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Reduced sensor based control of PV-DSTATCOM with switch current limiting scheme

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Abstract: The work delineated in this paper deals with the reduced sensor based operation of PV-DSTATCOM focusing on the voltage source inverter (VSI) switch current limiting control. Here, the VLLMS algorithm based soft computing technique of PV- DSTATCOM control is modified to incorporate both reduced sensor as well as switch current limiting schemes. Fault condition and uncertain load demand increases the risk of transient or high current flowing through the DSTATCOM switches beyond its capacity which damages the switches and ultimately affects the performance of the system. DSTATCOM is predominantly used for improvement of current related power quality issues by providing non-real power (i.e. the reactive and harmonic component) of the load demand. Hence, by controlling the amount of non-real power flow from the DSTATCOM, the current through the VSI switches can be limited. During this transient or high current condition, the control transits from power quality improvement mode to protection mode and as a result unity power factor operation at P.C.C is compromised for that period or few cycles of transient condition. Efficient operation of any control demands proper information about the current and voltage of the system which are determined by using sensors but fault in these sensors may deteriorate the controller performance which eventually degrades the system efficacy. Therefore, to mitigate this issue the number of measurement units is reduced i.e. measurement of current of only two phases for load as well as grid and measurement of line voltages using two voltage sensors instead of three sensors for each phase. The reduction in number of sensors is done without compromising with the controller efficiency. The system is studied using MATLAB/Simulink under different condition of steady- state, varying solar irradiance, increasing load above rated capacity. Further, the proposed control is validated in the developed experimental prototype.

Keywords: DSTATCOM, non-real power, power quality, protection, PV, reduced sensor, switch current limiting, VSI, VLLMS.

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1. Introduction

Escalating interventions around power electronics based devices has amplified the use of power electronic based devices and loads in the distribution network and subsequently, the power quality of the system is deteriorating. So, to compensate current related power quality issues, power quality conditioners like DSTATCOM (distribution static synchronous shunt compensator) and UPQC (unified power quality conditioner) are being used in the system [1, 3, 4, 8]. DSTATCOM provides the reactive and harmonic part of the load current and assures purely sinusoidal load current and unity power factor operation at P.C.C (common point of coupling). Due to diminishing fossil fuel reserves and poor environmental condition, there is significant drift towards incorporation of photovoltaic array (PV) into the existing distribution system. In case of DSTATCOM, the interconnection of PV is a progressive change since, no extra inverter is required for PV [2]. So, combination of PV-DSTATCOM is gaining much more demand due to its multifunctional approach.

Several control strategies for DSTATCOM and PV-DSTATCOM have been discussed in literature. Conventional technique like synchronous reference frame based has been discussed in [3] whereas this technique does not perform efficiently under dynamic condition due to presence of low power filters. Likewise, comparative study for different DSTATCOM control strategies is carried out in [4]. Adaptive and advance soft computing based control technique for DSTATCOM are delivering efficient performance in managing power quality [1, 6, 12-16].

Performance of any system not only depends on the efficiency of the controller but also on the efficacy and good health of installed devices (e.g. IGBT switches, sensors) and ancillary components (e.g. ICs used in the sensing unit). Subsequently, the accurate information of the power signals (voltage and current) is very much important for proper implementation of control scheme. So, sensors plays a pivotal role. But, fault in sensor leads to maloperation of the overall system. Few literatures are available where emphasis is given on reduction in sensor. In [5], the authors have reduced sensors for dc-link voltage, VSI current and load current. Indirect current control technique is used where only grid current is considered and dc-link voltage is estimated. Authors have reduced source voltage and load current sensors in [6]. Phase lock loop (PLL) is used to generate unit templates but using PLL can again bring issues of high cost, unstable operation under varying supply voltage, and also system complexity. In [7], grid voltage sensors have been reduced and estimation of grid voltage is done using virtual flux technique but it depends on the system parameters such as inductance and resistance. But proper generation of unit voltage templates is very crucial for generating switching signals for VSI irrespective of parameter change of the system. In [8], the voltage sensors are eliminated and enhanced second order generalized integrator based voltage estimation technique is estimated for power quality improvement. Works related to reduced sensor discussed in the literature involves extra burden of estimating voltages and current for controller to operate, hence, involves estimation techniques for the determination of sensor-less quantities.

In case of PV-DSTATCOM, the correct information of power signals is very much crucial for power quality improvement otherwise the grid current will not track the reference properly. Therefore, lesser number of sensor will have lesser probability of encountering fault. Also, from economic point of view, reduced sensor operation causes reduction in expenses in terms of cost per sensor and other ancillary components utilized for preparing a sensing unit for individual sensor. Hence, reduced sensor based control fosters the benefits of minimized system complexity, cost and noise.

Proper operation of VSI (DSTATCOM) demands healthily operating power electronic switches. Generally, when a system is designed the current handling capacity of the switches is considered very high to protect the power electronic switches from damage during transient or high current condition. As the current handling capacity or rating of the switches increases the cost of VSI increases but there still exists the chance of damage if the current goes beyond rating during any fault. In [9] detailed discussion is done on the sizing of the DSTATCOM (Shunt compensator). Power handling scheme of UPQC is implemented using SRF method. For the control of PV-DSTATCOM, there are various efficient and advance control techniques in the literature [10-15]. But, in all these studies scheme for VSI switch current limiting for the protection of DSTATCOM is absent. Only, during the sizing, safety factor for current rating is considered in the literature.

In order to protect the system, a current controlling factor or parameter must be there in the control algorithm of VSI. This factor will give authority to the controller to limit the current through the VSI switches to the rated value whenever the current through the system goes above the rated value. In the presented work, this controlling factor is accounted in the control algorithm of PV-DSTATCOM. DSTATCOM alone compensates for non-real (reactive and harmonics) component of load current to improve the current related power quality issues of the system but when PV is involved, it has to handle the maximum PV power also. Therefore, in case of PV-DSTATCOM, while designing DSTATCOM the maximum PV power and maximum non-real load power demand is considered.

So, the amount of non-real power is the only factor which is to be controlled when it goes beyond the safe limit. During, transient or sudden increase in the load demand the limiting factor of the controller comes into action and shifts the control mode from power quality improvement to current limiting mode without switching off the DSTATCOM. In the protection mode of operation, the limiting factor decides the amount of non-real power to be provided by DSTATCOM and grid to keep the current through the switches within the limit. Here, the objective of power quality betterment is subsided for certain period to safeguard the switches. Hence, there is no longer requirement of considering very high rating of switches rather a rating almost near to the system rating can be chosen which will significantly reduce the cost of the VSI.

The significant contributions of the proposed work are highlighted as below:

I. A comprehensive study of PV-DSTATCOM for power quality improvement as well as power management of the system under steady state and dynamic condition of varying solar irradiance and varying load demand

II. Reduced sensor operation by using simple law of KCL and KVL for determining the sensor-less quantities. It reduces the extra burden of estimating the sensor-less signals by using any complex techniques. Delivers the benefit of minimized probability of fault due to more number of sensor unit, reduced complexity of the system, reduced cost due to reduction in sensors and ancillary components for sensor unit.

