

# Review on Novel Grid Connected PV Solar System with Limited Reactive Power Compensation

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**Abstract**— Solar PV systems is a great source for power generation specially in Vidarbha. Solar PV generation can be placed near to the consumer premises as compared to other renewable source of generation. The rooftop PV system in general is grid tied and supports the off grid load with battery backup system. The reactive power is having great concern with solar performance.

**Keywords:** DC link, PV panel,MPPT, PWM,PLL

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## I. INTRODUCTION

A maximum power point tracker(MPPT) concentrate the output of PV module with a DC to DC (Boost) converter. In this paper study is carried out on the single phase synchronous reference frame (SRF) and on (VSC).this helps in the maximum generated power emigration by maintaining the DC link voltage constant without battery support.[1]

## II. EXPERIMENTAL SET UP

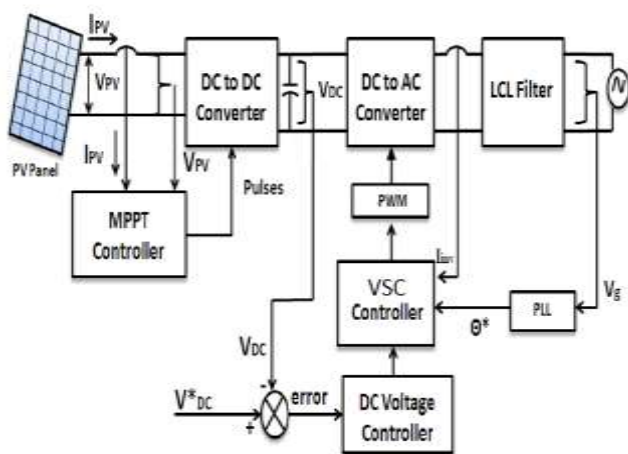


Fig.1: Block diagram of studied system with MPPT and PWM

Fig 1 shows schematic diagram of single phase grid connected PV system it consist of PV panels, DC-DC, MPPT controller, tank capacitor, VSC and various RL loads. System is consist of a matrix of PV arrays, which converts sunlight into DC power, a DC to DC boost converter to boost up the PV array voltage to a higher value.all the other miscellaneous are connected as per block diagram.

Various useful blocks explain below:

### A.PV Array MODULE

PV array is composed of number of PV panels. While PV panel is a seriescombination of solar cells[7]. A solar cell is basically a semiconductor diode whose p–n junction is exposed to light. A single solar cell can produce only up to 3 to 5 W output power and to increase the output power numbers of such cells are connected in series [1].

### B. DC to DC Boost Converter

DC to DC Converters shown in Fig.2 is used for converting one level of DC voltage to another level of DC voltage .This transformation is done with the help of a network consisting of storage elements like inductor and capacitor [1]

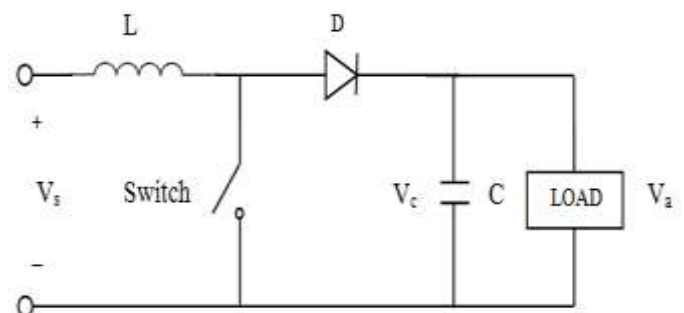


Fig.2. DC to DC Boost Converter

### C. Voltage Source Converter and SRF

Voltage Source Converters operating with the specified vector control strategy it can perform independent control of active/reactive power sending and receiving end. This ability of VSC makes it suitable for connection to weak AC networks, i.e. without local voltage sources. For power reversal, the DC voltage polarity remains the same for VSC

based transmission system and the power transfer depends only on the direction of the DC current. These various features helpful in reactive power control and use of PWM also becomes convenient.[8]

Synchronous reference frame (SRF) is mainly used with three phase system in which sinusoidal varying quantities are being transferred to dc quantities that provides better and precise control than PQ based control even under distorted condition of mains. But SRF based control scheme can be customized for single phase which can't be utilized to get the desired dc quantity to generate required reference command.[2]

