

Detection of Islanding and Power Quality Disturbances and their Mitigation using DVR¹Swapnil Paliwal, M.Tech Scholar, Electrical Department, Yagyavalkya Institute of Technology, Jaipur, Rajasthan²Neeraj Kumar Kumawat, Asst. Professor, Yagyavalkya Institute of Technology, Jaipur, Rajasthan**Abstract**

Islanding refers to the disconnection of the microgrid from the mains, including the generation of loads and power distribution. Whenever there is a fault or maintenance is required, islanding is performed. In normal or stable mode, the system operates in constant current control mode. After exercise, the system switches to voltage control mode. There are several methods for detection of islanding, such as active and passive methods. In this article, the SVM detection technology used to detect island conditions is performed. This article also explains in detail the benefits of support vector machine method in island detection. Islanding is the process of creating power islands as part of a supply system in case of widespread interference in the main network. In the case of island, even in case of failure of the mains, the uninterrupted power supply to the critical load can be maintained. In the event of a fault in the main grid, the grid will be automatically segmented and the DG source will deliver the critical load until the main grid is resynchronized with GD. Isolated islands can be of two types, intentional islands and unintentional islands.

This paper introduces the Dynamic Voltage Restorer (DVR) configuration and control strategy. To recompense for power for each phase discretely, a closed loop PI control law is proposed in the d-q reference frame. The proposed technique provides fast response or effectual case recompense functions. In addition, space vector modulation (SVM) is used to estimate the three-phase voltage to detect voltage drops. By using SVM, voltage drops can drop faster than other conventional technique. so, DVR can quickly and accurately reimburse for voltage drops. The results obtained are simulated in Matlab / Simulink, which shows that planned technique can effectively alleviate voltage drops and imbalances in the distribution network.

Keywords: Power quality disturbances, Dynamic Voltage Restorer DVR, Islanding, FACTS controller, SVM.

Introduction

This work presents a new method of detection to protect distributed generator feed systems. The method has been tested on allotment buses of 25 kV and below. The current interest in installing dispersed generators in low-voltage buses near customers has created new dispute for security engineers, which differ from traditional radial-based security methods. Therefore, it is necessary to reconsider typical protection configurations, such as closed stepless monitoring, impedance relay security areas, and discovery of unexpected islands in circulated generator systems. The island situation is defined as when part of unusable energy production system is isolated from major supply system, it is generally measured undesirable because it can cause potential injure to existing equipment, cause charge to public utilities and reduce reliability and power quality.

Current island detection methods usually passively and actively monitor overvoltage / under voltage and overvoltage / under frequency ratios. However, each method has ideal sensitive working conditions and insensitive working conditions, and its degree of deterioration in power quality is different, which is called non-detection zone (NDZ). The method of

detection of islands proposed in this paper adopts supposedly precise impedance measurement concept or enlarge it to symmetrical component impedance sphere using natural and man-made imbalances. In specific applications where this island detection method has been improved over the existing island detection method.

The general solution has been studied where protection engineers can conclude when this technique can be used the majority efficiently.

First of all, this article first briefly introduces the North American electricity system and the motivation to use distributed production. Then other chapters introduce the background and details of this technology in detail.

Islanding

An island is a situation where the power delivery classification is electrically remote from the rest of the electricity system, but is still powered by the Directorate-General connected to the grid. As shown in Figure 2.1. Traditionally, there is no active power source in the power distribution system and power cannot be obtained in the event of an upstream transmission line failure, but for DG this assumption is no longer valid. The recent carry out is that nearly all utilities involve DG to disconnect from the network as soon as probable in case of island stays. The IEEE 929-1988 standard [11] involve Directorate-General to be isolated and disconnected. Isolated islands can be intentional or unintentional. During the preservation service of the supply network, shutdown of supply network may result in generator islands. The unintended island phenomenon caused by the unexpected shutdown of the electricity grid has attracted more attention. There are various problems due to accidental islands. IEEE 1547-2003 standard [25].

A delay of up to 2 seconds is required to detect accidental islands and all Directorates-General no longer operate the circulation organization.

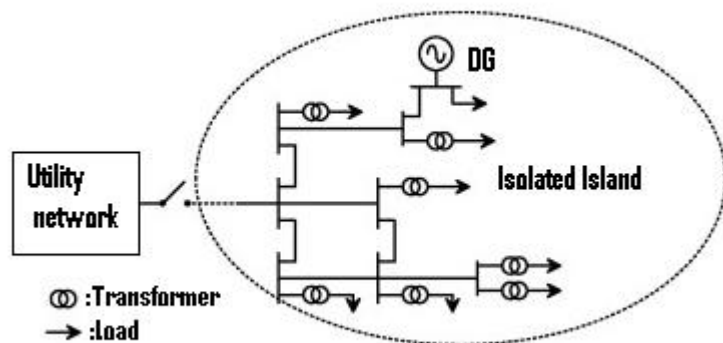


Figure 1: Scenario of islanding operation

Proposed methodology

This proposed introduces the Dynamic Voltage Restorer (DVR) configuration or control strategy. To recompense for the voltage for each phase discretely, a closed loop PI control law is anticipated in d-q position frame. The planned technique provides fast comeback or effectual case compensation functions. In addition, space vector modulation (SVM) is used to estimate three-phase voltage to detect voltage drops. By using SVM, voltage drops can drop faster than other conventional technique then, DVR can quickly or accurately recompense for voltage drops. The results obtained are

replicated in Matlab / Simulink, which shows that planned method can effectively alleviate voltage drops and imbalances in the distribution network.