III. A scheme to limit the VSI switch current to protect the DSTATCOM from damage during transient and high current due to uncertain load demand by introducing a limiting factor into the controller. It prevents the switches from uncertain risk of damage due to the current of value higher than the safety factor considered while designing. This schemes enables to consider the size of DSTATCOM or VSI almost near to the rating or the requirement of the system. Hence, economically reduces the unnecessary burden of considering comparatively higher rating of switches for safety of the switches.

IV. Power management between grid, load, PV and DSTATCOM for both active as well as reactive power of the system is carried out smoothly even during the transition of the operating mode of DSTATCOM from power quality mode to protection mode.

Thus, the focus of the proposed work is the operation of the grid integrated PV-DSTATCOM with reduction in the number of sensors and protection of the VSI switches along with power quality improvement and power management. The arrangement of the work in the paper is as follows: Section I is the introduction followed by system configuration in section II, proposed scheme is elaborated in section III with result and discussion in section IV and conclusion is in section V.

2. System Configuration

Fig. 1 displays the system considered for the presented work. A 3ph-3W system is taken with grid, single staged PV system, DSTATCOM and non-linear load. PV is directly connected to DSTATCOM through a DC –link capacitor C_{dc} with DC-link voltage of V_{dc}. DSTATCOM is connected at P.C.C through coupling inductor L_{coup}. R-C filters are used at P.C.C to eliminate ripples generated due to the switching of VSI (DSTATCOM). Perturb and Observe technique is implemented to track maximum power point [2].

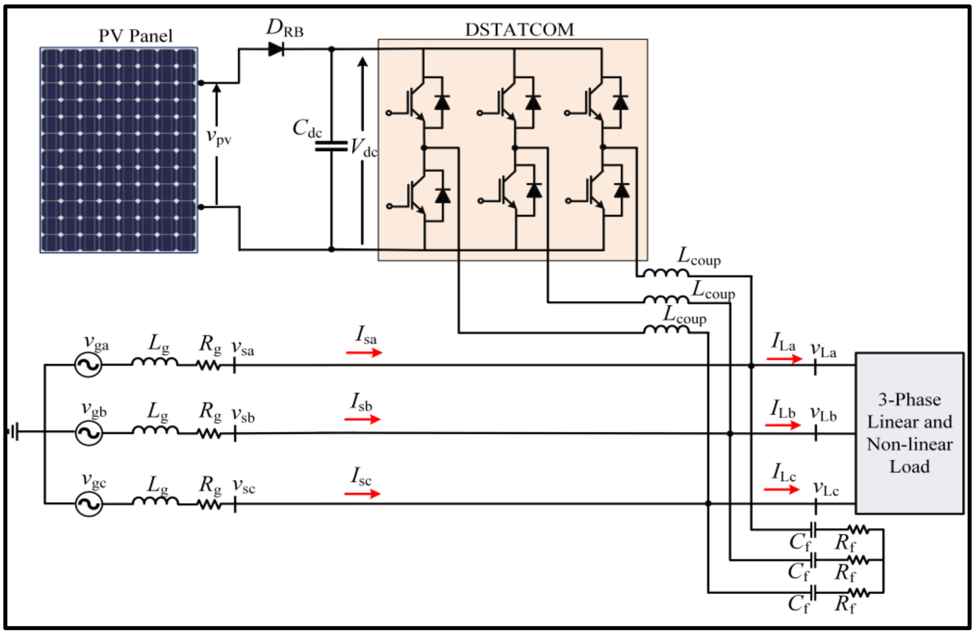


Figure 1. System Configuration

3. Proposed Scheme

The proposed work based on reduced sensor based shunt VSI current limiting based control algorithm involves estimation of fundamental active component and reactive component of load current, calculation of harmonic component, determination of required current and voltages with reduced number of sensors and computation of limiting factor to control the current.

3.1. Sensor Reduction:

Fault in the sensor causes DSTATCOM to deteriorate power quality rather than improving it due to inadequate information provided to controller. In this work, total seven number of sensors are used instead of 10 number of sensor. Two sensors for sensing line voltage of grid V_{sab} and V_{sbc}; two sensors for load phase current I_{La} and I_{Lb}; two sensors for grid phase current I_{sa} and I_{sb}; and one sensor for DC-link voltage V_{dc}. The phase voltage of all the three phases are required to determine the unit vector template. Hence, following equation is used to get V_{sa}, V_{sb} and V_{sc} from line voltage

.

$$V_{sa} = \frac{2V_{sab} + V_{sbc}}{3},\ V_{sb} = \frac{-V_{sab} + V_{sbc}}{3}, V_{sc} = \frac{-V_{sab} - 2V_{sbc}}{3} \quad (1)$$

Here, the current sensors are used to sense any two phases of the load and grid current but current of all the three phases are important to estimate active and reactive component and to generate switching signals. Therefore, the basic Kirchhoff'slaw of current (KCL) is applied at the source side and load side to get the rest of the phase current as in (2).

