Active Islanding Protection for Grid Connected Solar Photovoltaic Power Plant under Faulty Conditions

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Abstract- Distributed generation has recently gained lots of importance within the power trade as a result of its clean, cheap and obtainable technology. However, there are challenges related to the weight unit, among that islanding is a crucial facet. Islanding detection is a crucial concern within the grid connected star electrical phenomenon (PV) system as a result of utility service personnel and instrumentality safety. during this paper the modelling and simulation of a full of life anti-islanding technique in 3 section grid connected star electrical phenomenon power grid is performed once fault happens. a 3 section fault at load aspect is formed and protection of the system is sustained by the detection. the most objective is near to implement and assess a full of life anti-islanding technique in grid connected star electrical phenomenon power plants. The projected technique i.e., voltage harmonic injection technique that could be a a part of active islanding detection technique injects sixth harmonic into the reference modulating signal. Furthermore this technique depends upon injecting tiny voltage harmonics into the PWM modulator so as to discover the islanding event.

Key words: Anti-islanding, Active Anti-islanding, Islanding, PV System, Passive Anti-islanding, Voltage Harmonic Injection.

I. INTRODUCTION

Distributed generation (DG) from renewable power resources is penetrating the utility grid due to the rising cost of traditional energy sources and the environmental friendly features of renewable energy. DG is not without the problems of the problems the most significant is the issue of islanding. Islanding is a critical and unsafe phenomenon in which the application grid is disconnected from the distributed generation which still supplies load [1]. Islanding in the DG can be classified as planned and unplanned, of which unplanned is the most problematic. as unplanned islanding deals with the safety of the workers. So there is a necessity for the detection of the islanding in the distributed system.

There are many islanding detection schemes pronounced within the literature [2]-[5] which may be extensively classified as active, passive and communication-based schemes [6]-[9]. The communication-based schemes totally do not damage the energy first-rate of the power device with the negligible non detection zone (NDZ), the cost is a great deal higher than the opposite types of strategies and the operations are extra complex. Passive methods work on the measuring system parameters like voltage, frequency, etc. Whereas the active method is based on the injection of small disturbance signal to the certain parameters. Active methods have less NDZ when compared to the passive method.

The foremost contribution of this paper is to sight the islanding within the system continued by the protection of the system. In an electrical grid, a fault or fault current is any abnormal electrical phenomenon. In three-phase systems, a fault might involve one or a lot of phases and ground, or might occur solely between phases In power systems, protecting devices will sight fault conditions and operate circuit breakers and different devices to limit the loss of service attributable to a failure. within the system, a fault might have an effect on all phases equally that could be a "symmetrical fault". If just some phases area unit affected, the ensuing "asymmetrical fault" becomes a lot of difficult to analyse. A symmetrical fault is formed within the system i.e., LLLG fault is formed and it shows not abundant any distinction within the system performance except at the time of fault. The system for the islanding setup includes PV array, an inverter, filter and some more components that are explained below in detail.

Voltage source inverters (VSI) are used for electricity conversion from a DC supply to an AC output, both in a standalone mode or when linked to the application grid. Here LCL filter is utilized in area of conventional L filter. The LCL filter reduces the switching frequency ripple and facilitates in coupling with a current overall performance to the application grid.

II. SYSTEM SET-UP FOR ISLANDING DETECTION

A three-phase grid connected solar photovoltaic energy system is designed for the islanding detection setup, Which includes a dc supply (solar photovoltaic array), an inverter, a LCL filter, a delta- star transformer, a controller and utility grid so as to enforce the islanding event.

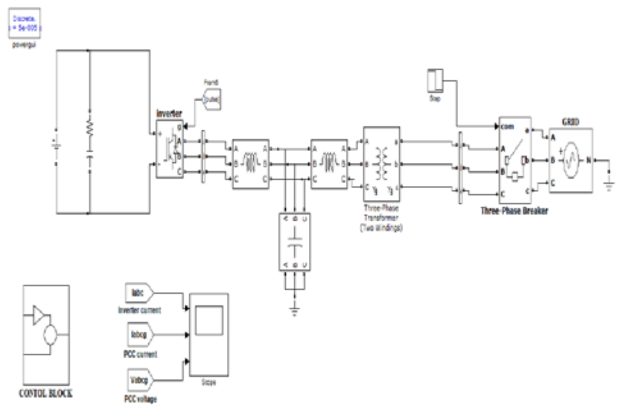


Fig 2.1 Single line diagram of Grid linked Solar Photovoltaic System with three phase fault

Fig 2.1 indicates the single line diagram of grid connected solar photovoltaic system. A grid linked inverter is a voltage source inverter (VSI) that converts direct current (DC) electricity into alternating current (AC) with a potential to synchronize to interface with a utility line. VSI synchronizes its frequency with that of grid 50 Hz [12]. LCL filter output provides inductive output on the grid interconnection point to prevent inrush current as compared to LC clear out and has better attenuation it also reduces ripple and helps in coupling with a current like performance. The ac source from the filter is connected to the grid by using an transformer. Here we use a step down transformer .The controller plays a key role in operating, handling, and protecting the DG system. Current controlled proportional integral controller is used in the system. A three-phase bidirectionall switch is used for enforcing the islanding condition.

III. ISLANDING STANDARDS FOR A GRID CONNECTED PHOTOVOLTAIC SYSTEM

Some islanding standards for grid linked solar photovoltaic (SPV) power plant is proposed. Table 1 and 2 indicates the clearing time records for DG disconnection at some point of underneath and over voltage and frequency activities.

Table 1. Voltage Standard Settings

Voltage (at pcc)	Maximum trip time(s)
V < 50%	0.16
50% ≤ V ≤ 88%	2.00
88% ≤ V≤ 110%	Continuous operation
110% ≤ V ≤ 120%	1.00
120% ≤ V	0.16

Table 2.Frequency Standard Settings

Frequency range (50HZ=Normal operation)	Clearing time(s)
<49HZ	0.16
49HZ≤Freq≤51HZ	Continuous operation
>51HZ	0.16

IV. NON DETECTION ZONE

The NDZ concept is an index to evaluate the performance of islanding protection. The non-detection zone is defined as the loading condition for which an islanding detection method would fail to operate in a timely manner. This performance index is defined by power imbalance (measured at distribution system point of-common coupling (PCC)) and plotted in ΔP-ΔQ space as shown in Fig 4.1.

