IJSRD - International Journal for Scientific Research & Development| Vol. 5, Issue 07, 2017 | ISSN (online): 2321-0613

Enhancement Efficiency of PV Smart Grid Power Convertor

[1]Akhilesh Soni [2]Prasant Kumar
[2]Assistant Professor
[1,2]Department of Electrical Engineering
[1,2](MPCT) Gwalior, INDIA

Abstract— The Smart Grid, thought to be consecutive generation power system, uses two-way flows of electricity and knowledge to make a cosmopolitan automatic energy delivery network .During this article, the facultative technologies for the Smart Grid. We tend to explore 3 major systems, specifically the sensible infrastructure system, the sensible management system, and therefore the sensible protection system. We tend to conjointly propose potential future directions in every system. Specifically, for the sensible infrastructure system, we tend to explore the sensible energy system, the sensible data system, and therefore the sensible communication system. For the sensible management system, we tend to explore numerous management objectives, like rising energy potency, identification demand, maximizing utility, reducing value, and dominant emission. We tend to conjointly explore numerous management strategies to attain these objectives. For the Smart protection system, we tend to explore numerous failure protection mechanisms that improve the dependableness of the sensible Grid, and explore the protection and privacy problems within the sensible Grid.

Key words: Smart Grid, Power Grid, Survey, Energy, Information, Communications, Management, Protection, Security, Privacy

I. Introduction

A smart grid (SG), also called smart electrical/power grid, intelligent grid, future grid, inter grid, or intra grid, is an enhancement of the 20th century power grid. The traditional power grids are generally used to carry power from a few central generators to a large number of users or customers. In contrast, the SG uses two-way flows of electricity and information to create an automated and distributed advanced energy delivery network. Table I gives a brief comparison between the existing grid and the SG. By utilizing modern information technologies, the SG is capable of delivering power in more efficient ways and responding to wide ranging conditions and events. Broadly stated, the SG could respond to events that occur anywhere in the grid, such as power generation, transmission, distribution, and consumption, and adopt the corresponding strategies. For instance, once a medium voltage transformer failure event occurs in the Distribution grid, the SG may automatically change the power flow and recover the power delivery service.

II. Proposed algorithm smart MPPT system

The maximum power is computed online using a modified perturb and observe algorithm. The computed maximum power is compared with instantaneous actual PV power, the error between reference (maximum) power and actual power activates ON/OFF controller with a hysteresis band to drive the buck chopper. Therefore, the instantaneous power extracted from the PV is maintained between the tolerance bands. The problem considered by MPPT methods is to automatically find the voltage VMPP or current IMPP at which a PV array delivers maximum power under a given temperature and irradiance. In this section, commonly used MPPT methods are introduced in an arbitrary order.

$$VMPP \approx k1\ VOC$$

This factor k1 has been reported to be between 0.71 an 0.78. Once the constant k1 is known, VMPP is computed by measuring VOC periodically. Although the implementation of this method is simple and cheap, its tracking efficiency is relatively low due to the utilization of inaccurate values of the constant k1 in the computation of VMMP.

The maximum power is computed online using a modified perturb and observe algorithm. The computed maximum power is compared with instantaneous actual PV power, the error between reference (maximum) power and actual power activates ON/OFF controller with a hysteresis band to drive the buck chopper. Therefore, the instantaneous power extracted from the PV is maintained between the tolerance bands.

A. *Fractional Short-Circuit Current:*

The method results from the fact that, the current at maximum power point IMPP is approximately linearly related to the short circuit current ISC of the PV array.

$$IMPP \approx k2\ ISC \quad (3)$$

Like in the fractional voltage method, k2is not constant. It is found to be between 0.78 and 0.92. The accuracy of the method and tracking efficiency depends on the accuracy of K2 and periodic measurement of short circuit current.

B. *Incremental Conductance:*

The method is based on the principle that the slope of the PV array power curve is zero at the maximum power point. (dP/dV) = 0. Since (P = VI), it yields:

$$\Delta I/\Delta V = - I/V \text{ , at MPP}$$
$$\Delta I/\Delta V > - I/V \text{ , left of MPP}$$
$$\Delta I/\Delta V < - I/V \text{ , right of MPP}$$

The MPP can be tracked by comparing the instantaneous conductance (I/V) to the incremental conductance (ΔI/ΔV). The algorithm increments or decrement the array reference voltage until the condition of equation (4.a) is satisfied. Once the Maximum power is reached, the operation of the PV array is maintained at this point. This method requires high sampling rates and fast calculations of the power slope.

III. Result & simulation model

A diagram of a proposed standalone photovoltaic system is illustrated in The system is modelled in MATLAB/Simulink. A boost converter is used to interface a PV array to a resistive load. The inductance of the boost converter is, input capacitance is, and output capacitor is To perform the maximum power point tracking, both P & O and IC algorithms have been implemented with all consideration of the optimization techniques. The simulation allows verification of the feasibility and relative performance of both algorithms under correctly the same conditions. Here, the main aspect to consider is the dynamic performance in terms of the speed at which the system converges on maximum power point, and the ripple in the power due to oscillations around the maximum power point at steady state conditions.