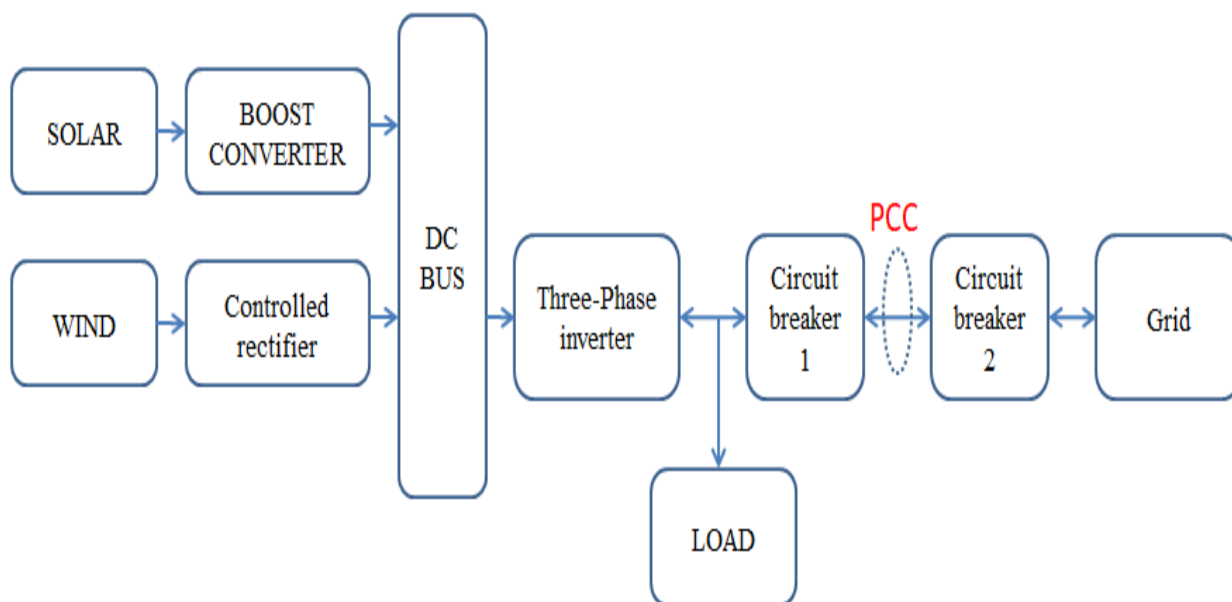


Fig. 2: Proposed block diagram

Modules

- AC GRID
- DC LINK
- THREE PHASE INVERTER
- ISLANDING DETECTION
- DVR
- PULSE WIDTH MODULATION (PWM)
- LOAD

Result and Discussion

The planned technique provides fast comeback or effectual case compensation functions. In addition, space vector modulation (SVM) is used to estimate three-phase voltage to detect voltage drops. By using SVM, voltage drops can drop faster than other conventional technique then, DVR can quickly or accurately recompense for voltage drops. The results obtained are replicated in Matlab / Simulink, which shows that planned method can effectively alleviate voltage drops and imbalances in the distribution network.

DVR (Dynamic Voltage Restorer) is a series of printers integrated with a large power supply system. The DVR includes a VSC (19-20) with a DC power supply. The main principle of a DVR is to compensate for power drop / expansion of the flow cable to the converter.

Synchronization is the process of matching the voltage and frequency of a generator or other source to a running network. An AC generator cannot deliver power to an electrical grid unless it is running at the same frequency as the network. If

two segments of a grid are disconnected, they cannot exchange AC power again until they are brought back into exact synchronization.

Maximum power point tracking (MPPT) is an algorithm applied to photovoltaic (PV) inverters to continuously adjust impedance detected by a photovoltaic system in changing conditions so that the PV system is identical to or close to the photovoltaic system.