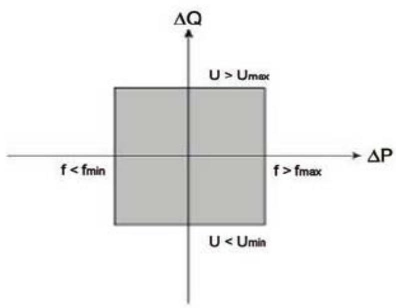


Fig 4.1 Non Detection Zone of OVP/UVP and OFP/UFP method

ΔP (Active power imbalance) ΔQ (Reactive power imbalance) Boundary limits of the NDZ.

Usually, at the PCC between the local electric power system (Local EPS) and area EPS, power mismatches both in active and reactive power vary within a certain range, depending on the generation of DGs and the system loading. When power mismatches are large enough prior to grid disconnection, most widely-used standard functions, such as under/over voltage and under/over frequency functions can easily detect such islanding events. However, in scenarios of small power mismatches, voltage and frequency deviations after islanding are not significant enough to be detected by those standard relay functions.

The active power mismatch determines the performance of frequency function, which results in the left and right boundaries. As for the inverter-based systems, the size of the NDZ, in terms of active power and reactive power mismatch at PCC, depends on the inverter control strategy. For a constant power control strategy, the following relationships define the boundary limits of the NDZ.

$$\left(\frac{V}{V\max}\right)^2 - 1 \le \frac{\Delta P}{P} \le \left(\frac{V}{V_{\max}}\right)^2 - 1 \rightarrow (5)$$

$$Q_f\left(1-\left(f/f\max\right)^2\right) \le \frac{\Delta Q}{P} \le Q_f\left(1-\left(f/f_{\max}\right)^2\right) \rightarrow (6)$$

where ΔP and ΔQ are the power mismatch before the grid is disconnected. P and Q are the power output of inverter based DG. V_{max}, V_{min}, f_{max} and f_{min} are the over/under voltage and frequency limits respectively. Q_f is the quality factor of the local load circuit.

V. PROPOSED ACTIVE ANTI-ISLANDING METHOD

Usually Passive techniques are the only which might be commonly used for the islanding detection applications since they're simple and clean to put into effect. But they've large non- detection zone (NDZ) and isn't feasible for smart grid programs. So active anti-islanding approach is designed. It has very small NDZ. The worst situations of anti islanding are given below.

1. The strength generated by way of DG should match the R-L-C load electricity ΔP = zero and ΔQ=0.

2. Resonant frequency of R-L-C load is equal as grid frequency (f=50Hz).

3. The Q component of R-L-C load is ready to be 2.5. During worst situations, the islanding detection could be very tough particularly in case of passive anti-islanding scheme. In this example active islanding strategies are relevant.

The main idea of the active anti-islanding method is to introduce an external perturbation in the the system parameters and study again back the identical and have a look at the adjustments within the parameters so that you can discover the islanding circumstance. The active strategies have higher accuracy and a lot of dependability than passive anti-islanding strategies. However, major drawbacks of the active opposed islanding technique embrace the tendency to disrupt the facility quality of the system, high cost, and sensitivity to changes within the power issue at PCC. Active strategies square measure developed to cut back NDZ of passive strategies, therefore most of the active strategies have terribly little NDZ (even eliminated) compared to passive strategies, except in cases of high alphabetic character issue masses. however the construct behind the active strategies is to drive the operation purpose of the system towards UFP/OFP and UVP/OVP trip limits, by destabilizing the system.

The Fig 5.1 indicates the flow chart of the proposed active anti-islanding algorithm.

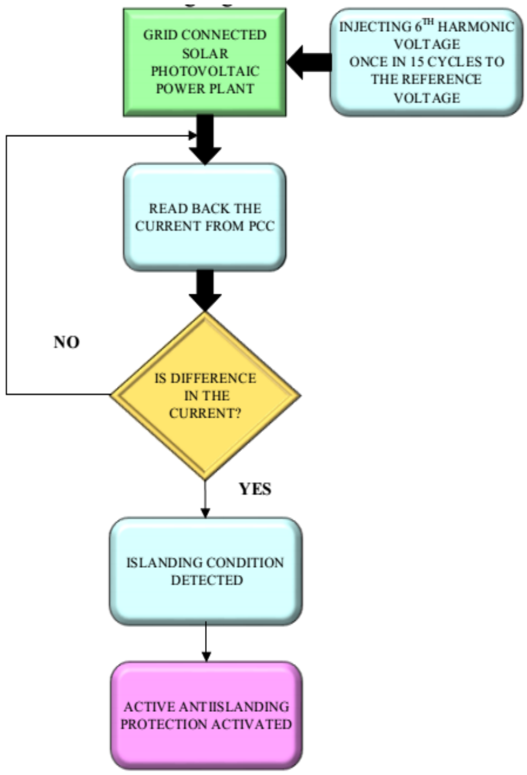


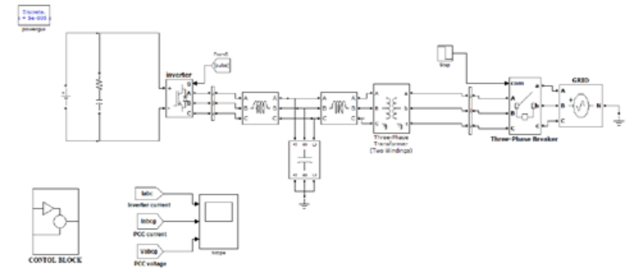
Fig 5.1 Proposed Active Anti-islanding Protection Algorithm

