# Passive Islanding detection technique of distributed network

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***Abstract-*** **Due to environment issue, congestion in transmission network, ever growing price for energy, power quality and reliability issue with exciting grid, small pocket of grids are increasing in system. These small grid have their generation, and are dependent on main grid only for power exchange. This small grid has different behavior when it is in grid connected (constant voltage source) or in grid isolated mode (constant current source). Islanding detection is divided into two technique, i.e., remote and local. Local method is further divided in passive, active and hybrid methods, advantages in passive method are short detection time, accurate and does not perturb the system.**

**When islanding occurs, few parameters change which are frequency, voltage, active power, and harmonics. According to large change in one of these parameters islanding is detected. For final dissertation a comparison of conventional technique and AI technique for detection of islanding. Before implementation of AI technique for islanding detection, it is relevant to implement conventional techniques for detection of islanding. Therefore, some conventional passive methods of over/under current(OUC),over/under voltage(OUV),over/under frequency(OUF) and Rate of Change of Frequency (ROCOF) have been implemented for islanding detection of DG.**

***Index Terms-*** **introduction, islanding, islanding technique, detection duration, conclusion.**

## 1. INTRODUCTION

Conventional power plant such as steam based ,gas based have scarecity of primary fuel.these plants and nuclear plants have exhibited issues of pollution and have great effect on environment.[2]

Renewable energy sources like solar,wind, etc. are penitrating into the grid due to the clears energy they provide alongwith less cost,site and not requiring water resources. Transmission network are also becoming congested,installation of new conventional power plant and addition of transmission network into exiting grid my require lot of time ,effort and cost.hence, a concept of distributed generation was developed . the distributed energy resources were easy to be embedded to grid meeting with energy requirement of local grid.distributed network is like a microgrid having own generation feeding local load .the network is connected to maingrid only for exchange of power in both cases i.e.surplus power or increased demand.[3]

One problem occur when DG is islanded from grid and provide power to local area. After islanding condition some parameters are change these parameter may be voltage, frequency, current, power. Its effect occur on load side. Due to that there are some problem occur like over-heated, effect of frequency on speed of machine, effect of voltage variation.Islanding detection is important because it's effect on load. There are some method of islanding detection are classified based on different parameters, some of them are voltage, frequency, power, current.[5]

## 2. ISLANDING

Islanding is defined as "Situation in which a system is electrically isolated from other part of the system but still continues to be supplied by other source of generation" [1]

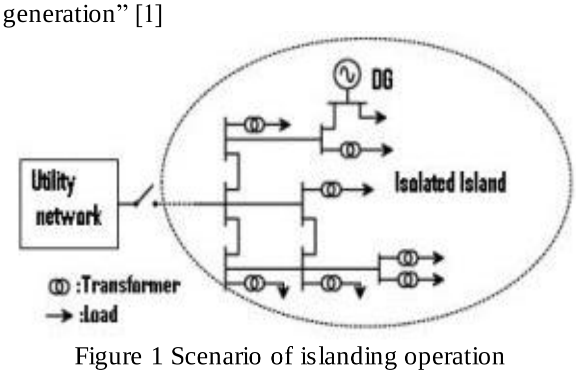


Figure 1 Scenario of islanding operation

In the shown in the figure islanding mode no active power connected to the distribution system. Further in fault condition distribution line does not receive any power.in that condition small case generation providing a supply to the system. Islanding can be sub divided in two part like intentional and unintentional. Islanding is a condition in which the DG (distributed generation) unit in micro grid energize the local network. While in this case micro grid are electrically separated from the main grid. One can say that islanding mode the micro grid become uncontrollable by the main grid and operate automatically. [1-4]

## 3. ISLANDING DETECTION TECHNIQUE

The main methodology of detecting islanding condition is comparing the DG output parameters with system parameters [1]. Then decide islanding situation according to change in these parameters. Islanding detection techniques can be classified into remote and local techniques. Further local techniques can be divided into passive, active and hybrid techniques as shown in figure 5.[10]

### 3.1 Remote islanding detection

Remote islanding detection techniques are as communication between utilities and DGs. They may have better reliability than local techniques, it is reliable than local technique but quit expensive. They are not easy to implement and so uneconomical.it is more expensive because of communication equipment.[1] In remote islanding detection technique like power line carrier communication, supervisory control and data acquisition, intertripping [3]

### 3.2 Local islanding detection

Local techniques are based on the measurement of system parameter of the small scale sources such as voltage, frequency. It is classified as follow.[5]