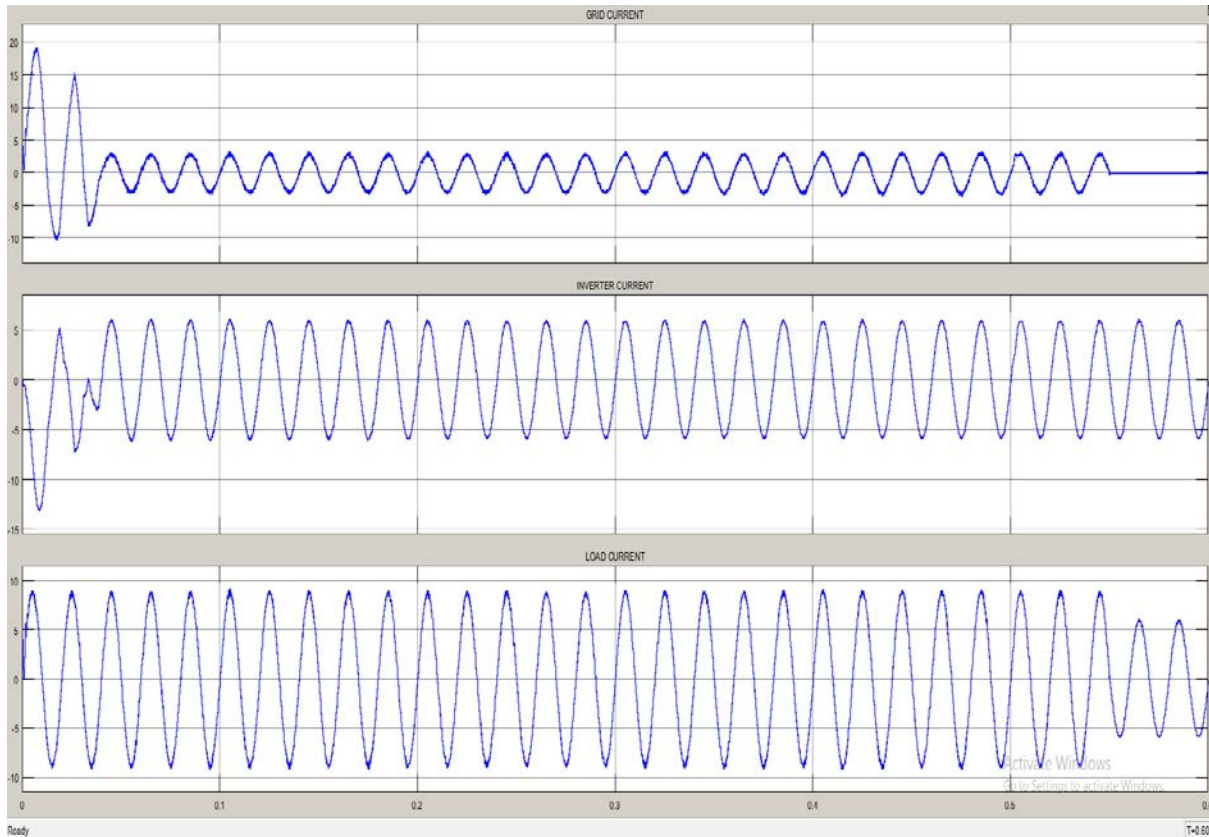


Fig. 3: Inverter current ,grid current, load current

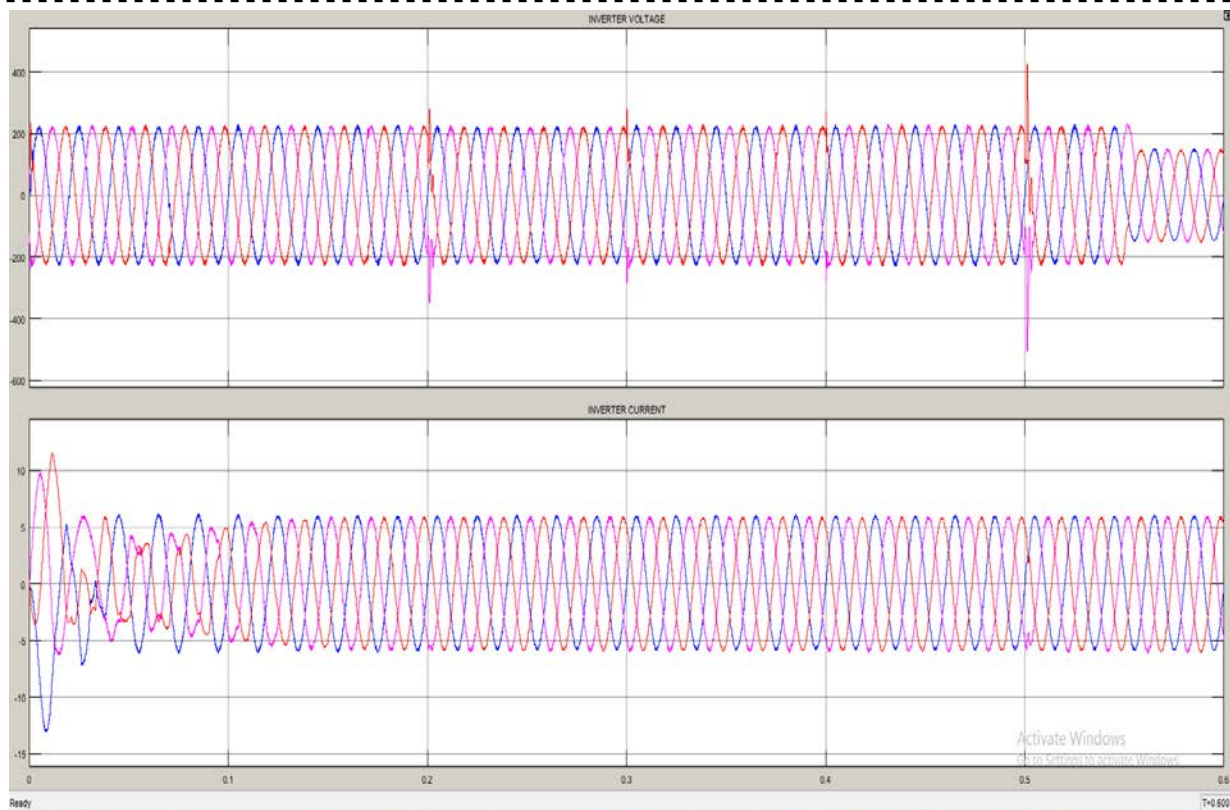


Fig. 4: Inverter current and voltage