In proposed method of the active anti-islanding we are injecting a sixth harmonic voltage once in an 15 cycles to reference voltage. This sixth harmonic voltage injected into the reference voltage will be given to the output of the inverter. Once the harmonic is injected into the grid connected photovoltaic power plant the current values are checked at the PCC (point of common coupling). If there is any difference in the current values we can say that the islanding is being detected and then the active anti-islanding protection is being activated. But if no difference in the current values being observed at the point of common coupling we can say islanding is not been detected

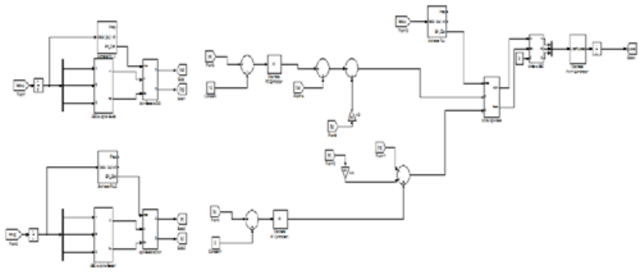
VI. SIMULATION MODEL WITH CONTROL BLOCK

Design of Grid connected Solar Photovoltaic Power System with its Controller is given in Fig 6.1. In the simulation model of the grid linked solar photovoltaic power plant, the sustainable DC supply along with DC hyper link capacitor represents the solar photovoltaic system and 3-phase AC supply represents the utility grid.

The different block used in the simulation consists of PWM inverter, LCL filter and a controller board. As the switching frequency of inverter is in medium frequency range (10 kHz), IGBT switches are preferred for the simulation. In the controller block the voltages and the currents from the PCC are considered and are compared with the reference values. We when we compare, as it is islanded we will get a difference in values. To reduce this difference we will use PI controller so we can say that the PI controller is used for reducing the steady state error. The controller is used for producing switching signals for the PWM modulator.



(A)



(B)

Fig 6.1 (A)Simulation diagram of Grid connected Solar Photovoltaic Power Plant without Islanding
(B)Controller block

The mathematical equations (1) & (2) given are used for the modelling of the controller board.

$$V_{sd} = i_{sd}R_s + L\frac{di_{sd}}{dt} - \omega_s L i_{sq} + v_g \rightarrow (1)$$

$$v_{sq} = i_{sq}R_s + L\frac{di_{sd}}{dt} - \omega_s L i_{sd} \qquad \rightarrow (2)$$

Equations (1) & (2) can be rearranged as

$$u_s = i_{sd}R_s + L\frac{di_{sd}}{dt}$$

$$u_q = i_{sq}R_s + L\frac{di_{sd}}{dt}$$

Where

$$u_d = v_{sd} + w_s L i_{sq} - v_g$$

$$u_q = v_{sq} - w_s L i_{sd}$$

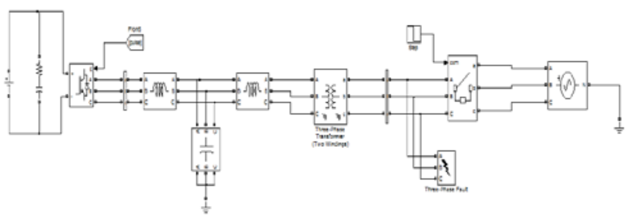


Fig 6.2 Grid connected Solar Photovoltaic Power Plant with Islanding when three phase fault

The Fig 6.2 shows the simulation model of grid related solar photovoltaic power plant with islanding in the case of no load circumstance. A three-phase bidirectionall switch is used for enforcing the islanding condition.

According to the fig 6.3 we suggests the simulation model of grid linked solar photovoltaic power system with islanding at a three-phase parallel R-L-C load connected to three phase fault.

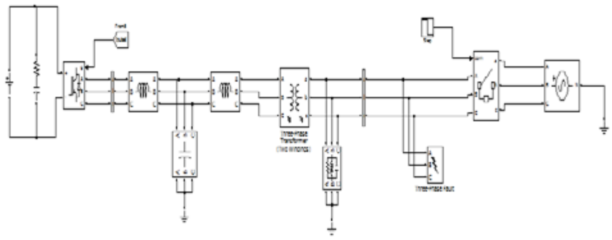


Fig 6.3 Grid connected Solar Photovoltaic Power Plant with three phase fault at parallel R-L-C Load

Unit Vector:

The unit vector technology is an essential element inside the simulation. In order to do the adjustments, we require cos and sin unit vectors commonly represented as cos θ and sin θ respectively. Since they assist us to get the projection of vectors along a selected direction they are known as Unit vectors. Fig 6.4 suggests the phasor diagram showing the unit vectors.

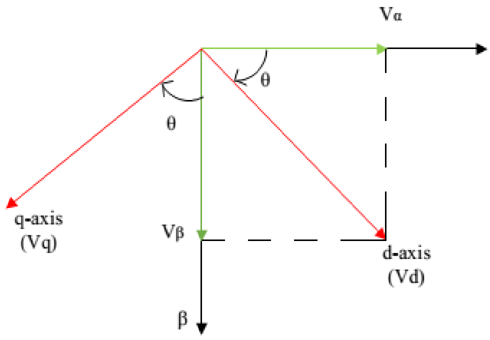


Fig 6.4 Unit Vector

From the Fig 6.4 we have,

$$\cos\theta = \frac{|v_\alpha|}{|v|} = \frac{(3/2)v_m \sin(\omega t)}{(3/2)v_m} = \sin(\omega t) \qquad \rightarrow (3)$$

$$\sin\theta = \frac{|v_\beta|}{|v|} = \frac{(3/2)v_m \cos(\omega t)}{(3/2)v_m} = -\cos(\omega t) \quad \rightarrow (4)$$

From the above derivation, it is evident that the unit vectors can be generated by transforming the gird voltage to α-β plane and then dividing the α-component and β-component by the magnitude of the space vector

Calculation of Load values:

Islanding may happen in any section of a grid i.e.in transmission lines, substations, distribution lines, etc. The Tables 4, 5 and 6 below shows the Load values which represents various power levels. Quality factor for a parallel R-L-C load is given by the equations (3) & (4)

$$Q_f = R / X_L = R / L\omega \rightarrow (3)$$
$$Q_f = R / X_L = RC\omega \rightarrow (4)$$