#### D. LCL Filter

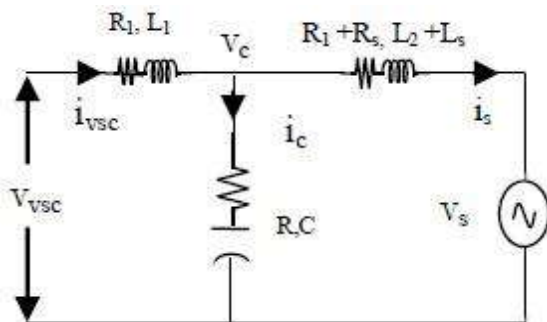


Fig.3. LCL Filter

Fig. 3 shows the LCL filter which is placed at the VSC output terminal to get the filtered output.[3] Proper design of filter is crucial from the stability point of view. The inverter output voltage is non-sinusoidal and hence it is required to connect a low pass filter between the inverter and the grid. Here Passive low pass harmonic filter will be used to reduce voltage harmonics and current distortion. This filter may be of L type or LC type or LCL type filter. The L type filters provide an attenuation of -20 dB/decade for all the range of frequencies.[4]

#### III. PREREQUISITE SOFTWARE FOR APPROACH

The simulation of above system can be design in MATLAB 2010.

#### IV. CONCLUSION

Reactive power control is need in solar PV system. This paper introduce study of new control scheme based on SRF theory for rooftop PV grid connected system. The VSC can be used it takes the advantage of both current and voltage

controllers. Which is also called current driven PWM based voltage controller. the VSC tracked power is driven into the grid by proper control on DC link voltage. It also ensured the total power being generated by PV transferred across the DC bus by the inverter to the grid. The DC Link system also provide control on the reactive power.[10]

#### REFERENCES

- [1] Velasco de la Fuente, D. ; Garcera, G. ; Figueres, E. ; Guacaneme, J. "Reconfigurable control scheme for a PV micro inverter working in both grid connected and island modes," IEEE Trans. Industrial Electronics, 2012.
- [2] Jmjun Liu ;Jun Yang ;Zhaoan Wang "A New Approach For Single- Phase Harmonic Current Detecting And Its Application in a Hybrid Active Power Filter," IEEE conf., 1999.
- [3] B. Singh, V. Verma, "Selective compensation of power-quality problems through active power filter by current decomposition" IEEE Trans. Power delivery., vol. 23, no. 2, April 2008.
- [4] Guohong Zeng; Rasmussen, T.W.; Lin Ma; Teodorescu, R., "Design and control of LCL-filter with active damping for Active Power Filter," IEEE International Symposium on Industrial Electronics, pp. 2657-2562, 2010.
- [5] S.Mekhilef, "Performance of grid connected inverter with maximum power point tracker and power factor control," International Journal of Power Electronics, vol. 1, pp. 49-62, 2008.
- [6] S.Mekh Femia, N.; Petrone, G.; Spagnuolo, G.; Vitelli, M., "A Technique for Improving P&O MPPT Performances of Double-Stage Grid-Connected Photovoltaic Systems," IEEE Trans. Industrial Electronics, vol. 56, pp. 4473-4482, 2009.
- [7] M. G. Villalava, j. r. Gazoli, E. Ruppert F., "Modelling and circuit -based simulation of Photovoltaic arrays" Brazilian Journal of Power Electronics, vol 14, no.4, pp. 35-45, 2009.
- [8] B. Crowhurst, E.F. El-Saadany, L. El Chaar and L.A. Lamont "Single- Phase Grid-Tie Inverter Control Using DQ Transform for Active and Reactive Load Power Compensation," IEEE conf., PECON, Malaysia, 2010.
- [9] M. Latour, M. Reking, I. Theologitis, M. Papoutsis and G. Masson, "Global market outlook for photovoltaics 2013-2017," EPIA, pp.5-6, 2013.
- [10] G. Masson, S. Orlandi, and M. Reking, "Global energy outlook for photovoltaics 2014-2018," EPIA, pp.9-11, 2014.
- [11] L. Legarda, et al., "Republic Act 9513: Renewable Energy Act of 2008," Philippines, p.11, 2008