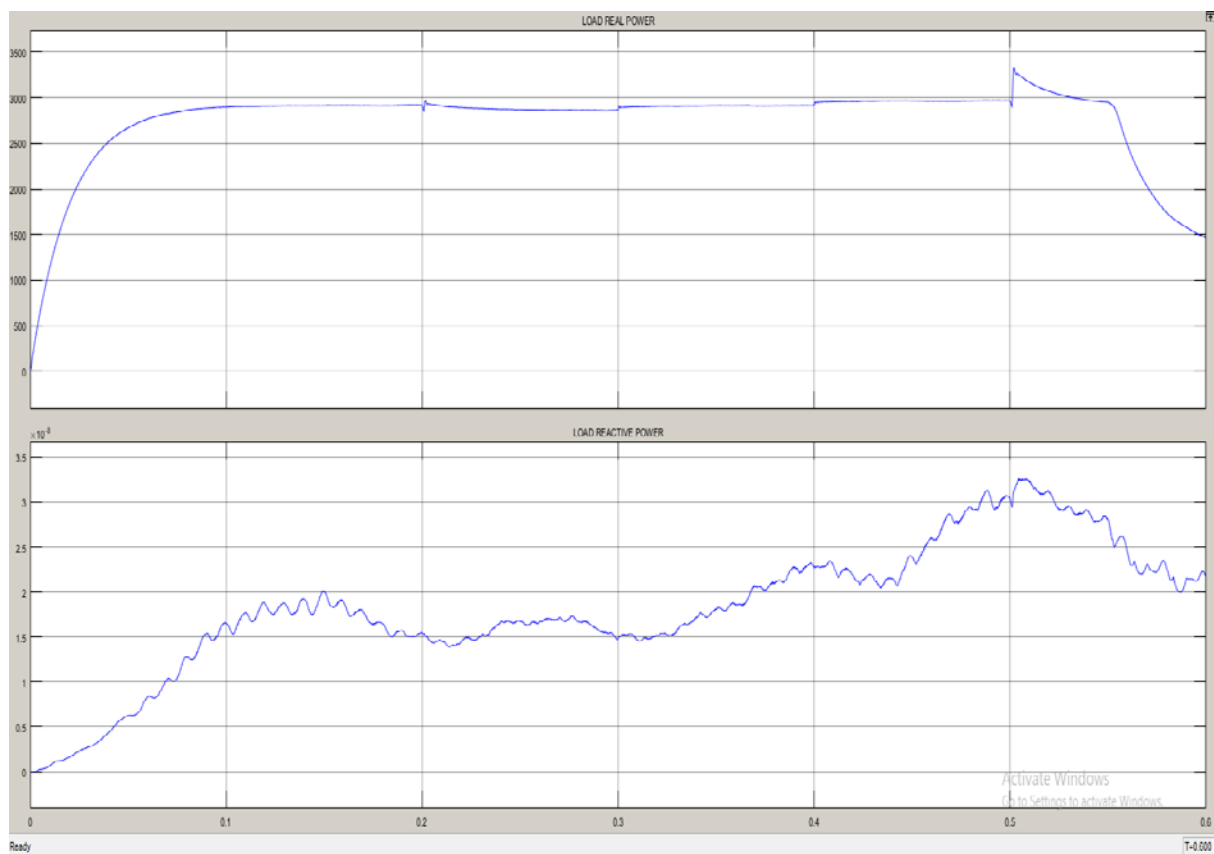


Fig.5: Load real power and reactive power

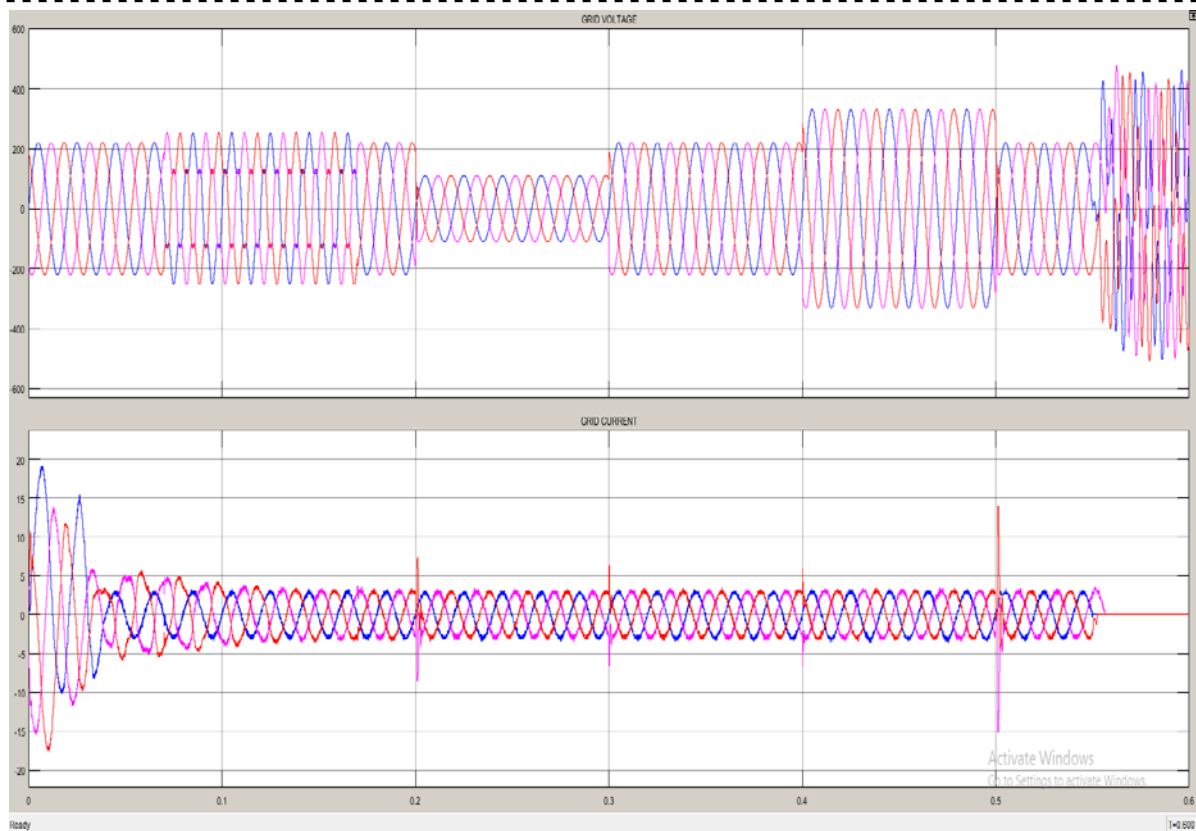


Fig.6: Grid disturbance as swell, sag, harmonics

