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Design of Islanding Detection System for Grid Connected PV System

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Abstract —*The main challenge of integrating distributed generator (DG) into power grid is islanding occurs when a disconnected line is energized by a local distributed generation source. If islanding is not quickly detected, it can present serious safety and hazardous condition many methods have been developed to detect this situation. If islanding is not quickly detected, it can present serious hazardous condition. In this paper present, various detection techniques likes islanding detection using rate of change of voltage and rate of change of frequency. This paper present on the design of rate of change of voltage scheme for detection against islanding for grid-connected PV system*

Keywords- *Introduction of islanding, System modeling, islanding detection, MATLAB/SIMULINK ,dv/dt,df/dt etc*

I. INTRODUCTION

When the distributed generator connected to the grid and power deliver to the load then in the case of the blackout the DG continues to deliver power to the load this condition is islanding. Islanding is dangerous to line workers. If the islanding is not detected it can present serious condition. When the islanding occurs the voltage and frequency cannot maintain its standard level. Moreover, Load generation mismatch is also the cause of the islanding.
In Grid connected PV system, In the case of a blackout, the solar panels will continue to deliver power as long as irradiance is sufficient, phenomena are called Unintentional islanding.
Intentional islanding is which the generator disconnects from the grid, and forces to power the local circuit. This is often used as a power backup system for buildings that normally sell their excess power to the grid.

II. SYSTEM DETAILS

A. Basic block diagram

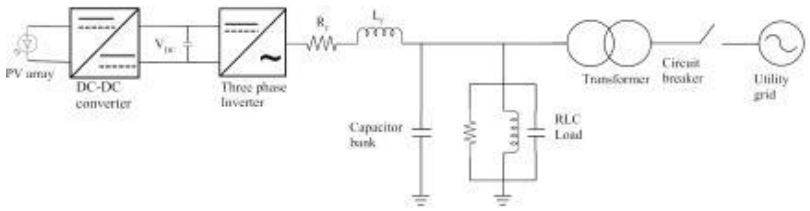
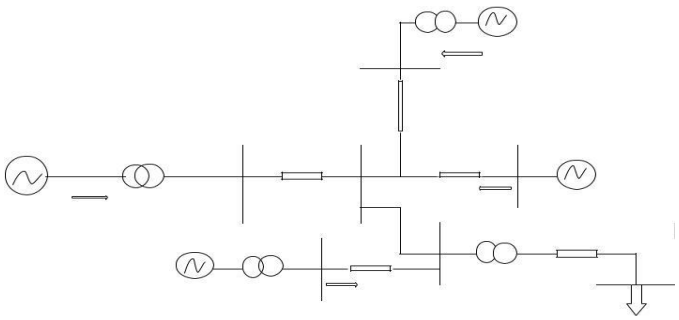


Fig.1.Basic building block of the system

Block diagram in figure [1] shows that solar PV which contains DC power is integrated with utility grid which contains AC power. DC of solar PV is converted AC by using of inverter, which is controlled by grid parameters and both PV and Grid is used to feed common RLC load.

B. Actual schematic Diagram of the System



Actual schematic diagram shows that four identical sources are connected with each other and fed to common load . where three sources are AC source and one PV is DC source.