TABLE 4. R Load Values in Ohms And Their Power Consumptions

Power (KW)	Resistance (Ω)
1	5.9658
10	59.658
15	89.484

TABLE 5. R-L Load Values For Some Selected Q Factors

Q_f	Resistance 5.9658	Resistance 59.658	Resistance 89.484
	Inductance (mH)	Inductance (mH)	Inductance (mH)
1	18.989	189.897	284.836
2	9.495	94.949	142.418
2.5	7.595	75.959	113.935
4	4.747	47.474	71.209

TABLE 6. R-L-C Load Values For Some Selected Q Factors

Q_f	Resistance 5.9658Ω	Resistance 59.658Ω	Resistance 89.484Ω
	Capacitance (ΩF)	Capacitance (ΩF)	Capacitanc e (ΩF)
1	533.63	53.36	35.57
2	1067.26	106.71	71.14
2.5	1334.07	133.39	88.929
4	2134.52	213.42	142.29

Alpha-Beta-Zero to dq0, dq0 to Alpha-Beta-Zero transformation:

The Alpha-Beta-Zero to dq0 block in the simulation performs a transformation of αβ0 Clarke components in a fixed reference frame to dq0 Park components in a rotating reference frame. The dq0 to Alpha-Beta-Zero block performs a transformation of dq0 Park components in a rotating reference frame to αβ0 Clarke components in a fixed reference frame.

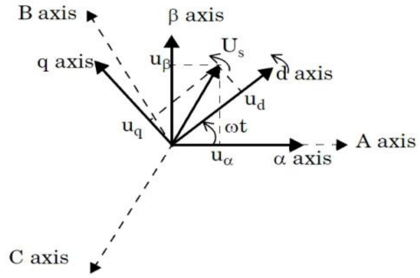


Figure 4.1 Alpha-Beta-Zero to dq0

Depending on the frame alignment at t = 0, the dq0 components are deduced from αβ0 components as follows: When the rotating frame is aligned with A axis, the following relations are obtained

$$u_s = u_d + j \cdot u_q = (u_\alpha + j \cdot u_\beta) \cdot e^{-j\omega t} \quad (5)$$
$$\begin{bmatrix} u_d \\ u_q \\ u_0 \end{bmatrix} = \begin{bmatrix} \cos(\omega t) & \sin(\omega t) & 0 \\ -\sin(\omega t) & \cos(\omega t) & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} u_\alpha \\ u_\beta \\ u_0 \end{bmatrix}$$

The inverse transformation is given by equation (6)

$$u_\alpha + j \cdot u_\beta = (u_d + j \cdot u_q) \cdot e^{j\omega t} \quad (6)$$

When the rotation frame is aligned by 90^0 behind A axis, the following relations are obtained

$$u_s = u_d + j \cdot u_q = (u_\alpha + j \cdot u_\beta) \cdot e^{-j\left(\omega t - \frac{\Pi}{2}\right)} \quad (7)$$
$$\begin{bmatrix} u_d \\ u_q \\ u_0 \end{bmatrix} = \frac{2}{3} \begin{bmatrix} \sin(\omega t) & \sin(\omega t - \frac{2\Pi}{3}) & \sin(\omega t + \frac{2\Pi}{3}) \\ \cos(\omega t) & \cos(\omega t - \frac{2\Pi}{3}) & \cos(\omega t + \frac{2\Pi}{3}) \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \end{bmatrix} \cdot \begin{bmatrix} u_a \\ u_b \\ u_c \end{bmatrix}$$

The inverse transformation is given by equation (8)

$$u_\alpha + j \cdot u_\beta = (u_d + j \cdot u_q) \cdot e^{j\left(\omega t - \frac{\Pi}{2}\right)} \quad (8)$$

The abc-to-Alpha-Beta-Zero transformation applied to a set of balanced three-phase sinusoidal quantities ua, ub, uc produces a space vector Us whose uα and uβ coordinates in a fixed reference frame vary sinusoidally with time. In contrast, the abc-to-dq0 transformation (Park transformation) applied to a set of balanced three-phase sinusoidal quantities ua, ub, uc produces a space vector

Us whose ud and uq coordinates in a dq rotating reference frame stay constant.

VII. VOLTAGE HARMONIC INJECTION

The proposed method for the protection of the system we are using an active anti-islanding method; the proposed method is the harmonic injection method. In the harmonic injection method we inject a sixth harmonic into the system. The harmonic will be added to the reference voltage value and then injected into the PWM and the obtained pulses are injected to the output of the inverter .the harmonics injected are the 6^{th} order harmonics, by injecting the 6^{th} order harmonics into the system the odd order harmonics can be eliminated. The sixth harmonic will be added to the reference voltage value and then injected into the PWM and the obtained pulses are injected to the output of the inverter.

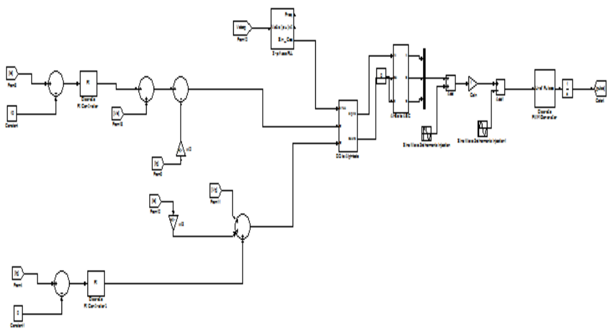


Fig 7.1 Simulation diagram showing Voltage Harmonic Injection to the system when three phase fault occurs

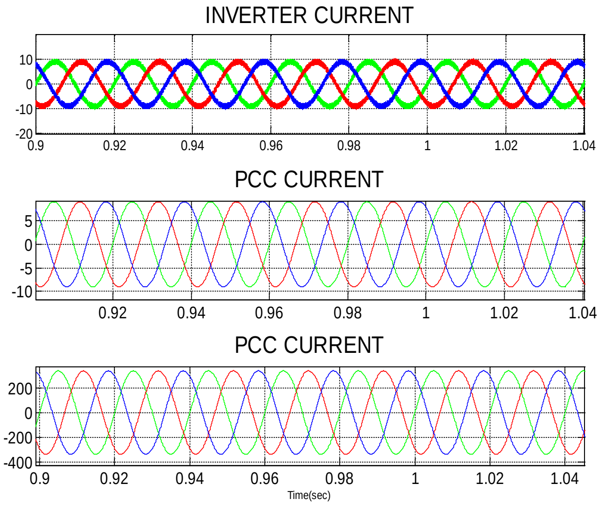
The system parameters used in simulation are given in the table7.