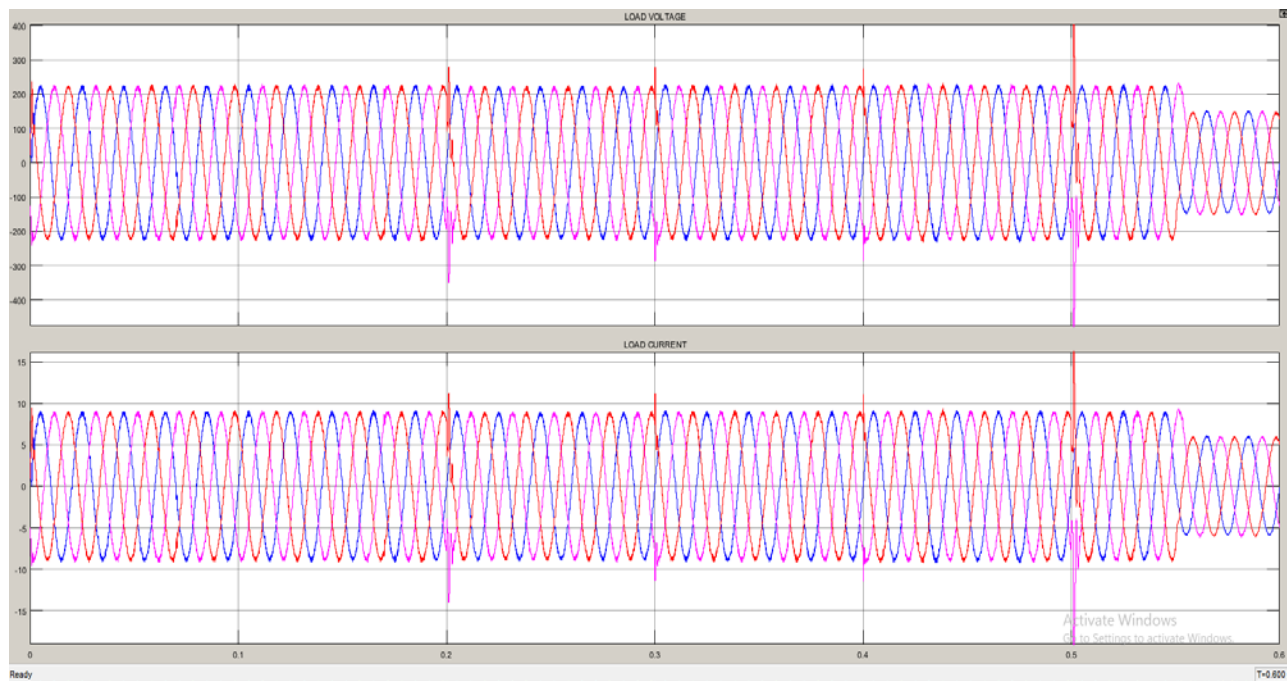


Fig.7: Load voltage and load current

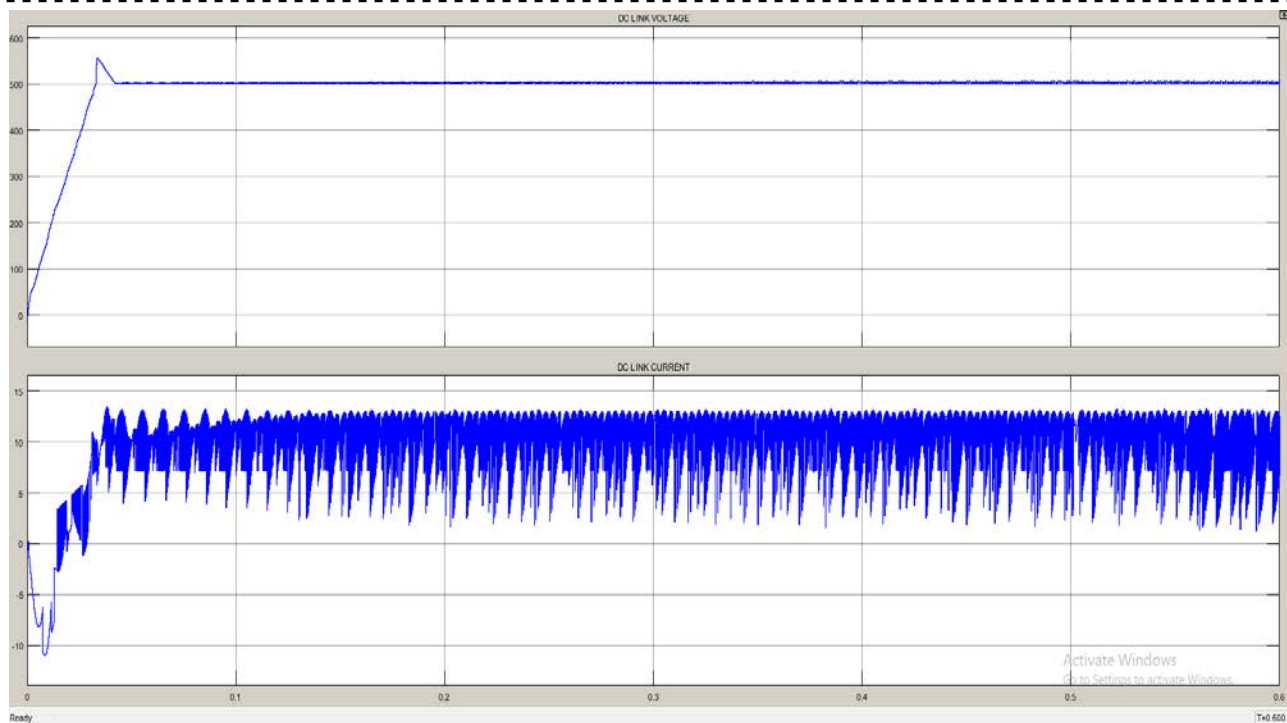


Fig. 8: DC link current and voltage

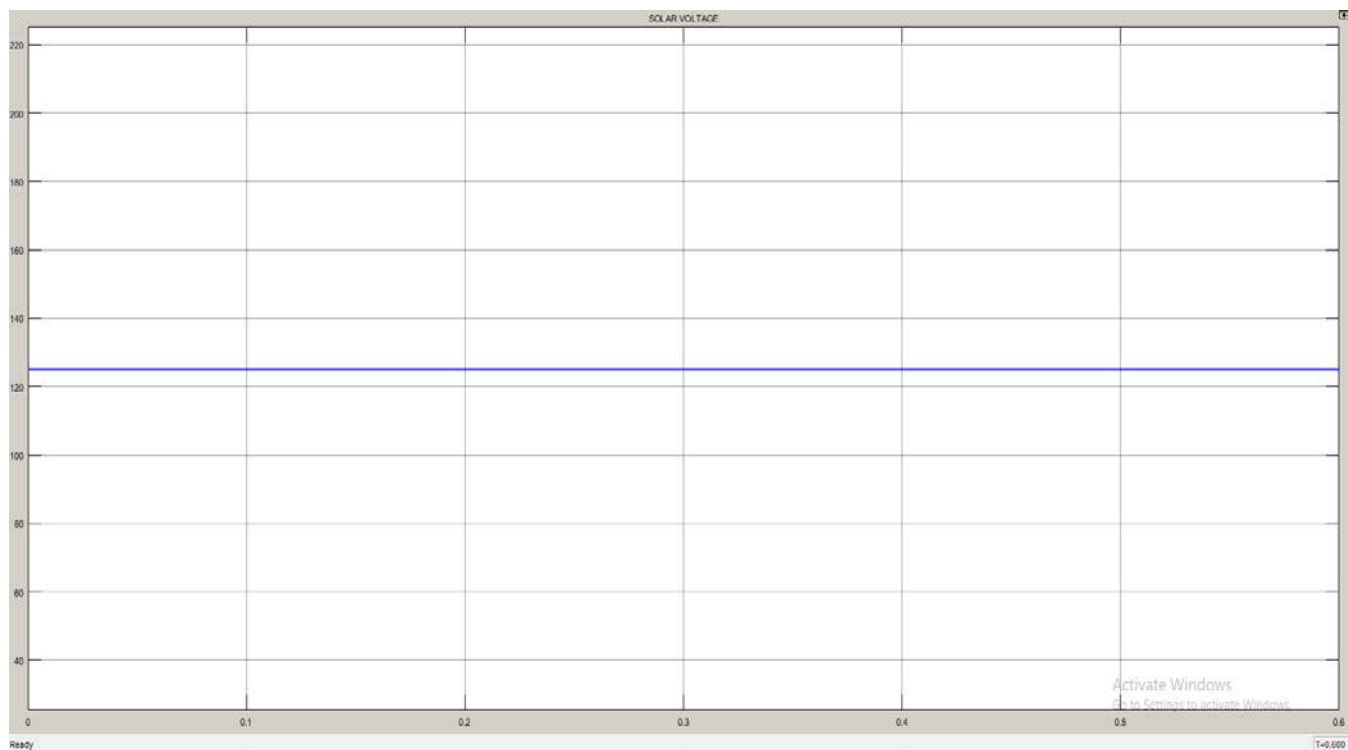