$$I_{sc} = -(I_{sa} + I_{sb}), \quad I_{Lc} = -(I_{La} + I_{Lb}) \quad (2)$$

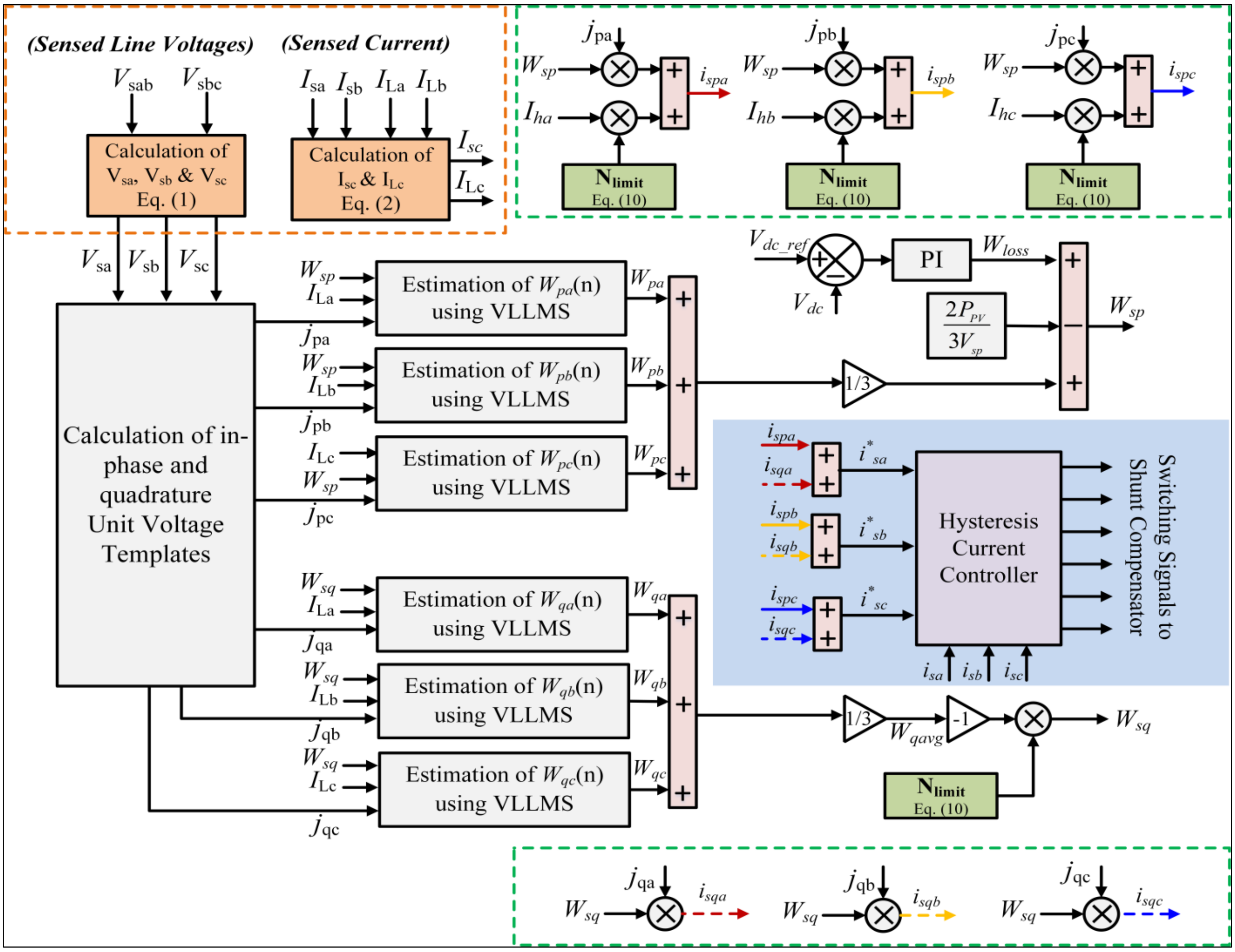


Figure 2. Proposed control scheme

Therefore, there is reduction of three number of sensors. In the physical system Hall effect current and voltage transducers are used to sense current and voltage. The cost of one Hall Effect voltage transducer (LEM LV 25-P) is \$76.46 and cost of one Hall Effect current transducer (LEM LA 55-P) is \$29.44 [10]. As the current and voltage rating increases the cost will also increase. Hence, in the present work total cost reduced is given as:

$$\begin{aligned} &\textit{Total cost reduced} \\ &= 2\times(\textit{cost of one current sensor}) + 1\times(\textit{cost of one voltage sensor}) \\ &= 2\times\$29.44 + \$76.46 \\ &= \$135.44 \end{aligned} \quad (3)$$

So, lesser number of sensors provide benefits w.r.t cost, maintenance, simplified calibration, reduces probability of fault, lesser number of ancillary components for sensing unit, lesser complex circuit and noise reduction.

3.2. Estimation of real, reactive and harmonic component of load current using VLLMS algorithm:

VLLMS (variable leaky least mean square algorithm) is a soft computing technique based on neural network [16]. VLLMS based algorithm is used to determine the fundamental real and reactive component of load current. The steps involved in the estimation of these components using VLLMS is discussed in detail in [1]. The Fig. 2 depicts the control architecture of the proposed work. This figure provides information regarding the implementation of VLLMS in estimation process. Then by using the magnitude of estimated real (W_{pa}, W_{pb} *and* W_{pc})and reactive part (W_{qa}, W_{qb} and W_{qc},), the magnitude of harmonic component (W_{ha}, W_{hb} and W_{hc}) is calculated.

The in-phase and quadrature unit templates are used in the estimation process and are given in

$$j_{pa}=\frac{V_{sa}}{V_{sp}},\ j_{pb}=\frac{V_{sb}}{V_{sp}},\ j_{pc}=\frac{V_{sc}}{V_{sp}} \qquad (\ where,\ V_{sp}=\sqrt{\frac{2}{3}(V_{sa}^2+V_{sb}^2+V_{sc}^2)}\ ) \quad (4)$$

$$j_{qa}=\frac{-j_{pb}+j_{pc}}{\sqrt{3}},\ j_{qb}=\frac{\sqrt{3}j_{pa}}{2}+\frac{(j_{pb}-j_{pc})}{2\sqrt{3}},\ j_{qc}=\frac{-\sqrt{3}j_{pa}}{2}+\frac{(j_{pb}-j_{pc})}{2\sqrt{3}}. \quad (5)$$

These unit templates and the magnitude of fundamental real and reactive component are used to get the fundamental real current and reactive current is obtained as in (6) and (7)

$$I_{pa}=W_{pa}\times j_{pa},\ I_{pb}=W_{pb}\times j_{pb},\ I_{pc}=W_{pc}\times j_{pc} \quad (6)$$

$$I_{qa}=W_{qa}\times j_{qa},\ I_{qb}=W_{qb}\times j_{qb},\ I_{qc}=W_{qc}\times j_{qc} \quad (7)$$

Then the harmonic current coponent of load current is calculated as:

$$I_{ha}=\sqrt{I_{La}^2-(I_{pa}^2+I_{qa}^2)},\ I_{hb}=\sqrt{I_{Lb}^2-(I_{pb}^2+I_{qb}^2)},\ I_{hc}=\sqrt{I_{Lc}^2-(I_{pc}^2+I_{qc}^2)} \quad (8)$$

3.3. Determination of N_{limit} *to limit VSI switch current:*

In Fig. 3, the algorithm for determination of current limiting factor N_{limit} is shown. In order to limit the VSC switch current based on the proposed work, a power limitation strategies is introduced to the VLLMS based control of PV-DSTATCOM controller to limit the flow of power through the converter, so that the switches can be protected even if the load demand increases beyond the rated value. Here, the DSTATCOM handles the non-real power (i.e. harmonic and reactive power) of the load demand and maximum possible power power produced by PV. By keeping this in mind, Design and sizing of the VSC is done as given in (9). The grid provides the active power demand of the load. However, during uncertain increase in the non-real power demand of load, the current through the switches will be more than the rated and will damage the switch. To resolve this unwanted scenario, a controlling parameter (N_{limit}) is introduced to control the flow of non-real power from the VSC.

