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Concentrating Power For Mppt Solar Pv Module Forming Channelization Of Efficient Energy

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Abstract

The energy of photovoltaic (PV) is going to become a most relevant part of renewable energy in world, by PVC Cell system for sufficient energy extraction this research will scrutinize the solar PV energy generation and conversion by effective devices to grid alliances Here this treatise target on I-V and P-V characteristics of Photo volatile modules or array, primarily under irregular shading condition, the model development of PV system and considering both physical and electrical parameters of solar PV module. The treatise ponder that how disparate bypass diode collocation could be influences maximum power conclusion characteristics of a solar PV module or array.

Keywords: *photovoltaic, PV array, modulation, MPPT technique.*

1. Introduction

The research concentration particularly at how traditional and proposed MPPT methods behave under protean weather circumstance in a digital control environment. Besides, from a solar PV system in order to develop Adequate technology for decisive energy conclusion [2], [7], this research scrutinize typical (MPPT) control strategies applied in solar PV industry, proposes accommodative and for rapid and loyal conclusion of solar PV energy. Power converters are used for fast switching and related to quick and accurate finding of the maximum power output has come by a calculated experimental system is developed by using real-time simulation technology, as experiments in hardware system the conventional and proposed MPPT techniques has build-up to compare and validate in a many practical condition [8-9]. After done 3rd comparison, evaluation and studied for various types MPPT techniques find out the many advantages, disadvantages and other properties. Thirdly it is going to achieve the making a development for efficient and loyal energy conversion technologies, for various types of converter configuration of a PV System will be find out by doing of some compression and energy extraction will be shown in this treatise, in this treatise after doing the different experiment by different bypass diode schemes we have find out very detailed Intensification and impacts of energy. By using effective bypass diode connection the central converter scheme has quite easy construction point of view and low in cost system to raise PV system in the path of efficiency, sufficiency, infallibility and performance in the comparison with micro-converter based PV systems [9]. After all for next-generation the PV system including energy storage units (ESU) provides flexibleness to operators of distribution scheme by the Evolution of coordinated control system. The main purpose of the control of hybrid PV system and energy repository unit is to supply the craved active and reactive generation of power to grid and simultaneously the stability of the dc-link voltage level of the PV system and energy repository system to be preserved by using coordinated control of power electronic converters. This treatise scrutinizes Ternary different combined control arrangement and path for grid integration of PV modules, battery repository and super capacitor (SC) [1], [5], following research article describes the mathematical modeling of generation of green energy using PV Array module as earlier modeling of piezoelectric crystal has been done by the author containing optimization of energy output in piezoelectricity generating unit and its electrical equivalent [6], [11].

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2. Description of Array

Solar cells are useful device for conversion of IR heat (photons) into potential gradient develops across the PN junction, equivalent circuit as depicted in Figure 1, as per the complexity in the design structure of the solar cell, manufacturers usually present a family of operating curves (P-V) as explained in Figure 2. These characteristics are obtained by measuring the array volt-ampere for a different luminous intensity or intensity of photons over arrays [1] [4] [8]. These characteristics obtained from the optimum output characteristic curve of voltage (V) or current (I), related to the focusing maximum power point tracking, can be calculated and calculation has been measured as per different intensity levels [3-4], [10]. It is clearly seen in Figure 2 that the current increases as the irradiance levels increase. The MPPT tracking concentrate on rapid increases in accurate results with a sudden rise in positive slope proportional to the illumination [3-4].