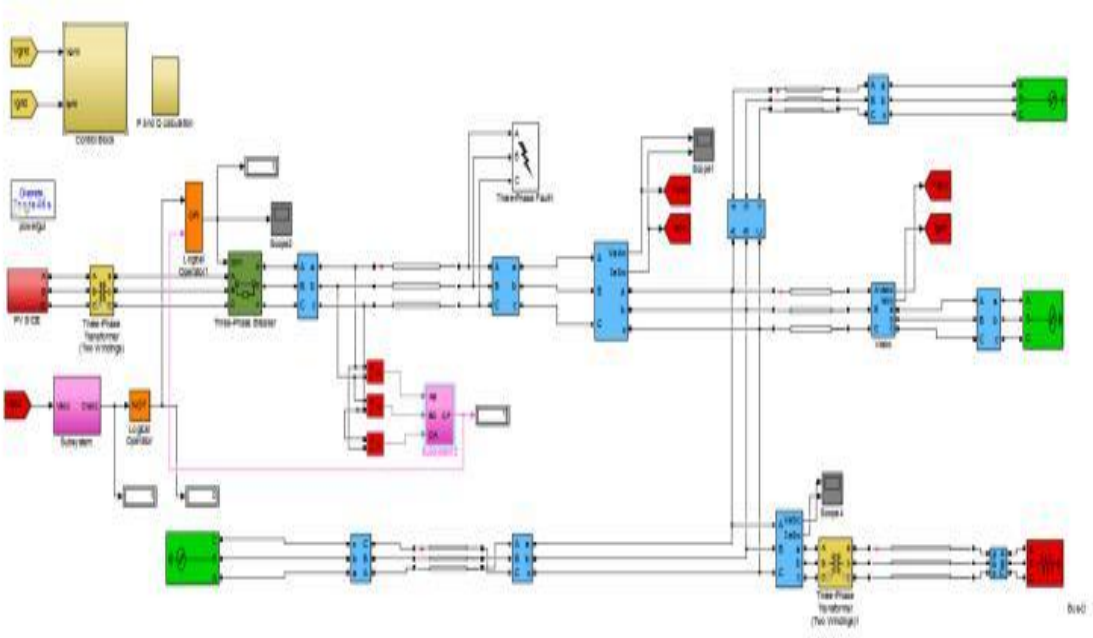
Table 1 System Specification

SR. NO	Equipment	Rating of Equipment
1	Generator-1	66Kv
2	Generator-2	100Kv
3	Generator-3	132Kv
4	Transformer-1	350/66Kv
5	Transformer-2	132/66Kv
6	Transformer-3	100/66Kv
7	Transformer-4	66/400Kv

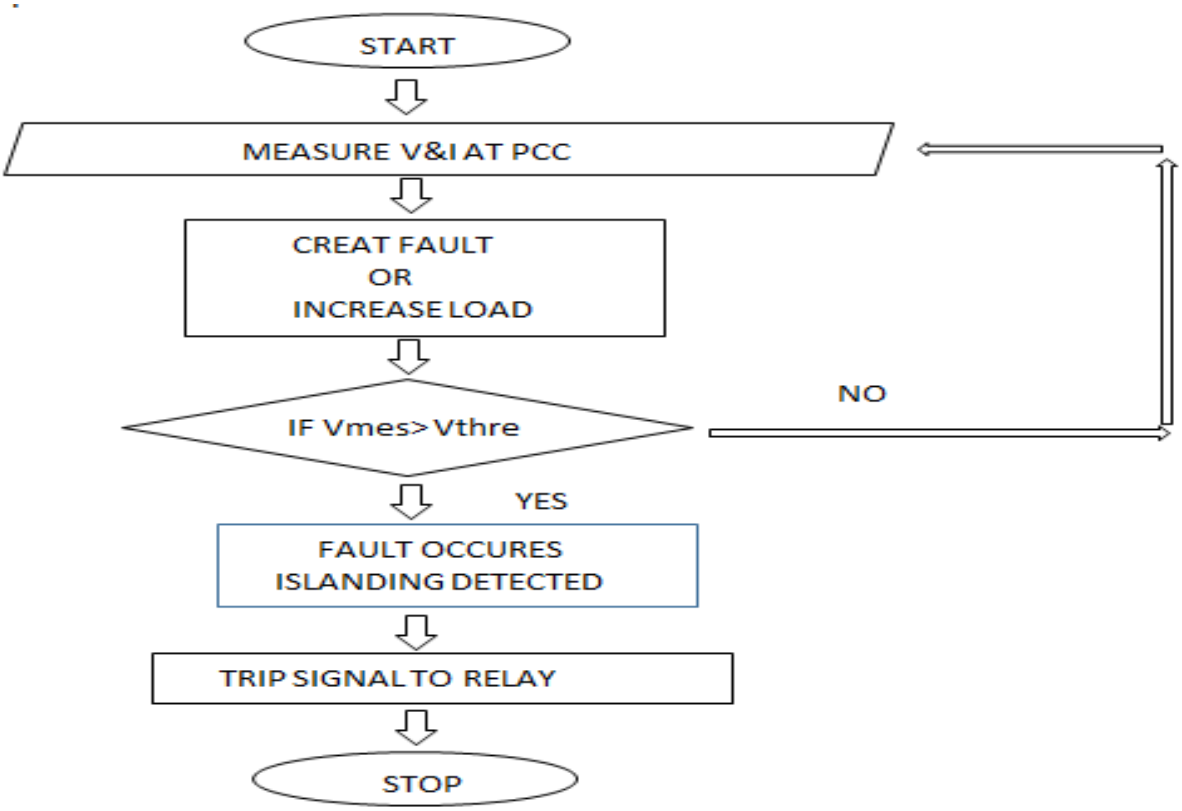
The above table[1] mention that in grid connected PV system there are three generators which generates different power and then there are three transformer which is step down to 66kv and there is one transformer which steps down to 66kv/400v.