TABLE 7. System Parameters

Sl.no.	parameters	value
1	Suitable DC source,v_{dc}	750 V
2	DC link capacitor,c_d	355.46 μF
3	Filter inductance ,L_1=L_2	4.765mH
4	Filter capacitance	3.472μF
5	Inverter Switching Frequency	10KHz
6	Grid Voltage, $v_{1\text{-}1\ ms}$	415v

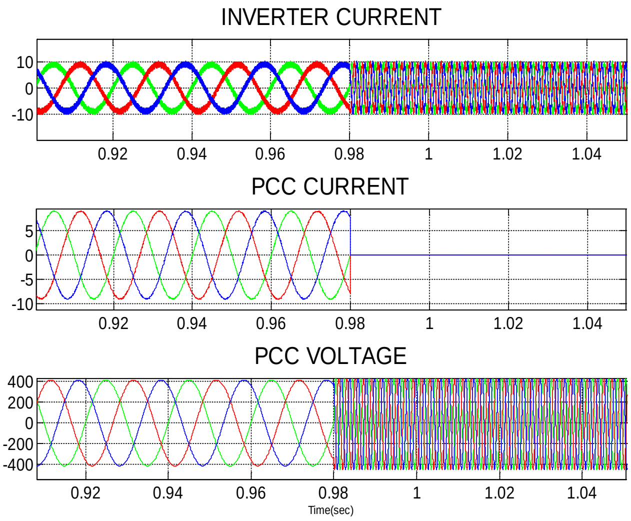
VIII. SIMULATION RESULTS

The various simulation results that have been obtained as shown below. The current and voltage waveforms of Grid connected solar photovoltaic power plant without and with islanding is shown in case (1) & case (2).



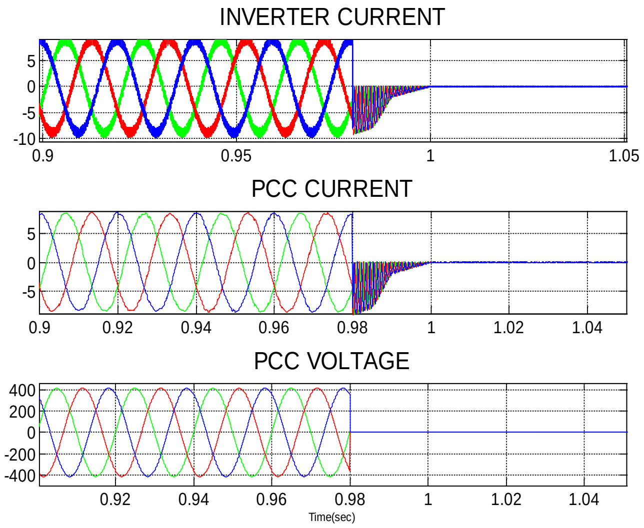
case(1) Simulation results without islanding event (a) Inverter side Current (b) PCC Current (c) PCC Voltage

In the grid connected solar as there is no disturbance in the system we will get a pure sinusoidal wave form. As we are using the switches as because of these switches we will get a small distortion so the inverter current will be thicker than the PCC current and PCC voltage waveforms

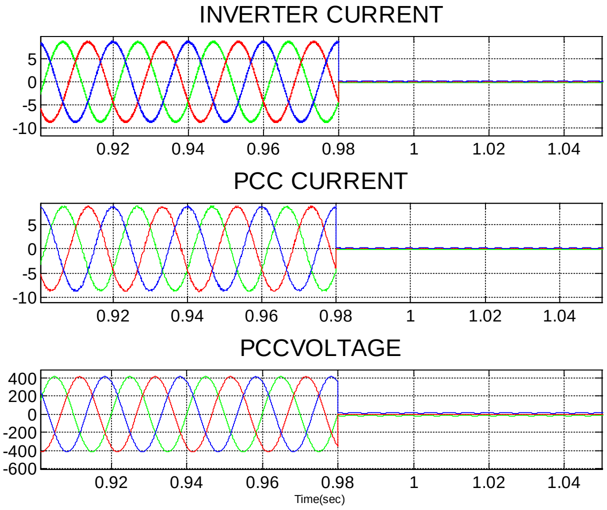


Case (2) Simulation results with islanding event (a) Inverter side Current (b) PCC Current (c) PCC Voltage during no Load condition. In Case (2) islanding is occurred at the time 0.98 sec i.e. the grid is disconnected at that time. The inverter current we get lot of fluctuations compared to before as because of the PWM generator has about 1000 Hz frequency while compared before utility disconnection it is only 50 HZ

As mentioned earlier, islanding may happen in any section of a grid i.e. in transmission lines, substations, distribution lines, etc. The R, R-L and R-L-C loads are considered when executing the islanding. Some of the results are shown in the cases (3)-(5) below.