Fig 9: Solar voltage

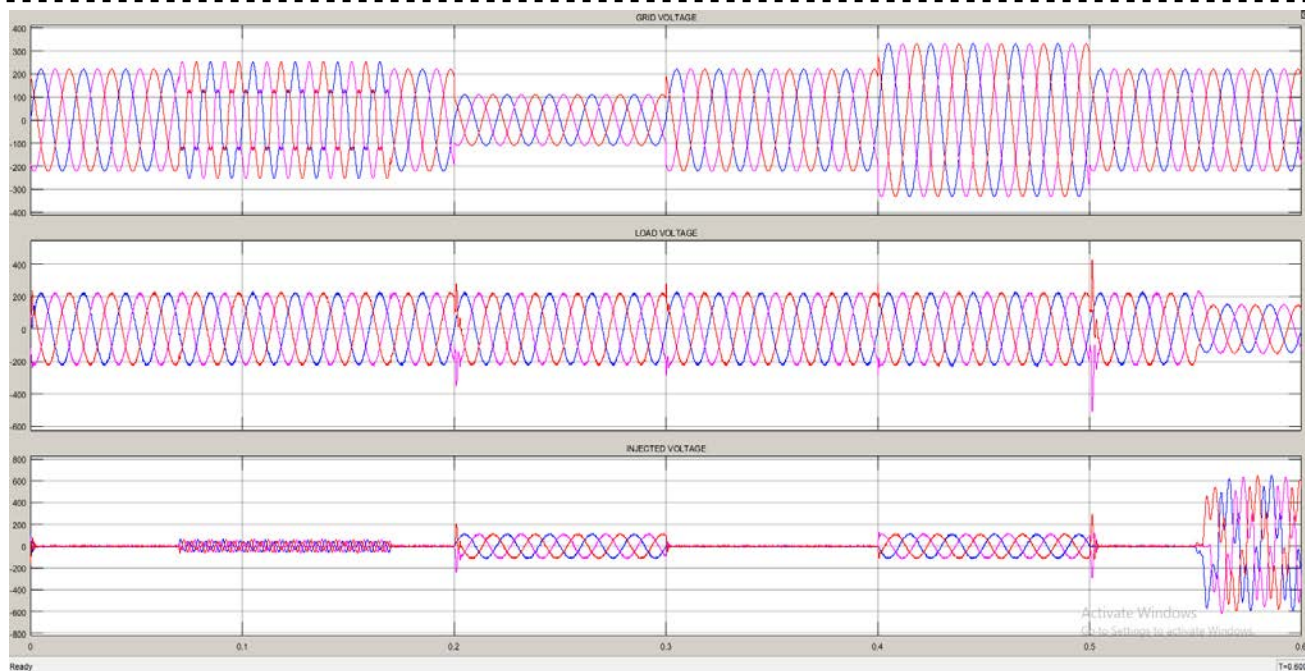


Fig. 10 : Grid disturbance as swell, sag, harmonics, and load voltage and injected voltage :