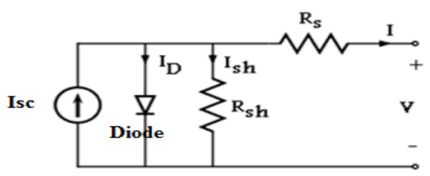

Figure 1. Equivalent Circuit of PV Array

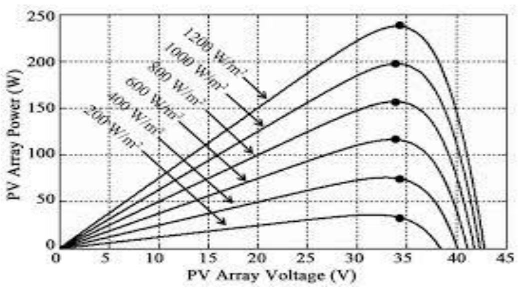

Figure 2. V-I and P-I Characteristics at Constant Temperature

The sequential parameters which tend to affect the irradiance and illumination levels on a surface of the panel at a fixed tilt on rotation of the earth on daily basis and revolution of earth depending upon the seasonal solar path, the formation of clouds (weather conditions), pollution and dust between the surface of panel and the sunlight, and the shade of the object positioned such that the illumination level is reduced, etc [4], [10].

The equation of the PV output current (I) is expressed as a function of the array voltage (V).

$$I = I_{sc} - I_o \{ e^{\frac{q(V+IR_s)}{KT_k}} - 1 \} - (V + IR_s)/R_{sh} \quad (1)$$

where V and I represent the PV output voltage and current, respectively; $R_s$and R_{sh} are the series and shunt resistance of the cell (in Figure 1); q is the electronic charge; I_{sc} is the light generated current; I_o is the reverse Saturation current; K is the Boltzman constant, and $T_k$is the temperature in$K$ [4], [7].

Equation (1) can be written in another form as [7]

$$I = I_{sc}\{1 - K_1[e^{K_2 V^m} - 1]\} - (V + IR_s)/R_{sh} \quad (2)$$

Where the coefficient K_1, K_2 and m are defined as:

$$K_1 = 0.01175,$$

$$K_2 = K_4/(V_{oc})^m,$$

$$K_4 = \ln((K_1 + 1)/K_1)$$

$$K_3 = \ln[(I_{sc}(1+K_1) - I_{mpp})/K_1 I_{sc}],$$

$$m = \ln(K_3/K_4)/\ln(V_{mpp}/V_{oc})$$

$I_{mpp}$is the current at maximum output power, V_{mpp} is the voltage at maximum power, I_{sc} is the short circuit current and V_{oc} is the open circuit voltage of the array.

Equation 2 is only applicable at one particular operating condition of illumination *G* and cell temperature T_c. The parameter variations can be calculated by measuring the variation of the short-circuit current and the open-circuit voltage in these conditions using the parameters at the normal illumination and cell temperature. Equation 2 is used for the *I-V* and *P-V* characteristics for various illumination and fixed temperature (25^0C) in Figure 2.

3. Arrangement of Algorithm

Constant voltage ratio method as measured “V” in Figure 3 represents the open circuit voltage, output current (I) from the PV array kept to be kept to zero quickly to calculate the V_{oc}ie “V” and then immediately kept to a pre-valued percentage of the calculated voltage, finally around 75%.There is wastage of energy during the same time the current (I) is kept to zero. The approximation of 75% as the maximum power point to V_{OC} ratio is not may not be précised, although simple and less costly to be applied, the interruptions weakens down array efficiency and does not suitable for finding the actual MPP and therefore the efficiencies of some systems may reach above 94%.

Few years back Solar inverters focuses on MPPT for the entire PV array (associated module) as a complete system. This kind of having systems the same current, redirected by the inverter, flows through series of strings in complete modules. As different modules have different I-V curves and different MPPs (as per manufacturing point of view, uneven shading, etc.) This structure concludes that some modules will be performing below their MPP, resulting in below efficient system. Now a day’s placement has been done for maximum power point tracker into individual modules, allowing each module to operate at maximum output-input ratio despite unequal shading, soiling or electrical mismatch. Calculation follows that having one inverter with one (MPP) Tracker for a substantial system that has east and west placing modules presents advantages when compared to having two inverters or one inverter with more than one (MPP) Tracker.