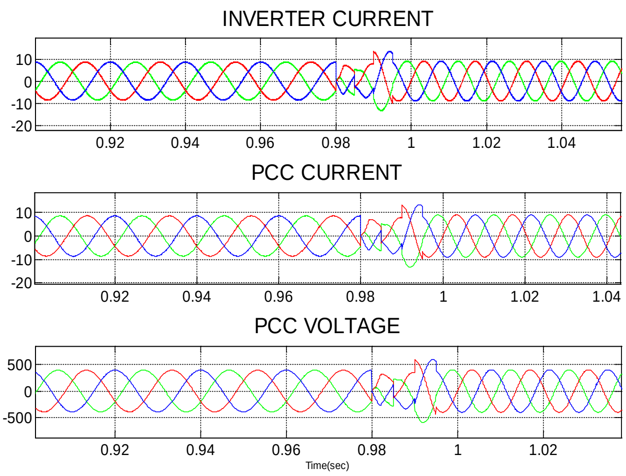


(i)

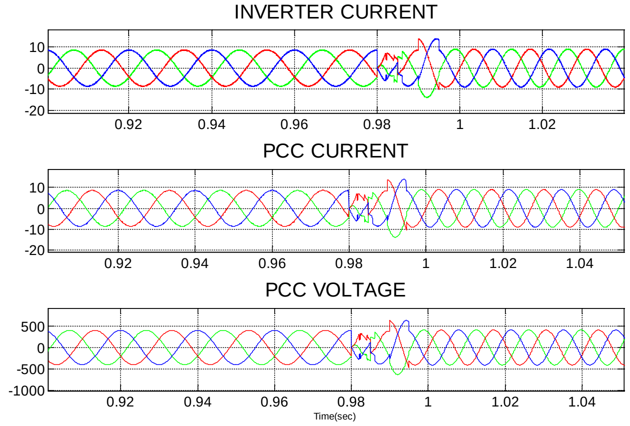


(ii)

Case(3) Simulation results with islanding event three (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R Load; (i) R= 5.9658Ω (ii) R= 59.658Ω

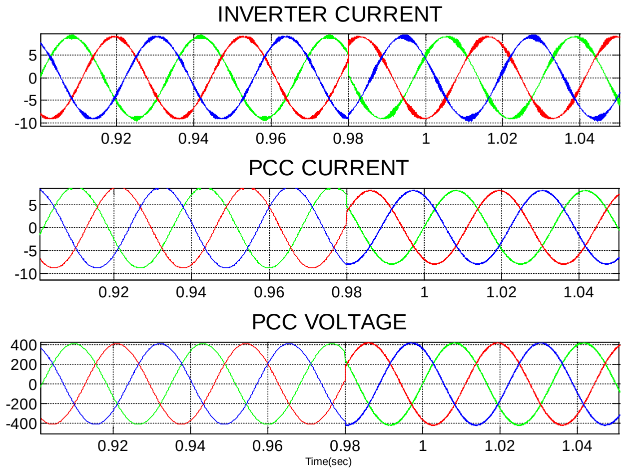


(i)

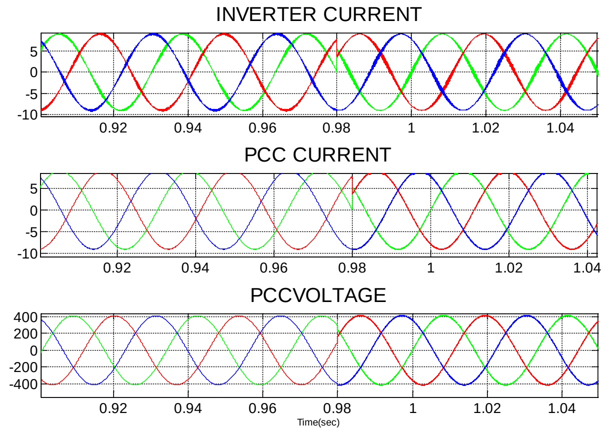


(ii)

Case(4) Simulation results with islanding event (a) Inverter side Current (b)PCC Current (c) PCC Voltage with R – L Load; (i) R= 59.658Ω, L= 75.959mH (ii) R= 59.658Ω, L= 47.474mH



(i)



(ii)

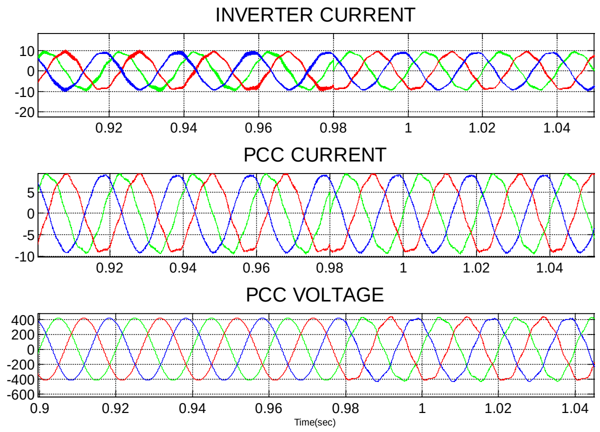
Case(5) Simulation results with islanding event (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R - L - C Load (i) R= 59.658Ω, L= 189.897mH, C= 53.36µF (ii)R= 59.658Ω, L= 75.959mH, C= 133.39µF

In the resistive load with R=5Ω when islanding is occurred at 0.98 sec as because of the heat dissipation we can see the current is circulating with small amount in the inverter and the PCC current where as the PCC voltage is zero. In the resistive load with R=59.658Ω when islanding is occurred at 0.98 sec as there is increase in the resistance value there will not be any dissipation and the inverter and PCC currents and the PCC voltages will be zero.

A resistive and an inductive load is connected to the system with different load values. The R load will utilize the current but whereas the L load will charge. As the inductance is a passive is passive filtering action will be performed and a pure sinusoidal wave is obtained.

By using the parallel RLC load minimum disturbance that are being occurred in the RL load are being reduced. As the capacitor is a storage element voltage fluctuations can be reduced and also the capacitor loads will not allow sudden disturbances in the system. Both by using the inductance and the capacitance action the ripple and be completely reduced

The simulation results shown in case(6) shows the voltage and current waveforms during grid connected and islanding mode after the injection of 6th harmonic voltage in case of NDZ



Case(6) Simulation results with Voltage Harmonic Injection during Non-Detection Zone (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R - L - C Load

As explained earlier in the proposed method we will inject an sixth harmonic in the system ,by this injecting of the sixth harmonic into the system we can say that we are eliminating the odd harmonics like first, third and fifth harmonics in the system. Here we are injecting a harmonic into the system with the parallel R-L-C load.