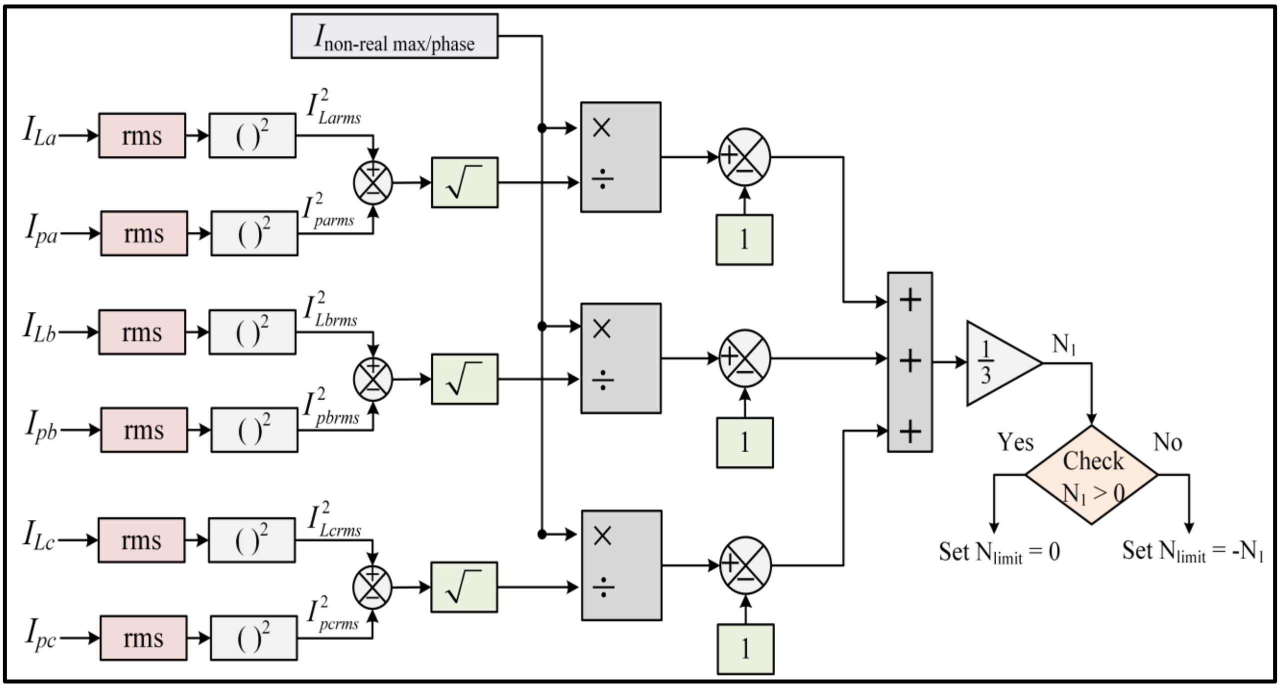


Figure 3. Block diagram determining N_{limit}

$$S_{sh} = \sqrt{{P_{PV}^{MPP}}^2 + Q^2_{load\_max} + H^2_{har\_max}}$$
$$= \sqrt{(1490)^2 + (0.4 * 1100)^2 + (0.2 * 0.9 * 1100)^2}$$
$$= 1566.17\ VA = 1.56\ kVA \quad (9)$$

Where, Q_{Load_max} is the maximum reactive power requirement of the load (as maximum load of 1.1 kVA 0.9 P.F is considered) and H_{har_max} is the maximum harmonic power corresponding to maximum load i.e. here, 20% of the real power is considered as maximum harmonic power.

The algorithm required to calculate the limiting factor N_{limit} is presented in Fig. 3. Let us calculate N_{limit} per phase,

$$N_{limit} = \frac{I_{non-real\_max}}{I_{non-real}} - 1 = \frac{I_{non-real\_max}}{\sqrt{I^2_{loadrms} - I^2_{realrms}}} - 1 \quad (10)$$

Where, $I_{non-real\_max}$ is the maximum nominal non-active current required by the load, $I_{non-real}$ is the actual non-active current required by the load and I_{load} is the total load current. Then, N_{limit} should be introduced in the evaluation of the reactive component of the reference grid current and in the reference active component of grid current for considering harmonic current as shown in the contrl architecture in Fig. 2. If $N_{limit} > 0$, then the total non-real part of load demand is fulfilled by the shunt VSC. If $N_{limit} < 0$, then the extra amount of non-real part of the load demand is provided by grid. So, in case of transient or high demand of non-real power, both DSTATCOM and grid fulfills the requirement. Hence, by controlling N_{limit} the VSC current can be limited.

3.4. Generation of switching pulses for PV-DSTATCOM:

The overall control algorithm for generation of switching signal for VSI is shown in Fig.2. The generated fundamental real, reactive, harmonic component and the switch current limiting factor are then further utilised to generate reference grid current signal to get the required pulses for switching of VSI.

Firstly, the average of fundamental real component (W_{pavg}) and reactive component (W_{qavg}) are calculated by using the magnitude real and reactive component of each phase

$$W_{pavg} = \frac{W_{pa} + W_{pb} + W_{pc}}{3} \qquad W_{qavg} = \frac{W_{qa} + W_{qb} + W_{qc}}{3} \tag{11}$$

Then, the DC loss component is considered which is provided by the grid to regulate the DC-link voltage and is given as:

$$W_{loss}(\kappa+1) = W_{loss}(\kappa) + k_p\{e_{dc}(\kappa+1) - e_{dc}(\kappa)\} + k_i e_{dc}(\kappa+1) \tag{12}$$

Where, κ is the discrete time instant, k_p as the proportional constant and k_i as the integral gain constant of DC link PI controller. The amount of PV power contributed to the system is depicted as:

$$W_{PV} = \frac{2P_{PV}}{3V_{sp}} \tag{13}$$

Finally, the magnitude of total in-phase and quadrature component of reference grid is obtained as in (14) and (15):

$$W_{sp} = W_{pavg} + W_{loss} - W_{PV} \tag{14}$$

$$W_{sq} = -W_{qavg} \times N_{limit} \tag{15}$$

Here, in case of reactive component in (15) switch current limiting factor is introduced to control the amount of reactive power contribution by grid during steady state and high current or transient condition.

Also, during few cycles of transient or high current condition the higher value of harmonic current component of load current is needed to be fulfilled by the grid in order to prevent DSTATCOM from damage. Therefore, the harmonic component obtained in (8) is incorporated with the reference grid current as in (16)

$$\begin{aligned} i_{sp\_a} &= W_{sp} j_{pa} + N_{limit} \times I_{ha} \\ i_{sp\_b} &= W_{sp} j_{pb} + N_{limit} \times I_{hb} \\ i_{sp\_c} &= W_{sp} j_{pc} + N_{limit} \times I_{hc} \end{aligned} \tag{16}$$

$$i_{sq\_a} = W_{sq} j_{qa}, \quad i_{sq\_b} = W_{sq} j_{qb}, \quad i_{sq\_c} = W_{sq} j_{qc} \tag{17}$$

$$i^*_{sa} = i_{sp\_a} + i_{sq\_a}, \quad i^*_{sb} = i_{sp\_b} + i_{sq\_b}, \quad i^*_{sc} = i_{sp\_c} + i_{sq\_c} \tag{18}$$

