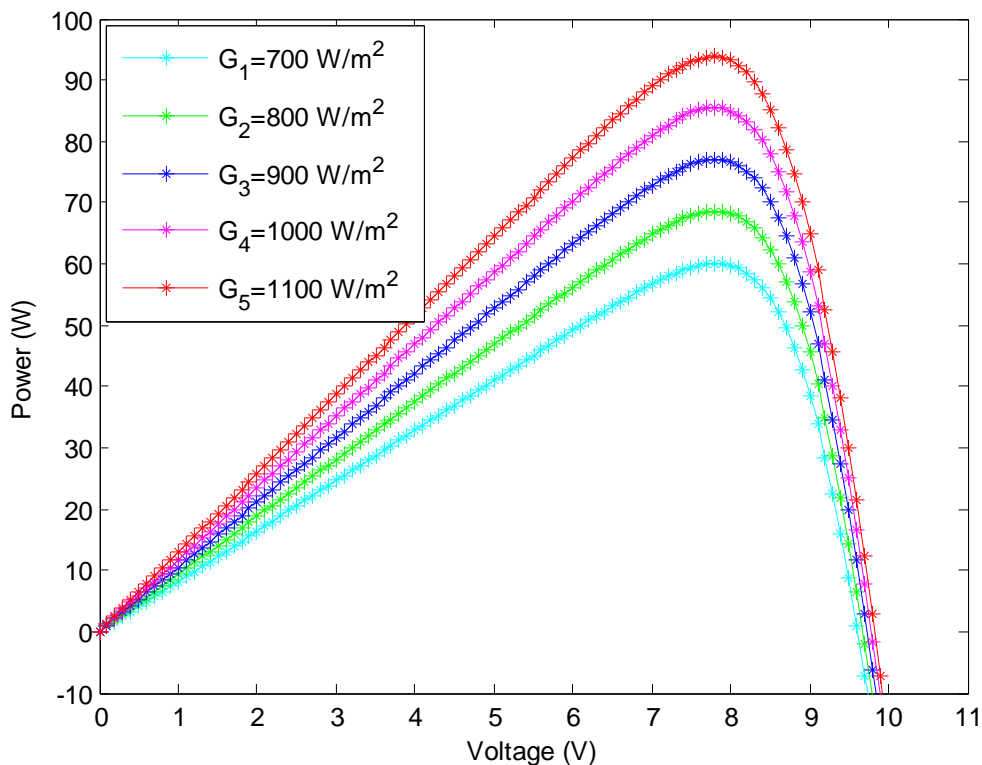


Fig.1. P-V characteristic curves of photovoltaic cells for various irradiance and constant temperature.

Figure 1 show the P-V curves for different irradiance. The effect of increasing irradiance while temperature was fixed is increasing the output and short circuit current, the output voltage almost not affected very much.

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