1. Passive Detection Techniques

Passive Techniques work on measuring system parameters like variations in voltage, frequency, harmonic distortion, etc. [2] these parameters change when the system is islanded. Detection of an islanding and grid connected condition is based on the thresholds of parameters. Special care should take while setting the threshold value. Passive techniques are fast and they don't offer disturbance in the system. They have a large non detectable zone (NDZ) in which they fail to catch-up the islanding condition. Some passive islanding method are below.[8]

**1.** Under voltage / Over voltage

Under voltage/over voltage technique is change voltage during islanding phenomena.one disadvantages is load power and generated power by the distributed generation during islanding is matched, voltage change very negligible. For voltage sag detection are maintain voltage .voltage sag is used to trigger detection technique as certain threshold.[7]

**2.** Under frequency / Over frequency

In the islanding detection of under frequency / over frequency technique, the change introduced during an islanding phenomenon is compared to preset threshold to detect island.[9]

**3.** Rate of change of frequency (ROCOF)

Rate of change of frequency is most preferred technique of islanding detection. A variation in power is introduced when the grid is disconnected, during island event .this power different result in change of frequency which is used to detect the islanding. If the disturbance in power is small, and frequency vary slowly. [2]

2. Active detection techniques

In the active methods directly introduce small perturbations in system [1] for islanding detection. Cause of this small perturbation will result in smallest change in system parameters when the DG is islanded, change will be negligible when the DG is connected with grid.

3. Hybrid detection schemes

A hybrid method is combination of both the active and passive detection techniques. The active technique is implemented after the passive technique to detect islanding. [10]

## 4.Simulation diagaram and result

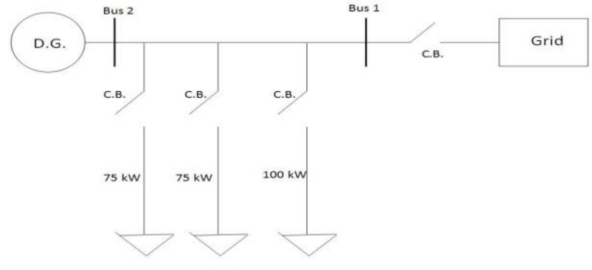


Figure 6 simulation diagram

| | |
|---|---|
| Nominal system frequency | 50Hz |
| Inverter nominal three phase power | 250kW |
| Nominal inverter primary line-line voltage(Vrms) | 25kV |
| Nominal DC link voltage | 480V |