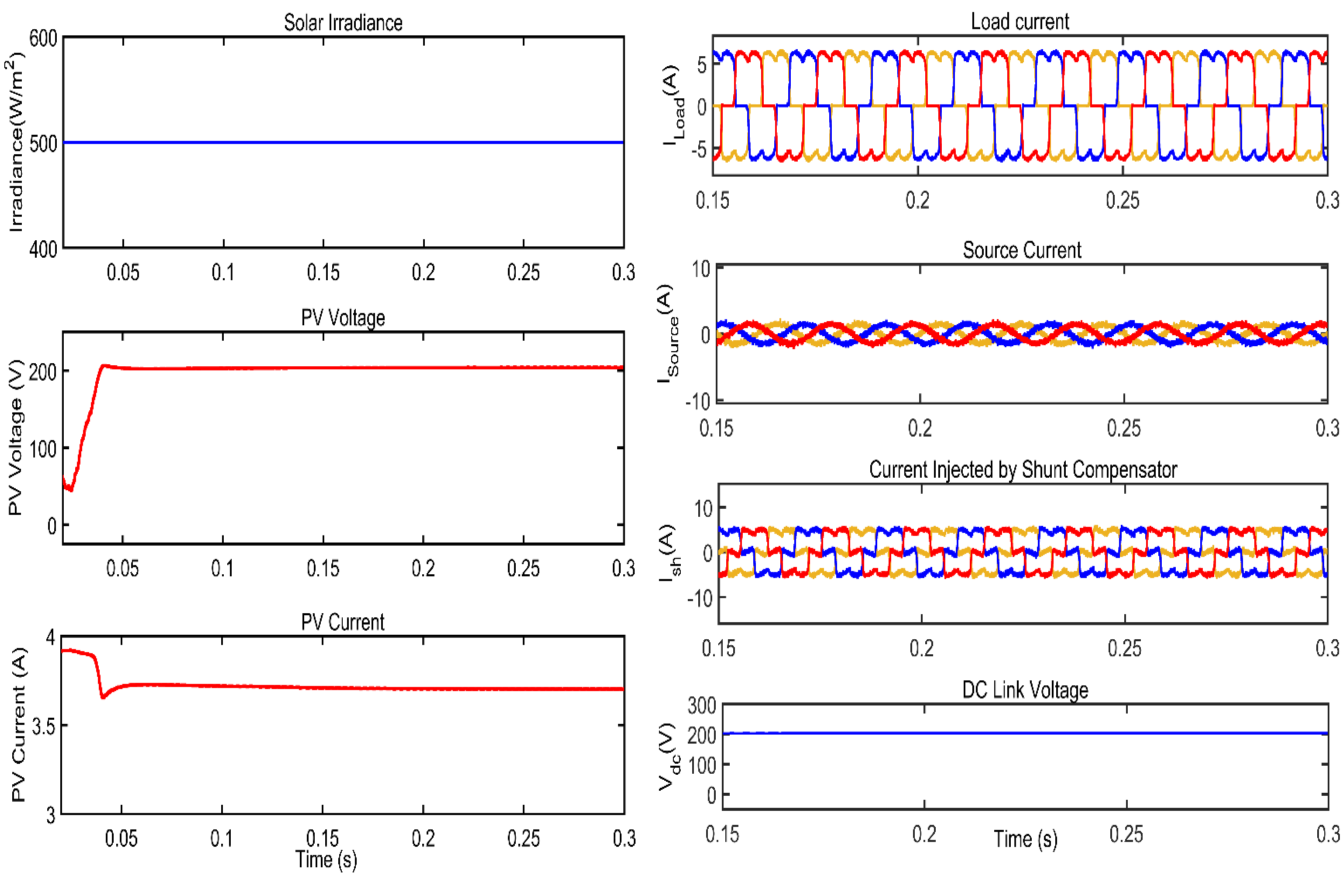
Then, the generated reference grid current is compared with sensed grid current and the error signal is the forwarded to hysteresis current controller (HCC) to get the switching pulses for DSTATCOM.

4. Results and Discussion

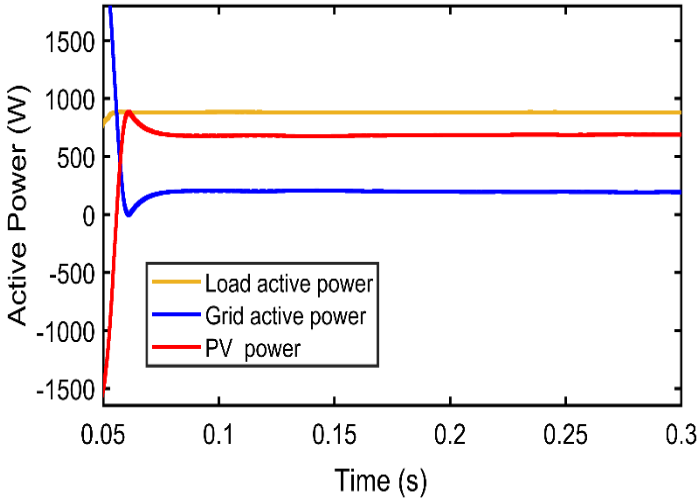
The proposed controller involving scheme for VSC switch current limiting of PV-DSTATCOM is implemented and analyzed with the help of MATLAB/Simulink. The parameters involved in the following studies are given in table I. The analysis is carried out under different cases of steady state, varying load and varying irradiance.

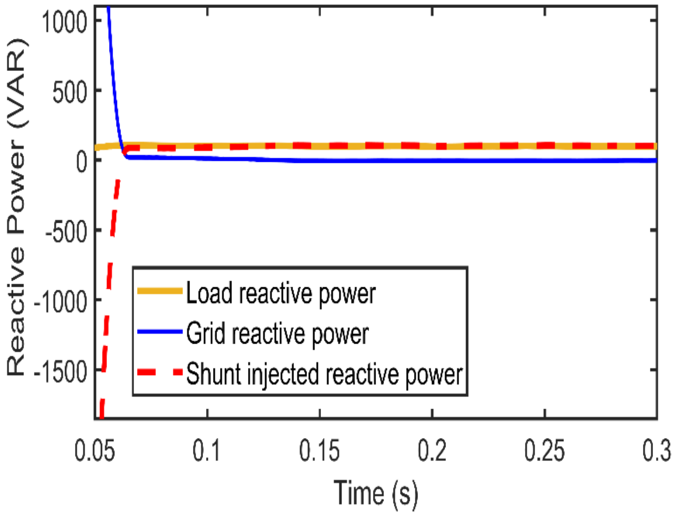
4.1. Operation of the proposed work under steady-state condition:

The performance of grid integrated PV-DSTATCOM with proposed control scheme is studied under steady state condition with constant demand of 850 W, 100 VAR of three phase nonlinear load. The PV system is working at irradiance of 500W/m2 as in Fig. 4(a). Here, the load demand is within the maximum switch current limit of DSTAT-COM. So, it can be seen in the Fig. 4(b) that the DSTATCOM performs the multiple op-eration of reactive power compensation, regulation of DC-link voltage and eliminating harmonics from the grid current. The real power demand of load is fulfilled both by grid and PV as in Fig. 4(c). Also, DSTATCOM manages the non-real power demand of load as in Fig. 4(d). Therefore, in Fig. 4(e) it can be seen that grid voltage and current are in phase and unity power factor operation is obtained at P.C.C.