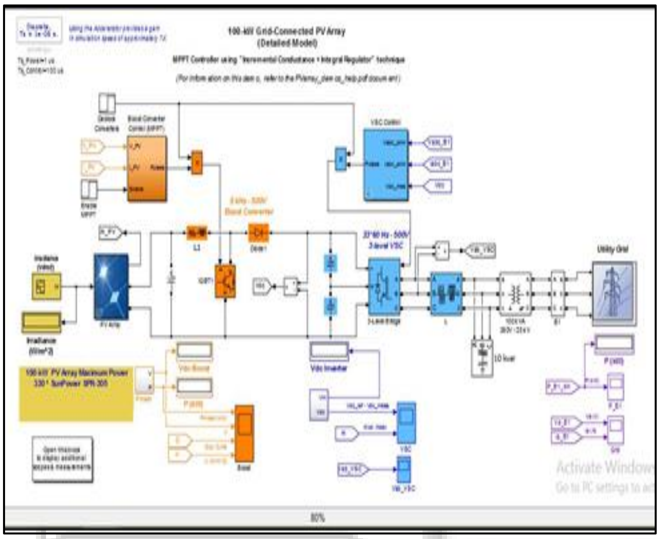

Fig. 1: Simulink Modeling in PV System

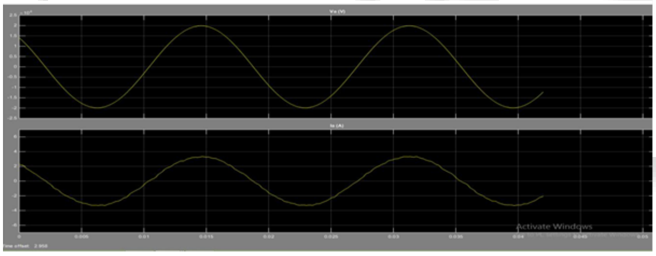

Fig. 2: Grid Output voltage waveform

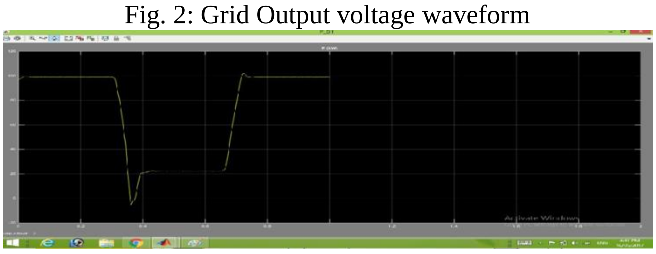

Fig. 3: All over power of Grid Output

Fig. 4: Power, Voltage, Duty cycle, Irritation curve

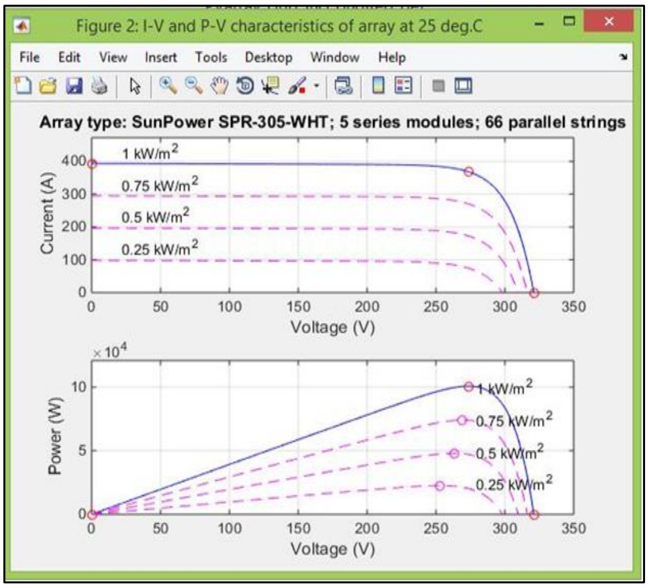

Fig. 5: V- I characteristics and Power –voltage curve

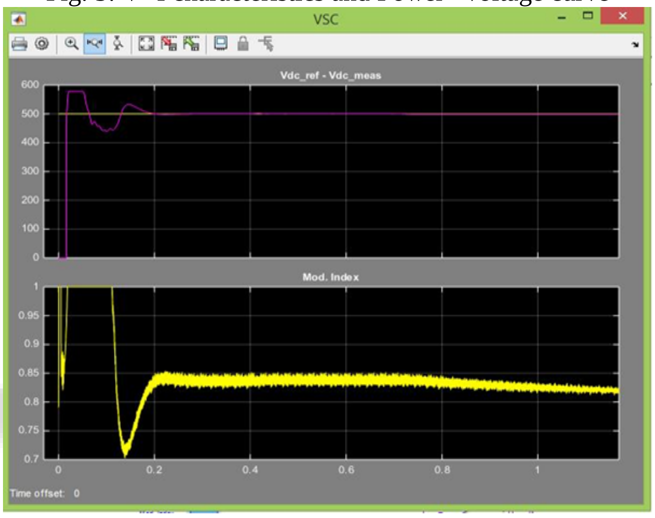

Fig. 6: Mode index Response

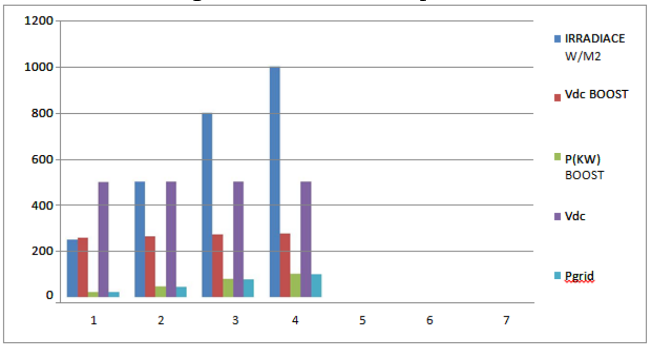

Fig. 7: Higher efficiency above of 99.00%

IV. CONCLUSION

In this Thesis, a general presentation of the photovoltaic systems and its components has been made. Models have been analyzed regarding the MPPT interaction. Various MPPT Techniques have been described and simulated. Some comparisons of MPPT's have been presented on: The requested sensors, which give an indication on the MPPT cost. The response time to a Solar irradiance step; The performance of MPPT's for a 2 PV series structures; Some drawbacks of each MPPT technique. Finally, among the compared MPPT Method, Perturb & Observe Method seems the most use. Indeed, the P&Ob is the fastest and stable, due to his variable perturbing value. Furthermore, the Three-Point Weighted (P&Oc) is the most robust, due to an equivalent 2nd order Gradient approximation. Precisely, even if the P&Oc responses are very slow compared to P&Ob, simulation results show that only the P&Oc is able to obtain the Maximum Power Point, if two panels are connected in series with different solar irradiance.

REFERENCES

[1] R. Faranda and S. Leva,"Energy comparison of MPPT techniques for PV Systems", WSEAS Trans. on Power Systems, Vol.3, No.6, June 2008, pp. 446-455.