Table 4 Parameter

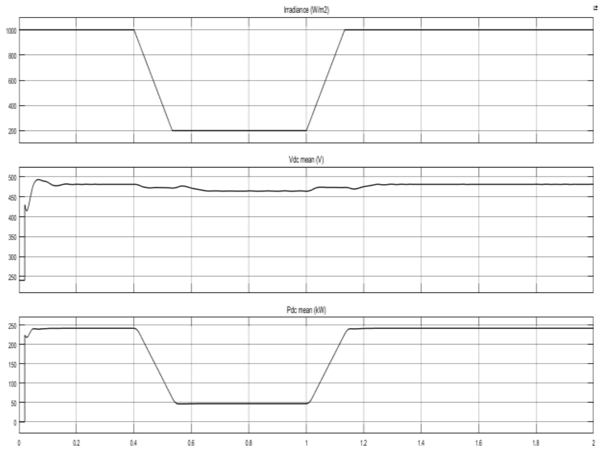


Figure 4.1 Normal PV System

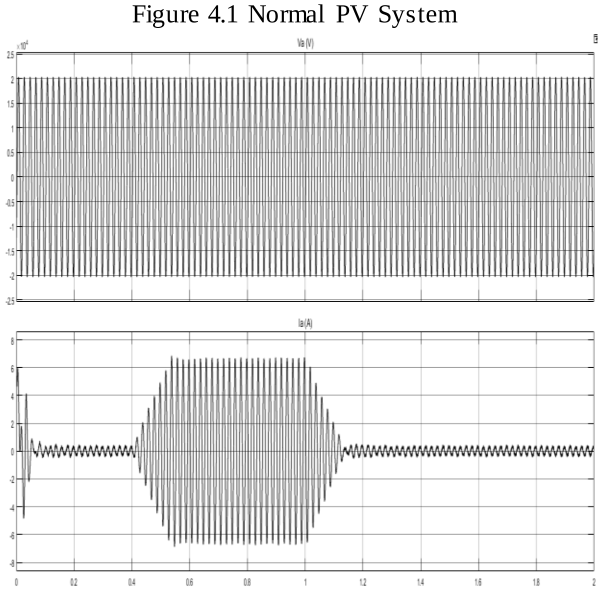


Figure 4.2 Normal system voltage and current at grid

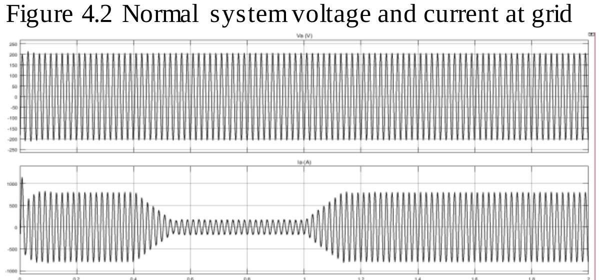

Figure 4.3 Normal system voltage and current at DG

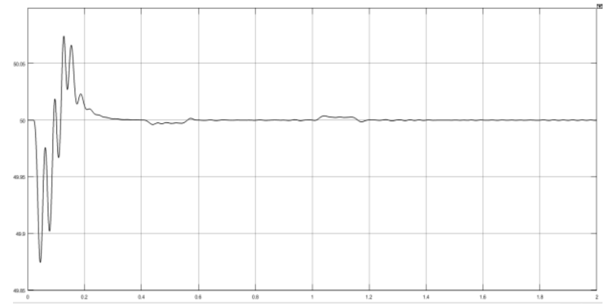

Figure 4.4 Normal system Frequency

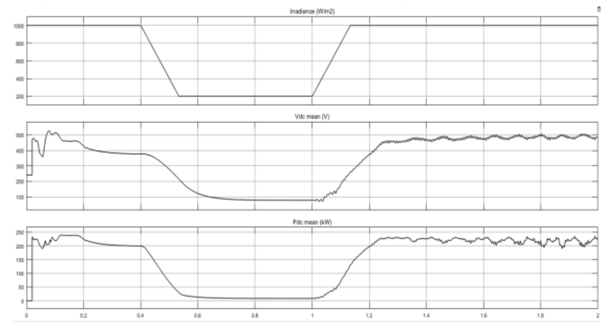


Figure 4.5 islanded PV array

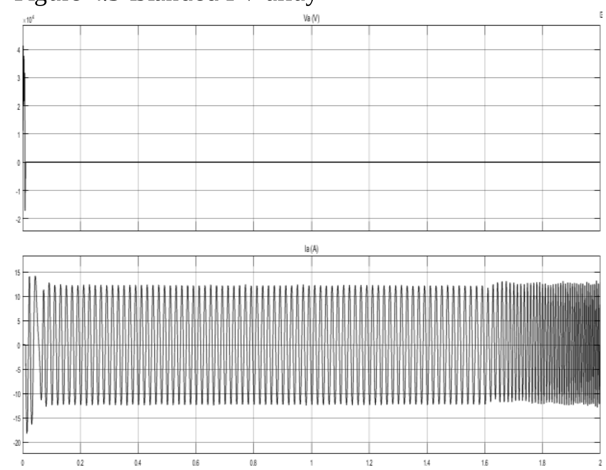


Figure 4.6 Islanded voltage and current at grid

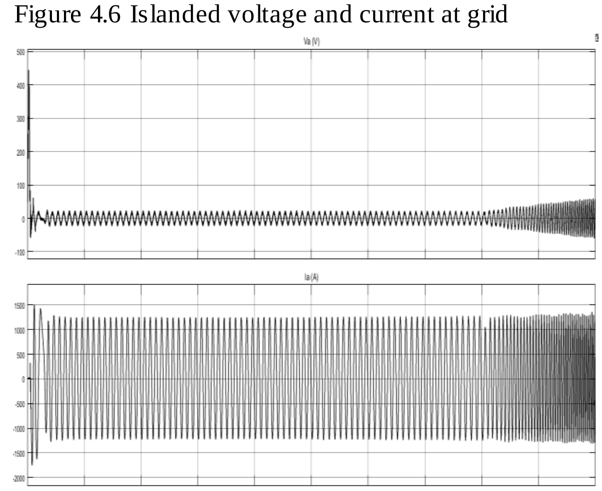


Figure 4.7 Islanded voltage and current at DG

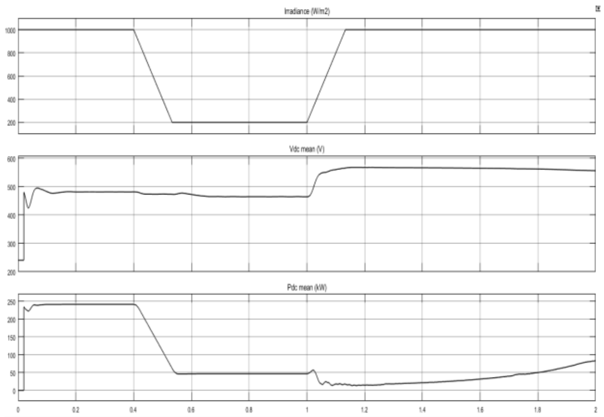

Figure 4.8 Variation in radiation in fault condition PV array

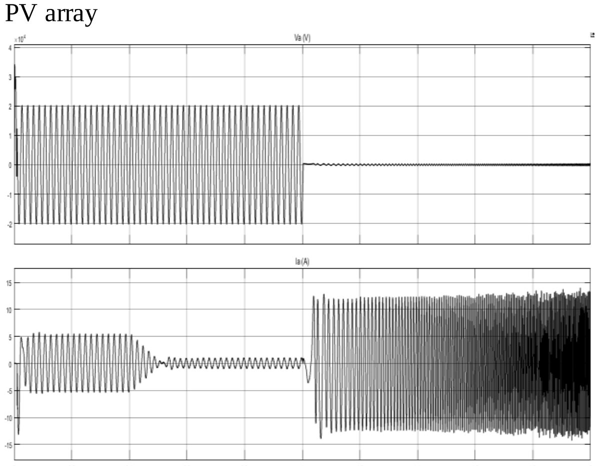

Figure 4.9 fault condition voltage and current at grid

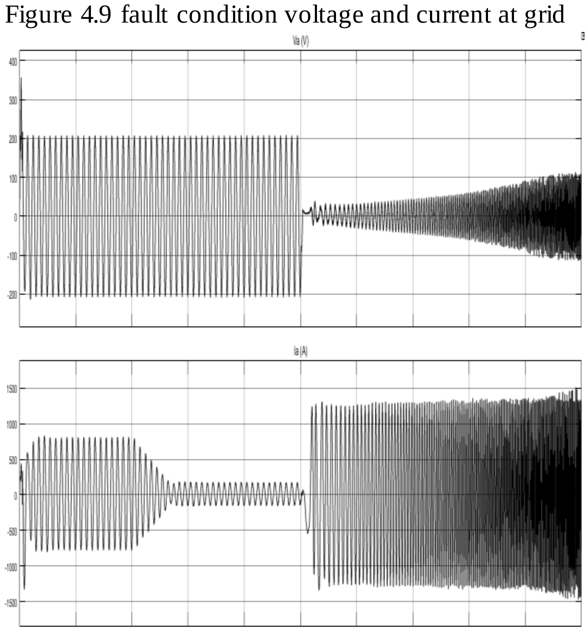

Figure 4.10 Fault condition voltage and current at DG

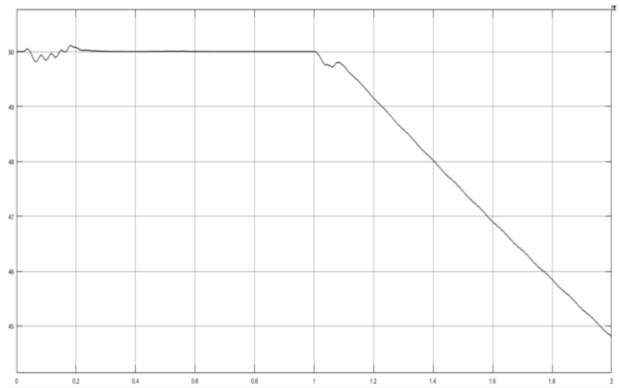

Figure 4.11 Frequency at fault condition

## 5. ISLANDING DETECTION AND DETECTION DURATION

Table 5.1 comparison of detection time

| Scenario | OCST | OCDT | UVST | UVDT | UFST | UFDT | ROCOFST | ROCOFDT |
|---|---|---|---|---|---|---|---|---|
| Single phase to ground fault | 1 | 0.187 | 1 | 0.007903 | 1 | 0.001 | 1 | 0.00075 |
| Phase to phase fault | 1 | 0.1938 | 1 | 0.007903 | 1 | 0.001 | 1 | 0.00074 |
| Phase to phase to ground fault | 1 | 0.1925 | 1 | 0.007903 | 1 | 0.001 | 1 | 0.00073 |
| Three phase fault | 1 | 0.04252 | 1 | 0.007879 | 1 | 0.001 | 1 | 0.00076 |
| Three phase to ground fault | 1 | 0.04252 | 1 | 0.007879 | 1 | 0.001 | 1 | 0.00075 |

## 6. CONCLUSION

In this paper implemented by different passive islanding detection technique and its detection duration in 250kw solar panel are connected by grid in the normal condition system worked and in the islanding condition system work waveform in the result .in the fault created in the system worked in different behavior and implemented over current /under current, over voltage/under voltage, over frequency/under frequency and rate of change of frequency .and compare this all method in trip status to trip time and detection time .

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