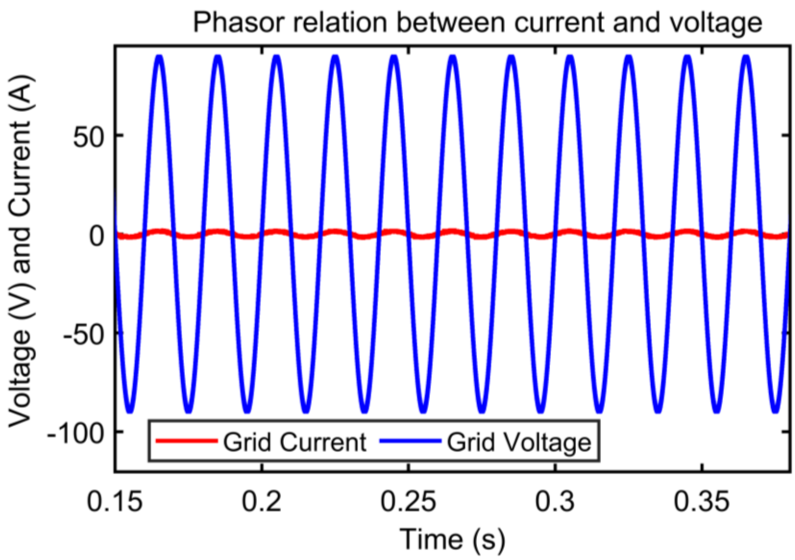


(a) (b)





(c) (d)

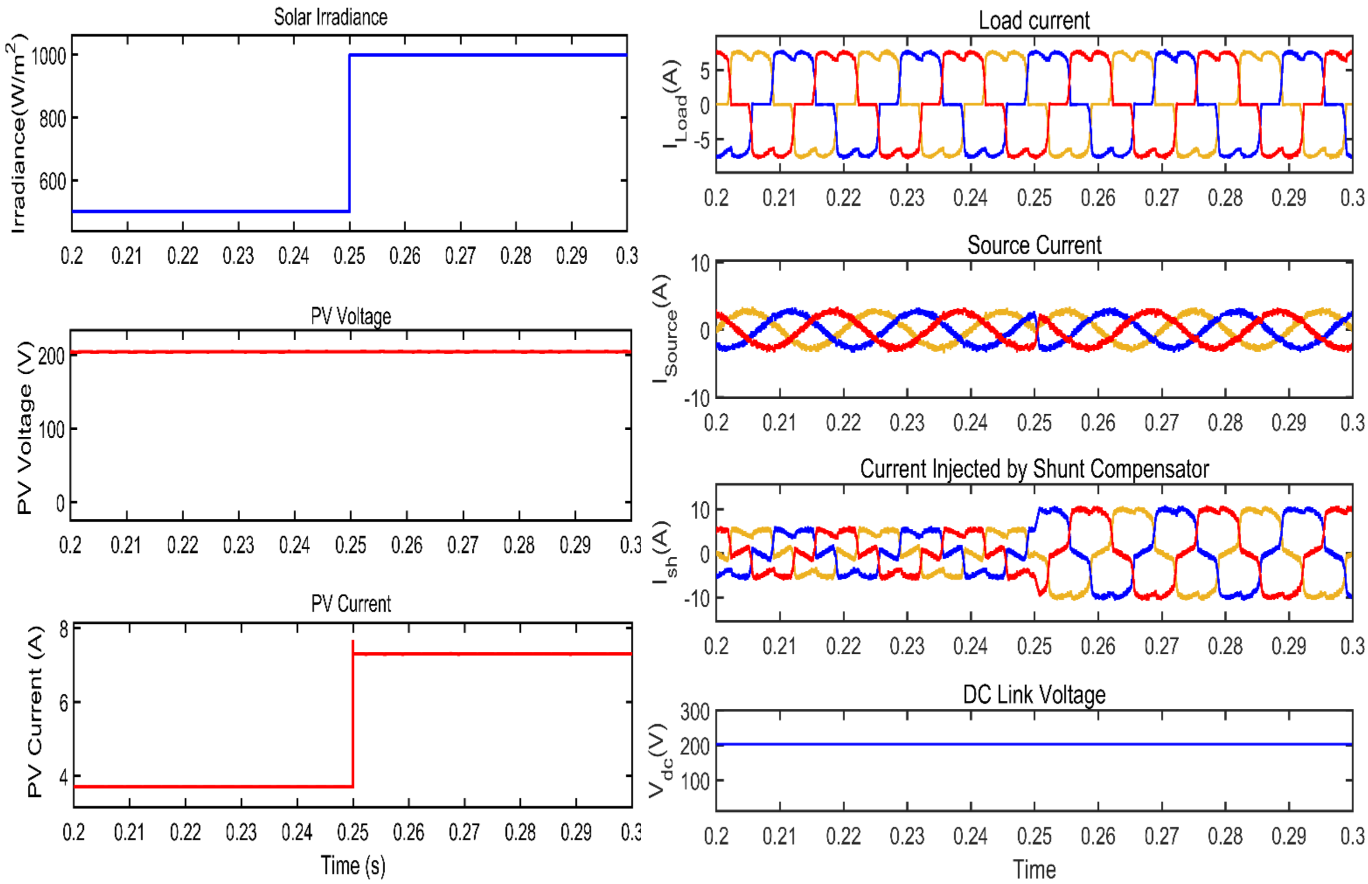


(e)

Figure 4. Under steady–state condition (a) PV voltage and current at 500W/m²; (b) Performance of PV-DSTATCOM; (c) Real power balance between PV, grid and load; (d) Reactive power balance between PV, grid and load; (e) Phase relation between voltage and current.

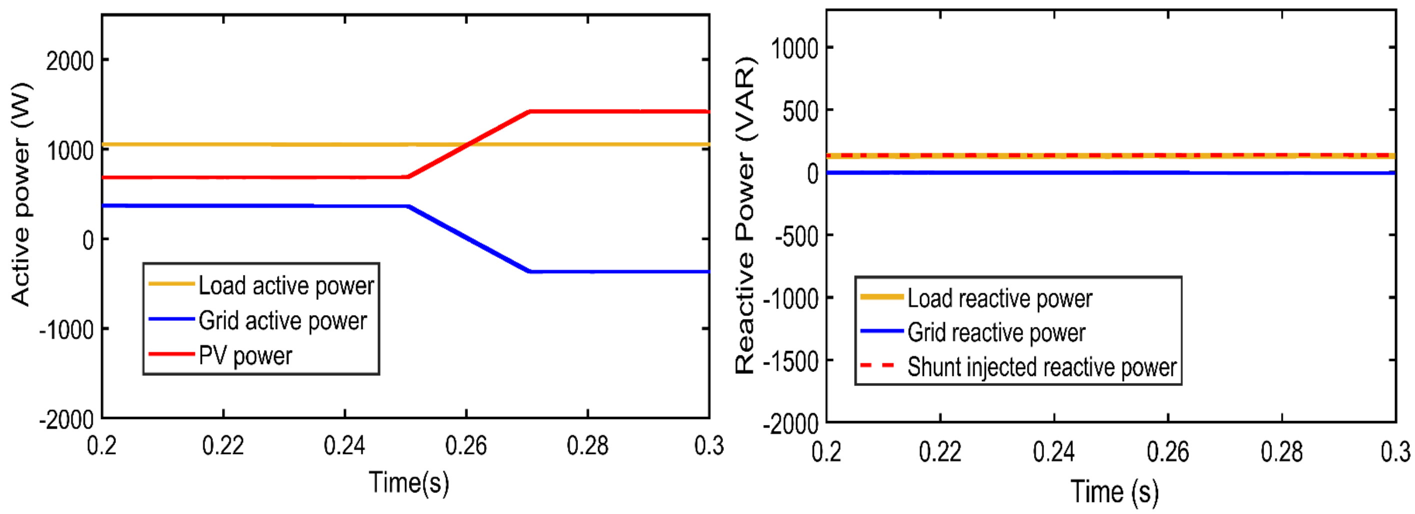
4.2. Operation of the proposed work under varying solar irradiance condition:

The performance of grid integrated PV-DSTATCOM with proposed control scheme is studied under changing irradiance condition from 500 W/m² to 1000w/m². In Fig. 5(a), it is observed that with the change in irradiance there is negligible change in PV voltage whereas PV current is increased and the power contributed by PV array is also increased. As the switch current limit of DSTATCOM is decided by considering the maximum PV current and maximum non-real power demand of the load. So, at t = 0.25 sec, when there is increase in PV current due to increment in irradiance the system operation is not effected and DSTATCOM performs its function as shown in Fig. 5(b).