[2] T. Esram, and P.L. Chapman, “Comparison of Photovoltaic Array Maximum Power Point Tracking Techniques”, IEEE Trans. Energy Conv., Vol.22, No.2, June 2007, pp.439-449.
[3] C. Hua and C. Shen, “Comparative Study of Peak Power Tracking Techniques for Solar Storage System”, Proc. APEC, 1998, pp. 679-685.
[4] D.P.Hohm and M.E.Ropp, “Comparative Study of Maximum Power Point Tracking Algorithms Using an Experimental, Programmable, Maximum Power Point Tracking Test Bed”, Proc. Photovoltaic Specialist Conference, 2000, pp. 1699-1702.
[5] K.H.Hussein, I.Muta, T.Hoshino and M.osakada, “Maximum Power Point Tracking: an Algorithm for Rapidly Chancing Atmospheric Conditions”, IEE Proc.-Gener. Transm.Distrib.,Vol.142, No.1, Jan. 1995, pp. 59-64.
[6] Salas, E. Olias, A. Barrado, and A. Lazaro, "Review of the maximum power point tracking algorithms for stand-alone photovoltaic systems", Solar Energy Materials and Solar Cells, Vol.90, 2006, pp. 1555-1578.
[7] T. J. Liang, J. F. Chen, T. C. Mi, Y. C. Kuo, and C. A. Cheng, "Study and implementation of DSP-based photovoltaic energy conversion system", Proc. of the 4th IEEE Int. Conf. on Power Electronics and Drive Systems, Vol.2, Oct. 2001, pp. 807-810.
[8] A. Luque, S. Hegedus, “Handbook of Photovoltaic Science and Engineering”, Wiley, Jul. 2003, ISBN: 0471491969
[9] J. Poortmans, V. Arkhipov, “Thin Film Solar Cells-Fabrication, Characterization and Applications”, Wiley, Nov. 2006 ISBN:0470091266.
[10] N.Kasa, T.lida and H.lwamoto, “Maximum power point tracking with capacitor identifier for photovoltaic power system”
[11] I. Glasner, J. Appelbaum, “Advantage of boost vs. buck topology for maximum power point tracker in photovoltaic systems”,
[12] G.J. Yu, Y.S. Jung, J.Y. Choi, G.S. Kim, “A novel two-mode MPPT control algorithm based on comparative study of existing algorithms”