4. The Current-Voltage Characteristic and the Powers Curves

The physical constants are the Boltzmann constant K_B, the electron charge q and the thermal voltage V_{th}=K_B.T/q, where T is the temperature

$$I\_max := \frac{1}{Rlmp + Rs}\left(\left(\operatorname{LambertW}\left(\frac{Is\,(Rlmp + Rs)\,e^{\frac{Iph\,Rlmp + Iph\,Rs + Is\,Rlmp + Is\,Rs}{\eta\,Vth\,(Gp\,Rlmp + Gp\,Rs + 1)}}}{Gp\,Rlmp\,Vth\,\eta + Gp\,Rs\,Vth\,\eta + Vth\,\eta}\right) + \frac{Iph\,Rlmp + Iph\,Rs + Is\,Rlmp + Is\,Rs}{\eta\,Vth\,(Gp\,Rlmp + Gp\,Rs + 1)}\right)\eta\,Vth\right) \quad (1)$$

$$V\_max := \frac{1}{Rlmp + Rs}\left(Rlmp\,Vth\,\eta\left(-\operatorname{LambertW}\left(\frac{Is\,(Rlmp + Rs)\,e^{\frac{Iph\,Rlmp + Iph\,Rs + Is\,Rlmp + Is\,Rs}{\eta\,Vth\,(Gp\,Rlmp + Gp\,Rs + 1)}}}{Gp\,Rlmp\,Vth\,\eta + Gp\,Rs\,Vth\,\eta + Vth\,\eta}\right) + \frac{Iph\,Rlmp + Iph\,Rs + Is\,Rlmp + Is\,Rs}{\eta\,Vth\,(Gp\,Rlmp + Gp\,Rs + 1)}\right)\right) \quad (2)$$