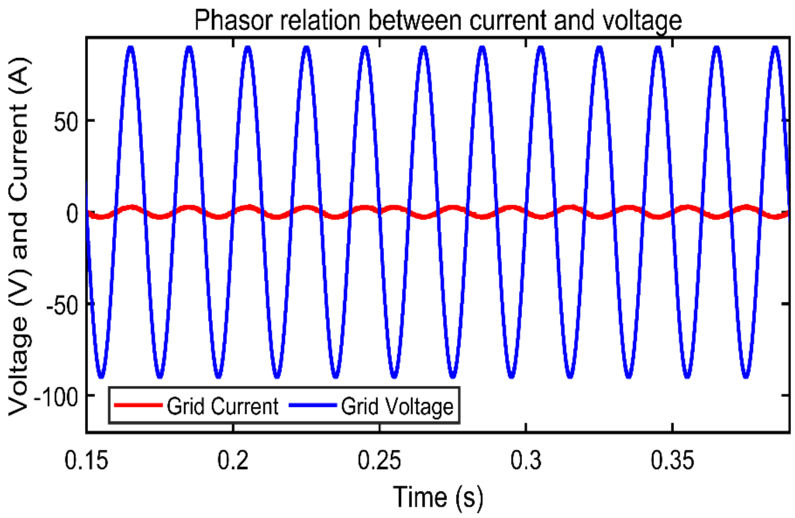
Solar Irradiance
Irradiance(W/m^2)
PV Voltage
PV Voltage (V)
PV Current
PV Current (A)
Time (s)
Load current
I_{Load}(A)
Source Current
I_{Source}(A)
Current Injected by Shunt Compensator
I_{sh}(A)
DC Link Voltage
V_{dc}(V)
Time

(a) **(b)**



Active power (W)
Load active power
Grid active power
PV power
Time(s)
Reactive Power (VAR)
Load reactive power
Grid reactive power
Shunt injected reactive power
Time (s)

(c) **(d)**



(e)

Figure 5. Under varying solar irradiance from 500W/m² to 100W/m² (a) PV voltage and current (b) Performance of PV-DSTATCOM; (c) Real power balance between PV, grid and load; (d) Reactive power balance between PV, grid and load; (e) Phase relation between voltage and current.

4.3. Operation of the proposed work by varying the load demand from rated value to very high value such that the switch current is beyond the limit at solar irradiance of 500 W/m²:

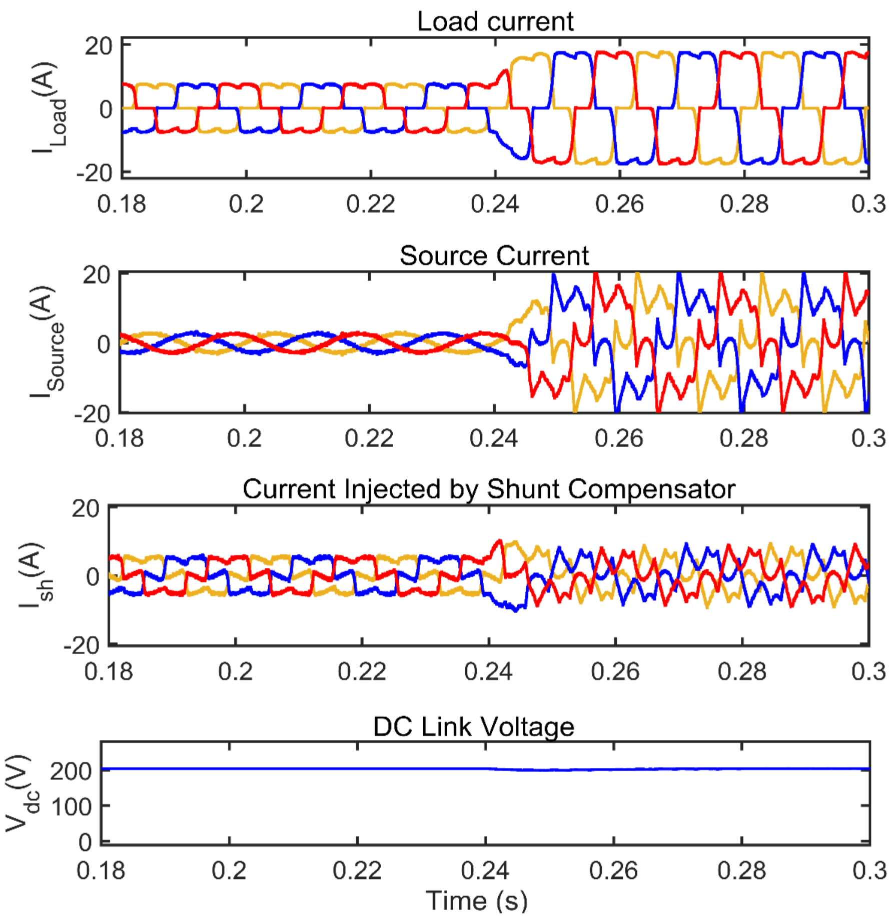


Figure 6. Performance of PV-DSTATCOM under varying load demand

In Fig. 6, from period t = 0 sec to t = 0.25 sec the load demand is 1019 VA (1000 W, 200 VAR) where the reactive power demand is less than designed reactive power handling capacity of DSTATCOM i.e. 300 VAR. Therefore, under this condition the controller is operating for power quality improvement and power management of the system.