After the injection of the 6thharmonic voltage, the THD of the system voltage and inverter current is continuously monitored. From the THD values monitored, the islanding condition was detected. The obtained THD vales during NDZ without and with harmonic injection were shown in Fig 8.1 and 8.2.

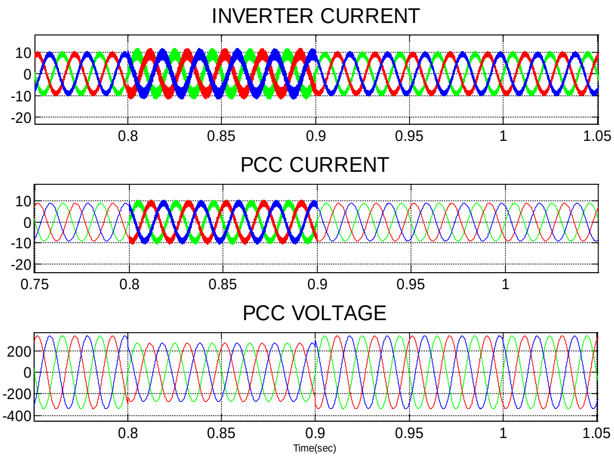
Fundamental frequency 50hz	
I_{INVR}	31.35
I_{INVY}	53.45
I_{INVB}	46.27
I_{PCCR}	31.21
I_{PCCY}	53.45
I_{PCCB}	46.27
V_{PCCR}	23.23
V_{PCCY}	40.45
V_{pccB}	35.32

Fig 8.1 THD analysis without harmonic injection

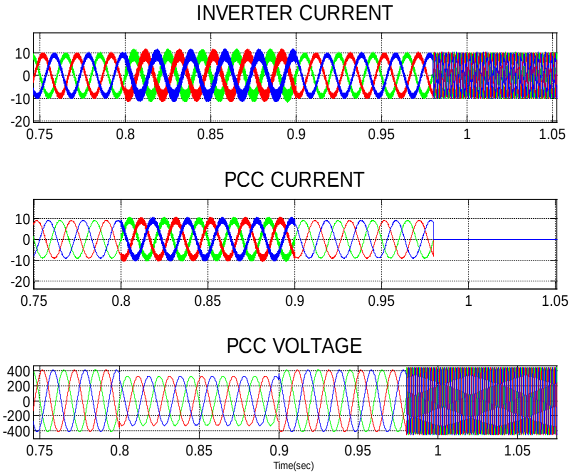
Fundamental frequency 50hz	
I_{INVR}	5.36
I_{INVY}	5.40
I_{INVB}	3.63
I_{PCCR}	5.21
I_{PCCY}	5.20
I_{PCCB}	2.65
V_{PCCR}	5.04
V_{PCCY}	5.03
V_{PCCB}	4.13

Fig 8.2 THD analysis with harmonic injection

Here are the simulation results when a LLLG fault is created in the system.The current and voltage waveforms of Grid connected solar photovoltaic power plant without and with islanding is shown when a fault is created in case (1.1) and (2.1)

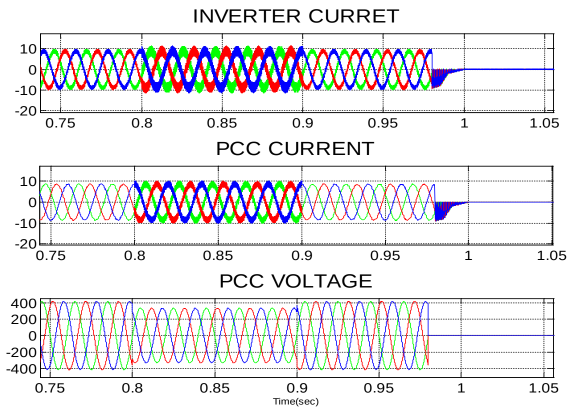


Case(1.1) Simulation results without islanding event under faulty conditions (a) Inverter side Current (b) PCC Current (c) PCC Voltage

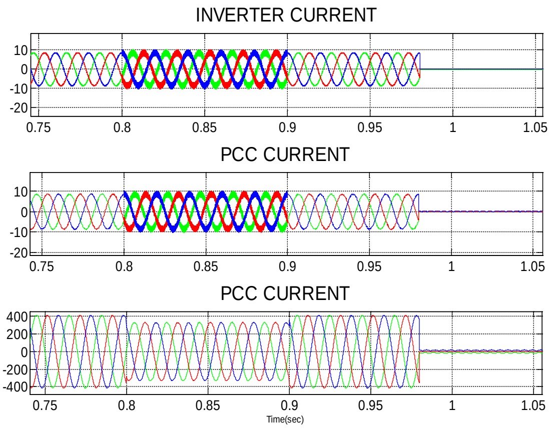


Case (2.1)Simulation results with islanding event under faulty conditions (a) Inverter side Current (b) PCC Current (c) PCC Voltage during no Load condition

Some of the results are shown below when R, R-L and R-L-C loads are considered when fault is occured are shown from case(3.1)-(5.1)

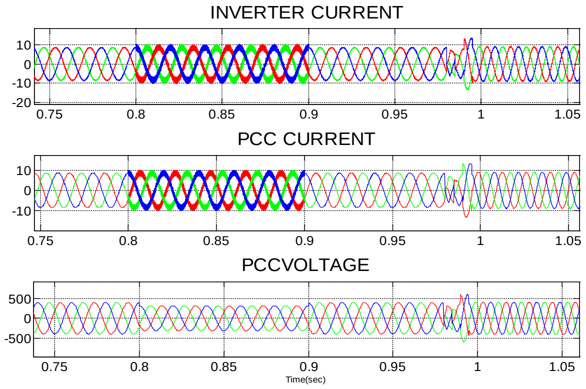


(i)