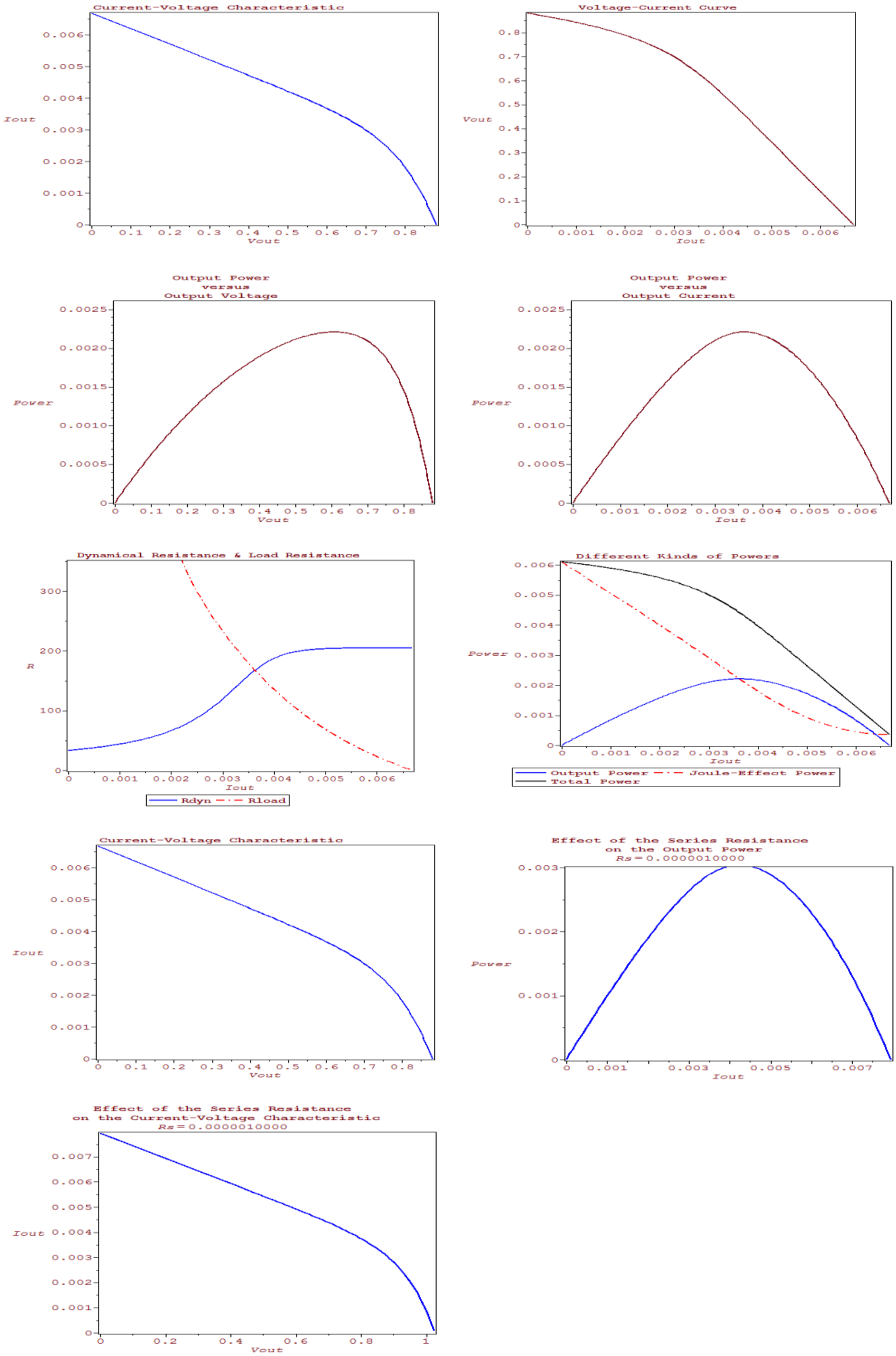

Figure 3. Output Voltage Curve

4.1. Physical Parameters Effect

Effect of the series resistance Rs:

We begin by introducing the current-voltage characteristic (equation (6):

1. tr_equa:=Iout=Iph-Is*(exp((Vout+Iout*Rs)/(eta*Vth))-1)-Gp*(Vout+Rs*Iout):
   For Gp, Iph, η, Is, we use the numerical values given in the previous section. Rs lies in the range 10^(-6) ohms to 100 ohms.
2. kB:=1.18062*10^(-23):T:=400:q:=1.30219*10^(-19):Vth:=(kB*T)/q:
3. Gp:=5.07*10^(-3):Iph:=7.94*10^(-3):eta:=2.31:Is:=13.6*10^(-9):
   In the next Figures 4, we give animations to evidence the effect of the series resistance on the current-voltage characteristic and on the output power of the solar cell Pout, Iout:

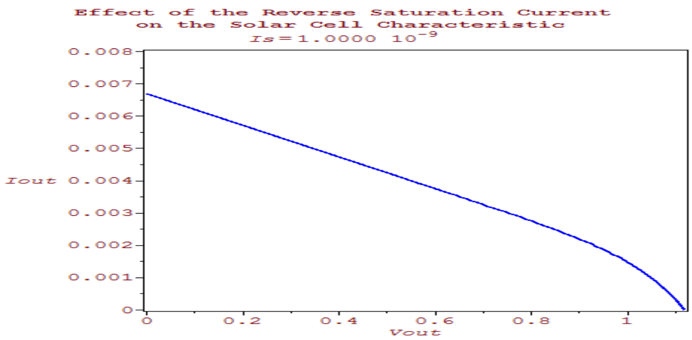

Figure 4. Effect of the series resistance on the current-voltage characteristic and on the Output Power of the Solar Cell Pout

4. kB:=1.38062*10^(-23):T:=400:q:=1.60219*10^(-19):Vth:=(kB*T)/q:
5. animate(plot,[Pow_cur(Iout),Iout=0..Isc,Power=0..0.0029,axes=boxed,numpoints=100,thickness=2,linestyle=SOLID,color=blue,title="Effect of the Reverse Saturation Current\n on the Output Power"],Is=10^(-9)..100*10^(-9)). As shown in the Figure 5.