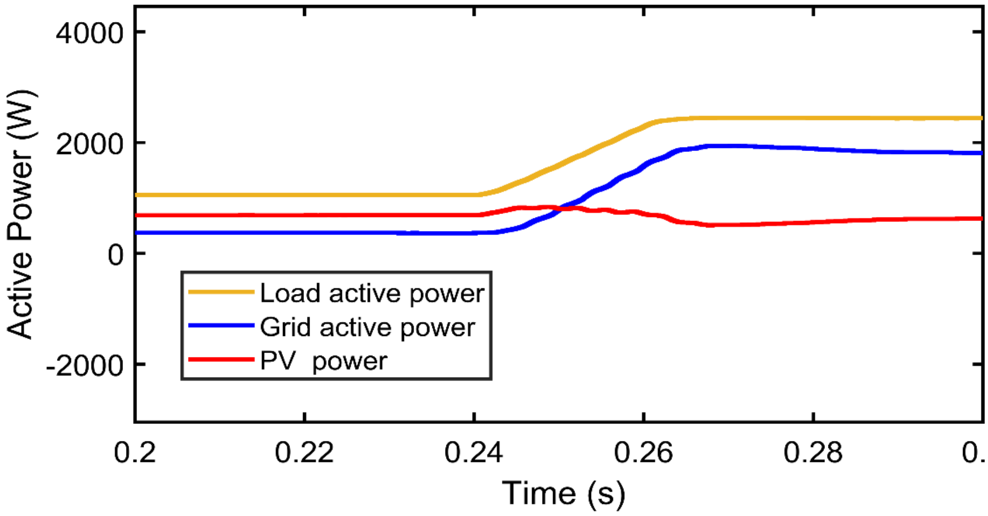


Figure 7. Real power management between grid load and PV under varying load demand

But, at t = 0.25 sec, there is sudden increase in load demand of value 2453 VA (2400W, 510 VAR) where the reactive power requirement of the load is very high as compared to the rated capacity of the DSTATCOM which will eventually led high current to flow through the switches hence damaging it. So, in order to prevent the switches from damage the switch current limiting part of the controller will come into action. Now, the extra amount of non-real power which is above the rated value of the DSTATCOM is provided by the grid. Though the real power demand of the load is also high but this will not affect the VSI switch. This is because the share of the real power demand that is contributed by PV is within the real power handling capacity of the switch and the maximum power produced by PV is taken into consideration while the designing of DSTATCOM. The rest of

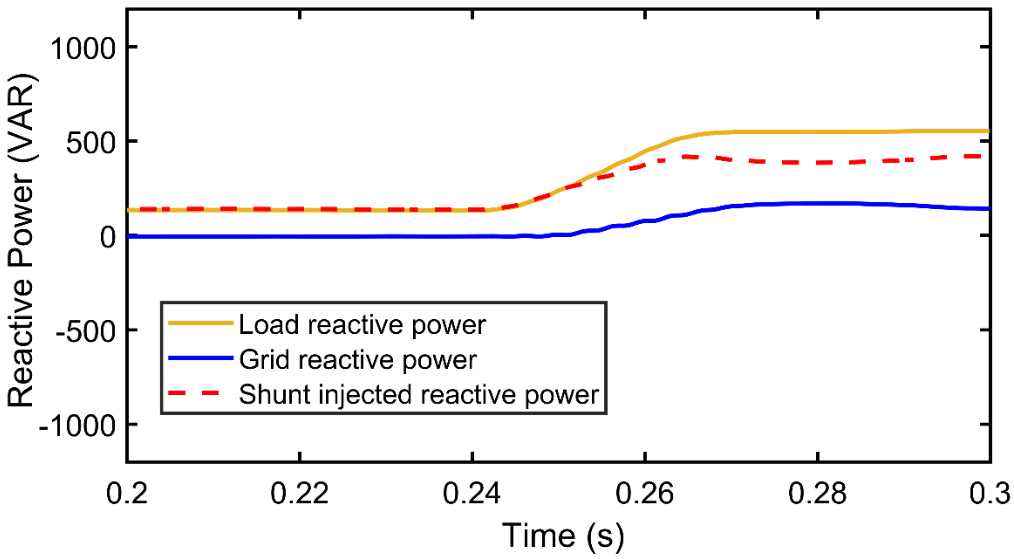


Figure 8. Reactive power management between grid load and PV under varying load demand

the real power requirement of the load is provided by grid. Therefore, under this transient condition, the total reactive power demand of the load is managed by grid and DSTATCOM and total real power demand is fulfilled by PV and grid as shown in Fig. 7 and 8 respectively.

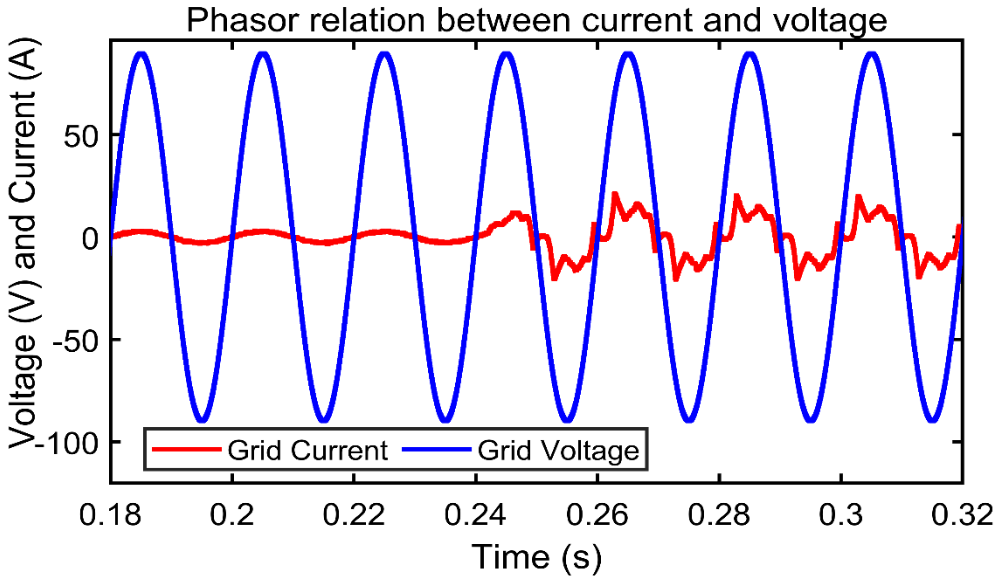


Figure 9. Phasor relation between grid current and grid voltage

In Fig .9, it can be observed that before t = 0.25 sec the current through the DSTATCOM is within the safe limit as a result unity power factor operation is obtained. But, from t = 0.25 sec, when the current is beyond the safety limit then the priority shifts towards preventing DSTATCOM from damage instead of power quality improvement. Therefore, in this high current period the grid supports DSTATCOM by feeding extra amount of non-linear current to load. Eventually, the grid current and grid voltage deviates from their in-phase condition.

Table 1. Parameters for simulation

Parameters	**Value**
Grid	110 V (line-line) RMS, 50 Hz
Interfacing inductor (shunt VSC)	4 mH
DC link capacitor	4.4 mF
DC link voltage	200 V
Non-linear load	(i) 850 W, 100 VAR (ii) 2400 W, 510 VAR (iii) 1000 W, 200 VAR
SPV voltage and current at MPP	203 V, 7.35 A
SPV power at MPP	1.49 kW

5. Conclusion

An innovative analysis of PV-DSTATCOM control with reduced number of sensors and incorporated switch current limiting scheme is carried out here. Three sensors have been reduced with reduction in $135.44 from the sensor expenses without vitiating with the effectiveness of the controller. The introduction of switch current limiting scheme has also protected the system from irreversible damage during transient and high current condition even under dynamic condition of varying load and solar irradiance. The current limiting factor is efficiently synchronized with the controller operation such that it successfully switches from power quality enhancement mode to switch protection mode till the transient persists. Henceforth, no need to take unnecessarily higher rating switches, so, subsequently the rating of the DSTATCOM is reduced leading to reduced cost of the overall system. The system is able to economically maintain the power quality of the system along with power management with reduced sensors and switch current limiting strategy.

6. References

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