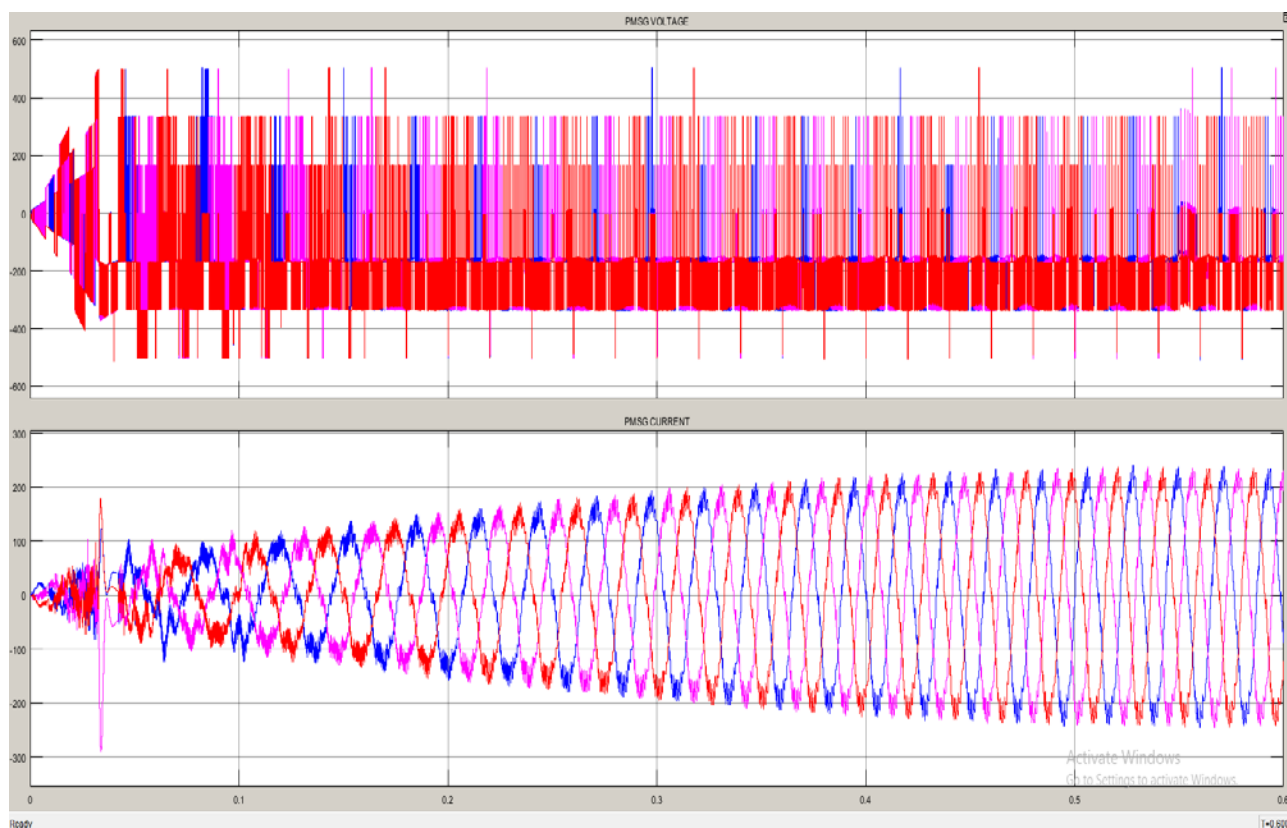


Fig. 11: Permanent Magnet Synchronous Generator voltage and current

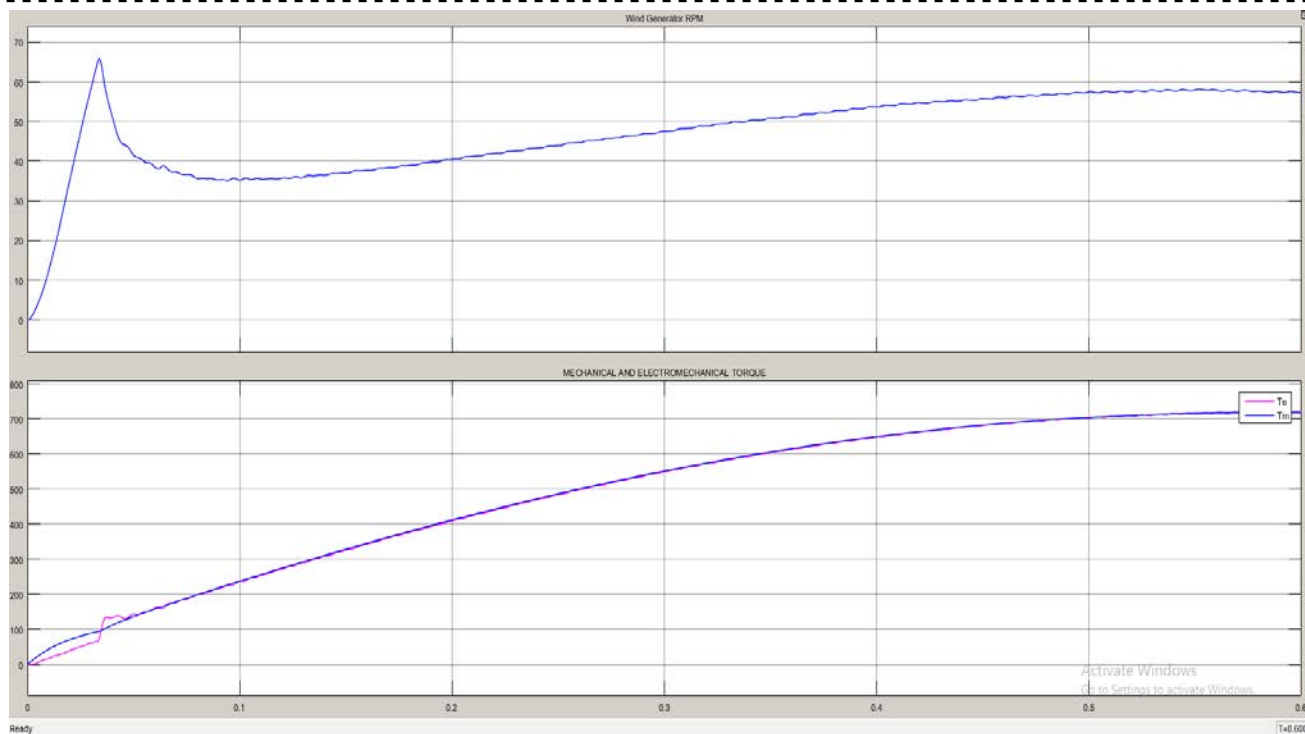


Fig.12: Wind generator RPM and mechanical and electromechanically torque

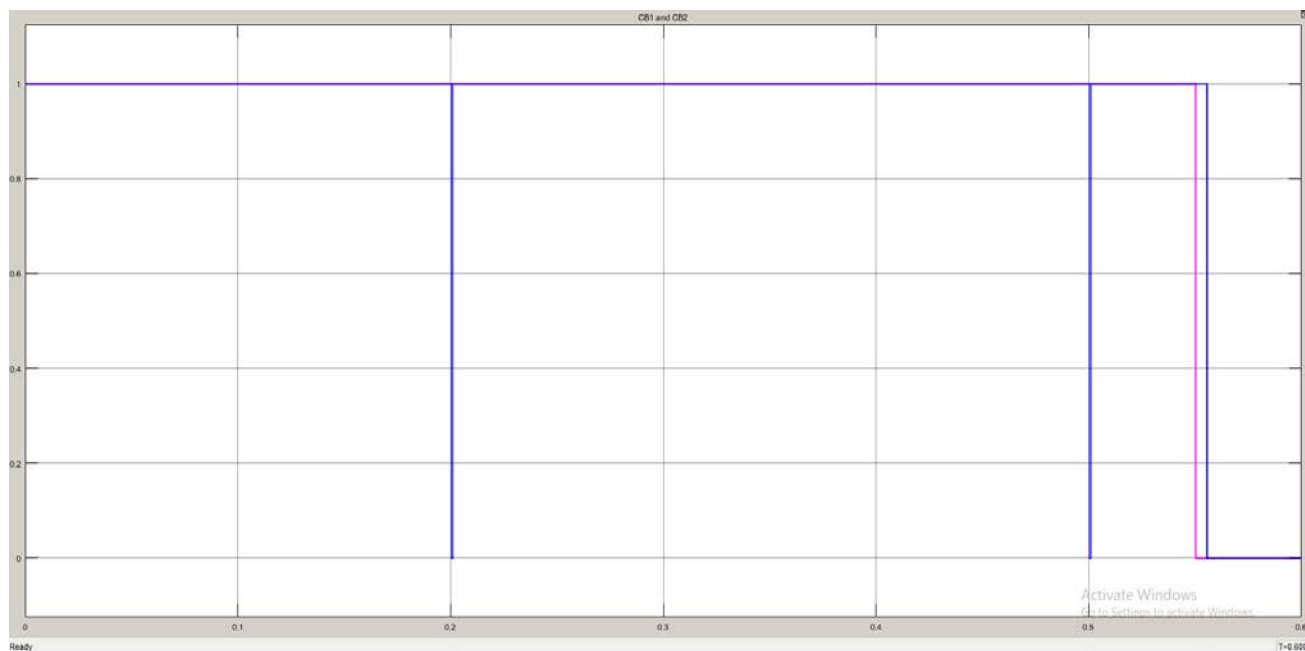


Fig.13: Circuit breaker 1 and circuit breaker 2 operation

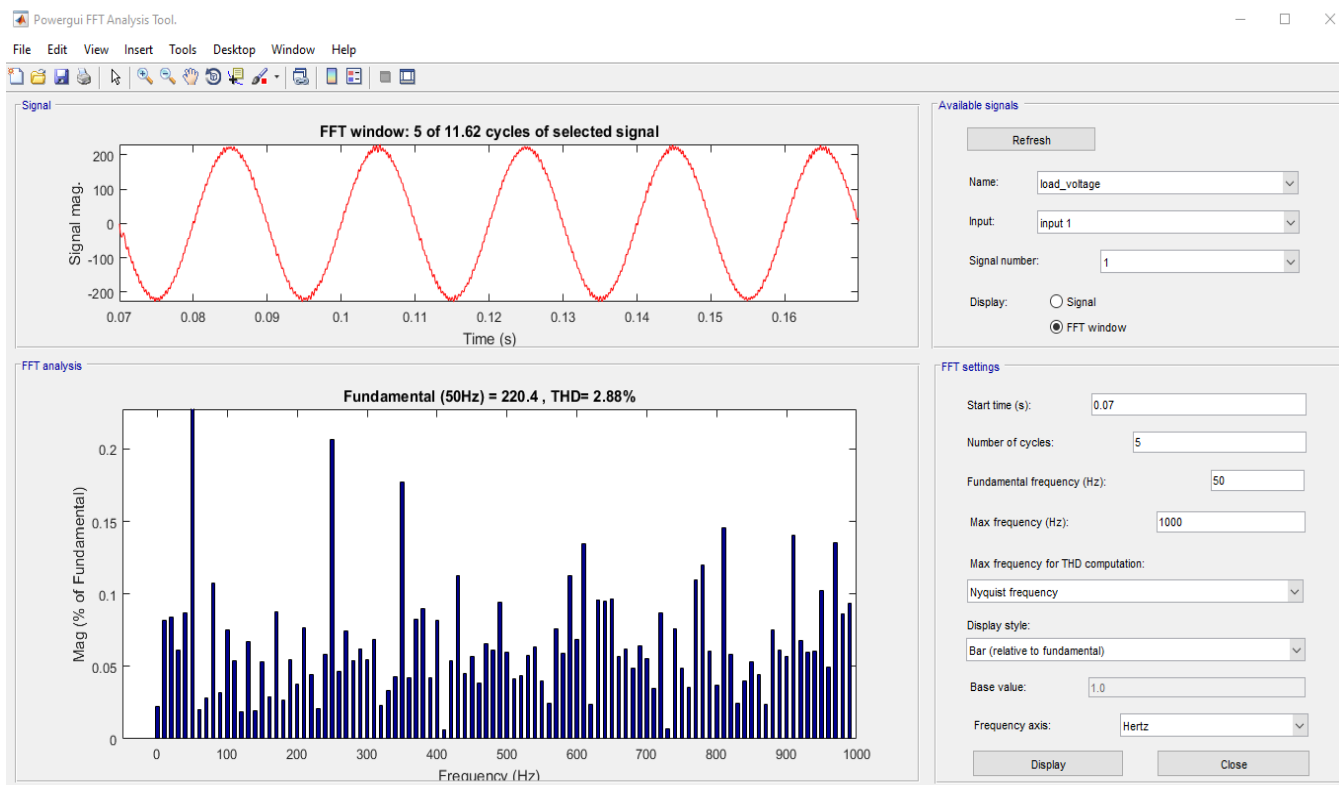


Fig.14: Total harmonic distortion at load voltage

Conclusion & Future Scope

In this paper, including control, the island detection mode for island mode of operation is proposed, and the MATLAB Simulink software verifies the mode of network limitation mode. Here, the two modes of operation are mainly controlled by detection technology. It also supports switching from the constant present control mode to the constant voltage control mode. The output of the imitation diagram clearly shows the island situation and its detection. The advantage of the proposed DVR configuration is that it can save energy in compensation mode by compensating only for the phases shown voltage drop. In standby mode, the IGBT of the inverter is used to bypass the secondary side circuit of the serial transformer, so no other bypass switch is required. The results confirm in the Matlab / Simulink simulation model. This paper simulates a balanced voltage drop and an unbalanced voltage drop to test the proposed DVR presentation. The replication results show that the proposed DVR can ensure compensation of power drop and thereby continue load power at nominal voltage.

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