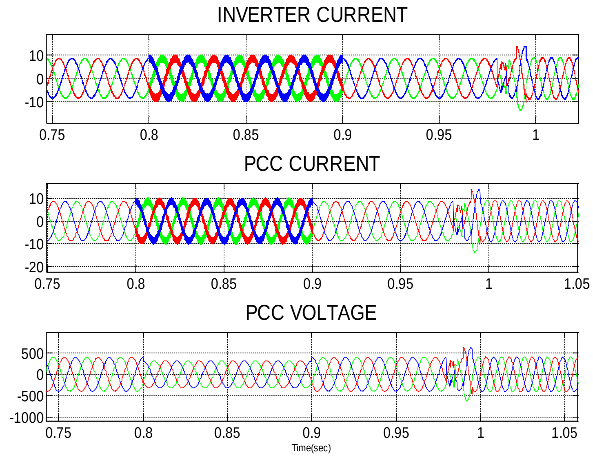


(ii)

Case (3.1) Simulation results with islanding event under faulty conditions (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R Load; (i) R= 5.9658Ω (ii) R= 59.658Ω

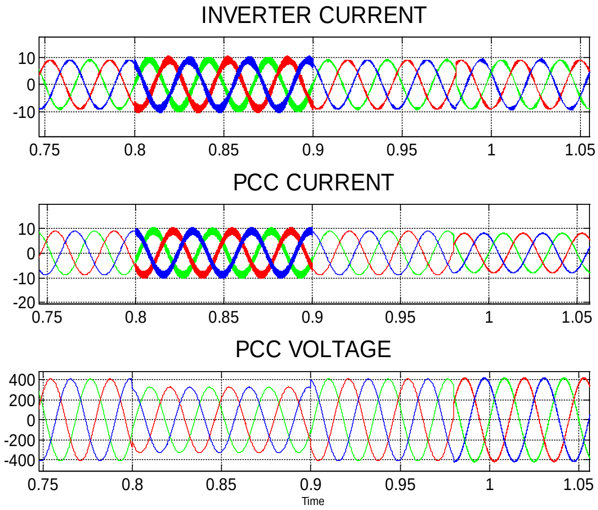


(i)

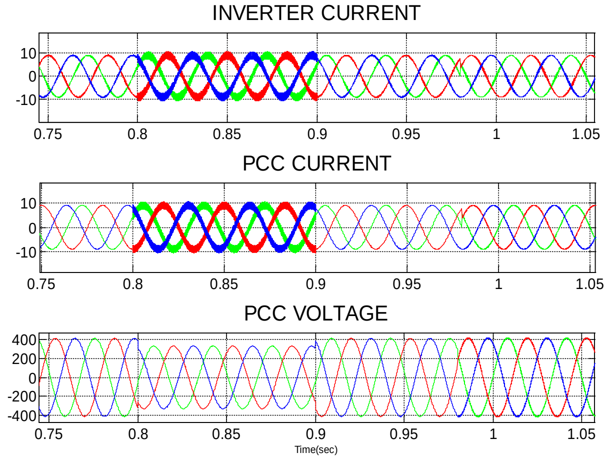


(ii)

Case (4.1) Simulation results with islanding event under faulty cconditions (a) Inverter side Current (b)PCC Current (c) PCC Voltage with R – L Load; (i) R= 59.658Ω, L= 75.959mH (ii) R= 59.658Ω, L= 47.474mH

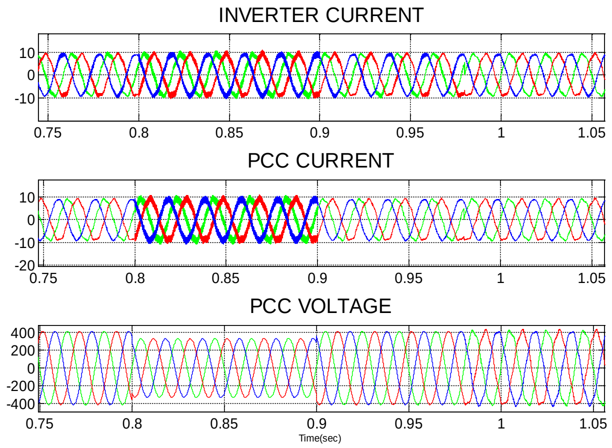


(i)



(ii)

Case (5.1) Simulation results with islanding event (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R - L - C Load (i) R= 59.658Ω, L= 189.897mH, C= 53.36μF (ii)R= 59.658Ω, L= 75.959mH, C= 133.39μF



Case (6.1)Simulation results with Voltage Harmonic Injection during Non-Detection Zone (a) Inverter side Current (b) PCC Current (c) PCC Voltage with R - L - C Load

The results are shown for the inverter current and PCC current and voltage. L-L-L-G fault is created in the system during the time 0.8 sec to 0.9 sec and a difference in the results is shown when compared to the normal condition; though a fault is created in the system disturbance will not be there in the system after the fault occurrence.

IX. CONCLUSION

This paper presents analysis, modelling and simulation of an active anti-islanding method in three phase grid connected solar photovoltaic power plants both under normal and also in the faulty conditions. The proposed method, voltage harmonic injection method, injects a 10% of 6th harmonic voltage into the modulating signal in order to detect the islanding event. Modelling and simulation results are given to demonstrate the ability of the proposed method in islanding detection during non-detection zone. The grid connected solar PV model has been implemented using the MATLAB/SIMULINK environment. The behaviour of the proposed scheme was examined under different load operating conditions both under normal and faulty conditions. This work aims to find the best solutions that lead to the detection of islanding condition during non-detection zone condition and also for the smart grid applications in which passive method fails.

X. FUTURE SCOPE

The enforced active islanding detection device pulses a perturbation so as to fulfil the ability quality and security needs. The reliability is improved by a stationary error associated associate acceleration of an ultimate error within the frequency which will rise between the electrical converter output current and also the voltage over its terminals. The direction of the frequency drifting is decided in line with the basic frequency of the grid to realize a shorter detection time. By drifting the frequency in one direction the reliability and security performance are maintained once multiple generators are put in within the same radial feeder.

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