III. SYSTEM MODELING

The simulation of grid-connected pv system has been designed by used of Simulink library blocked in Matlab. The PV source connected to converter then inverter and is connected to the transformer and 3 utility grids. The Simulink model shown in below figure[5]. The model has been done by used of Matlab block and design some system. The system is integrated at 66kV voltage. The inverter has controlled by controlling block shown in the model. Boost converter has controlled by some P and O technique. The duty cycle of the converter has been controlled by this technique.

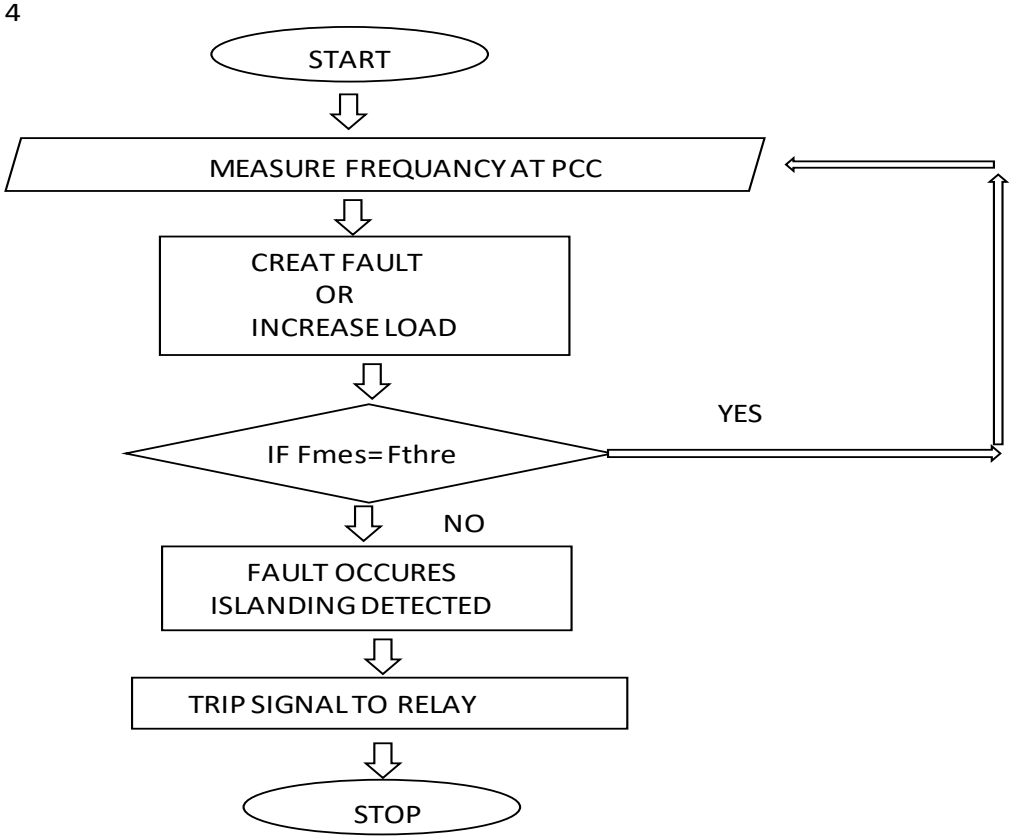


A. FLOWCHART FOR ISLANDING DETECTION



B. FLOWCHART FOR ISLANDING DETECTION

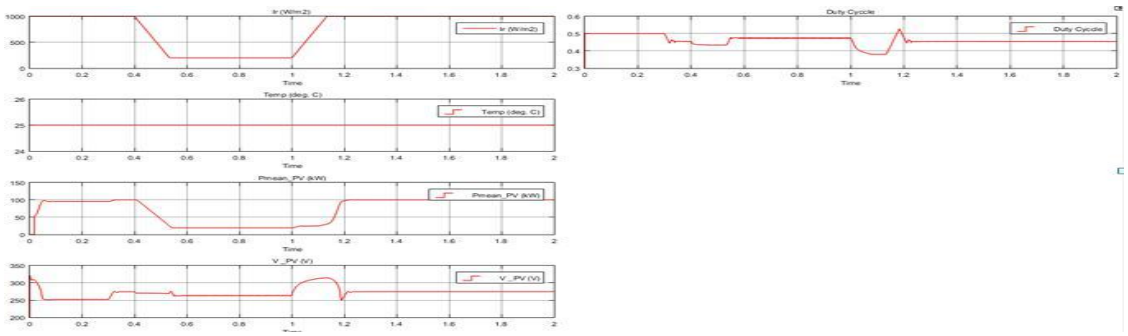
4



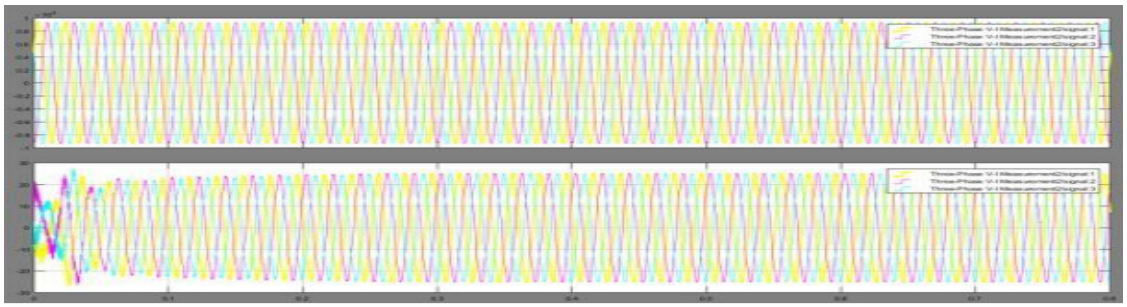
IV. RESULTS

A. PV MEASUREMENT

The model has been done by used of Mat lab block and designs some system. The system is integrated at 66kV voltage. The inverter has controlled by controlling block shown in the model. Boost converter has controlled by some P and O technique. The duty cycle of the converter has been controlled by this technique.