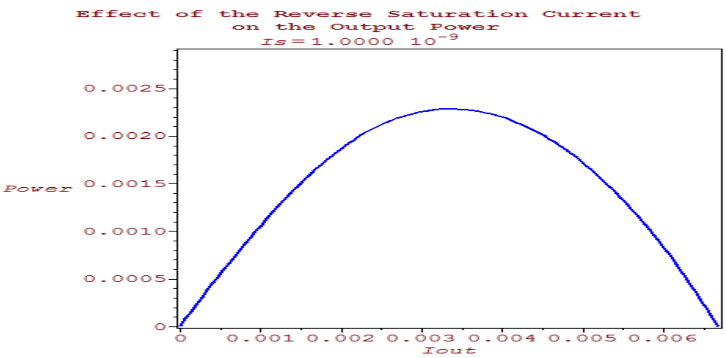

Figure 5. Effect of the Reverse Saturation Current on the Output Power

4.2. Effect of the ideality factor η:

1. restart:with(plots):Digits:=10:
2. tr_equa:=Iout=Iph-Is*(exp((Vout+Iout*Rs)/(eta*Vth))-1)Gp*(Vout+Rs*Iout):
3. kB:=1.18062*10^(-23):T:=400:q:=1.20219*10^(-19):Vth:=(kB*T)/q:
4. The numerical values of and are given in the previous section. increases from 1 to 3.
5. Gp:=5.07*10^(-3):Rs:=8.59:Iph:=7.94*10^(-3):Is:=13.6*10^(-9):
6. In the next Figures 6, we give the effect of the ideality factor on the current-voltage characteristic and on the output power of the solar cell:

7. animate(plot,[Iout(Vout),Vout=0..Voc,Iout=0..Isc,axes=boxed,numpoints=100,thickness=2,linestyle=SOLID,color=blue,title="Effect of the Ideality Factor\n on the Current-Voltage Characteristic"], eta=1..3);

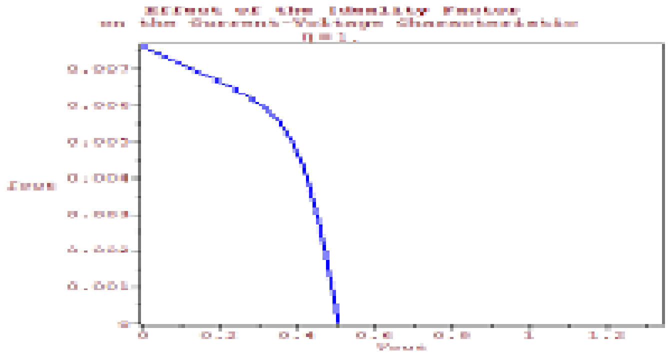

Figure 6. Effect of the Ideality Factor on the current-voltage Characteristic and on the Output Power of the Solar Cell

5. Conclusion

There are various methods of describing conductance the methods are observable, and rising conducting medium, are examples of "incremental rising slope conductance" procedure for finding the local peak value of the power characteristics for the condition of operation for the PV array, and so providing a true peak power point. The (P & O) method may be responsible for produce harmonics of output power around the MPP also under steady state irradiance, whereas Incremental Conductance Method (ICM) suitable instated of (P and O) method that it can be used in the MPP without harmonics around same coordinates, performing MPPT under sudden varying irradiation conditions with higher side of accuracy than the (P&O) method. Since, the (ICM) can produce harmonics and can perform direct impact under rapid change in atmospheric conditions, as the sampling frequency rate decreases due to the high complexity in the designed algorithm compared to the (P&O) method.

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