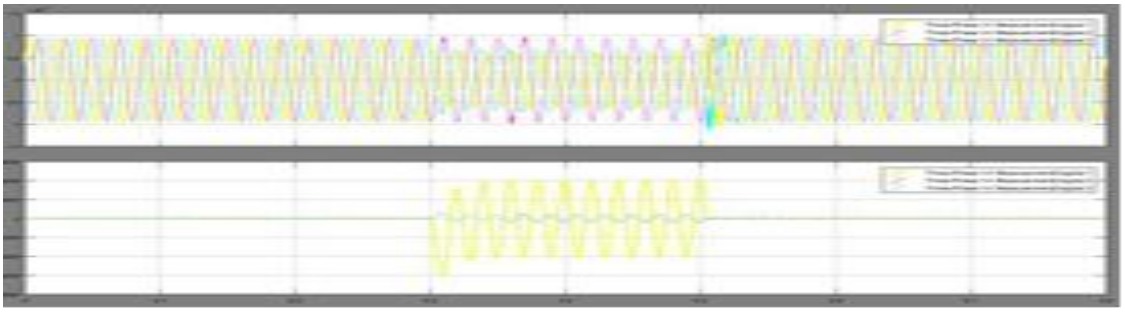


In the shown in above figure, the irradiance changes by some time interval and the temperature is 250Celsius. The power of shown in above figure is changed by the irradiance.

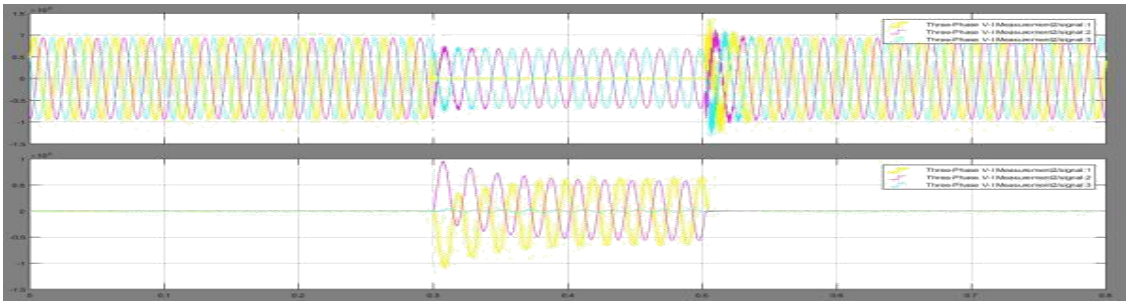


The system is integrated at 66 KV voltage at PCC point. The PCC voltage and current during healthy condition shown in the figure. Waveform of voltage and current are similar through end.

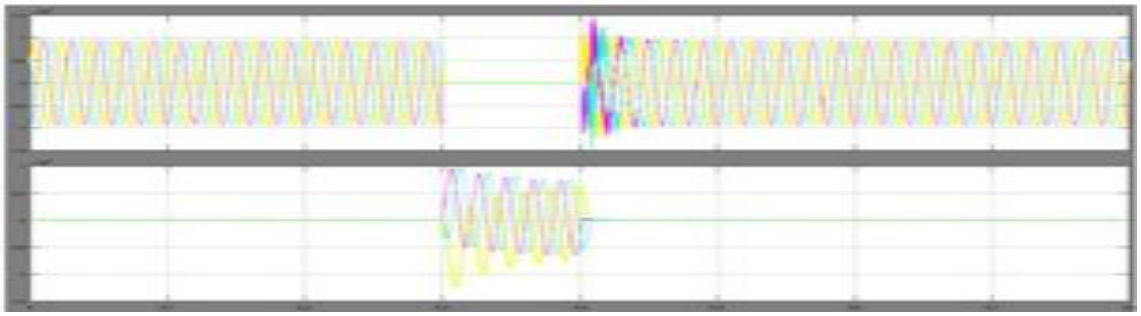
The whole system has been generated the power is 66 KW. So the current and voltage for L-G,LL-G and LLL-G fault at PCC is may get changed respectively, for the time duration of fault in between 0.3-0.5 seconds.



So at PCC during L-G fault the current get increase and voltage get decrease for the time duration of fault in between 0.3-0.5 seconds.



At PCC during LL-G fault the current of two phase get increase and voltage get decrease for the time duration of fault in between 0.3-0.5 seconds.



V. CONCLUSION

This paper was presented on the the design of detection scheme against islanding for grid-connected PV system. The rate of change of voltage and change of frequency was designed for detection scheme. So the future work is to minimize operating time of islanding detection.

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