

Islanding Detection Techniques and Prevention by Using FACTS Device

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Abstract— Drawn out unplanned islanding-mode task can torment unfortunate destruction of utility's assets and regarded monetarily unfruitful which results in bargaining security and workableness. Hence, this exploration exhibits differentiating elements in embracing either detached or dynamic islanding discovery methodologies dependent on chose inactive calculations; Over/Under Voltage and Frequency identification (Passive) or Active Frequency Drift and Sandia Frequency Shift recognition (Active). Correlations of the proposed philosophies are introduced utilizing MATLAB/Simulink to see predominance and materialness in deciding the status of the lattice's working mode. With we are apply a LC channel reality gadget VSC based controlling an islanding wonder. Examining of Time examination and counteractive action system in islanding mode.

Key words: Islanding; Distributed Generation; Islanding Inverter-Based; Grid; Detection Algorithms; MATLAB; Power System Transients

I. INTRODUCTION

Islanding is the circumstance where a dissemination framework turns out to be electrically confined from the rest of the power framework, yet keeps on being empowered by DG associated with it. As appeared in the figure 1.2. Generally, an appropriation framework doesn't have any dynamic power creating source in it and it doesn't get control in the event of an issue in transmission line upstream yet with DG, this assumption is never again substantial. Current practice is that practically all utilities expect DG to be disengaged from the framework as quickly as time permits in the event of islanding. IEEE 929-1988 standard [1] requires the separation of DG once it is islanded. Islanding can be deliberate or Non purposeful. During support administration on the utility matrix, the shut down of the utility framework may cause islanding of generators. As the loss of the network is intentional the islanding is known. Non-deliberate islanding, brought about by unintentional shut down of the network is of more intrigue. As there are different issues with unexpected islanding. IEEE 1547-2003 standard [2] stipulates a most extreme postponement of 2 seconds for identification of an inadvertent island and all DGs stopping to empower the conveyance framework

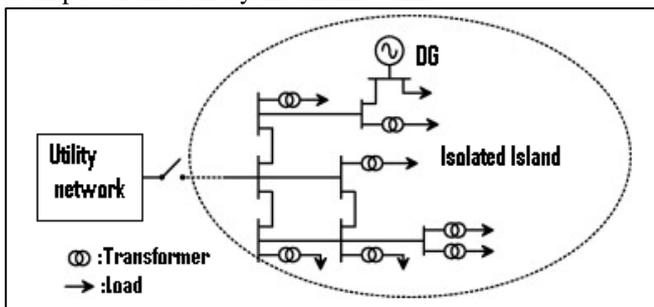


Figure 1.1: Scenario of Islanding operation.

A. Issues with Islanding:

In spite of the fact that there are a few advantages of islanding task there are a few downsides also. Some of them are as per the following:

Line laborer security can be compromised by DG sources nourishing a framework after essential sources have been opened and labeled out.

The voltage and recurrence may not be kept up inside a standard admissible level. Islanded framework might be deficiently grounded by the DG interconnection.

Momentary reclosing could result in out of stage reclosing of DG. Because of which enormous mechanical torques and flows are made that can harm the generators or prime movers [6] Also, drifters are made, which are possibly harming to utility and other client hardware. Out of stage reclosing, if happens at a voltage crest, will produce an extreme capacitive exchanging transient and in a daintily damped framework, the peak over-voltage can approach multiple times evaluated voltage. [3-5]

II. ISLANDING PREVENTION BY STANDARD PROTECTION SYSTEMS

Matrix associated PV frameworks are required to have an overvoltage transfer (OVR), an under voltage hand-off (UVR), an over recurrence hand-off (OFR), and an under recurrence hand-off (UFR) which disengage the PV framework from the utility if the greatness or recurrence of the PCU's terminal voltage goes past certain limits. Under most conditions, these transfers will counteract islanding. To get this, consider the arrangement appeared in Figure 2.1. At the point when the reclose is shut, genuine and responsive power $P_{PV} + jQ_{PV}$ flows from the PV system to node a, and power $P_{load} + jQ_{load}$ flows from a to the load. Summing at node a, we see that

$$\Delta P = P_{load} - P_{PV}$$

$$\Delta Q = Q_{load} - Q_{PV}$$

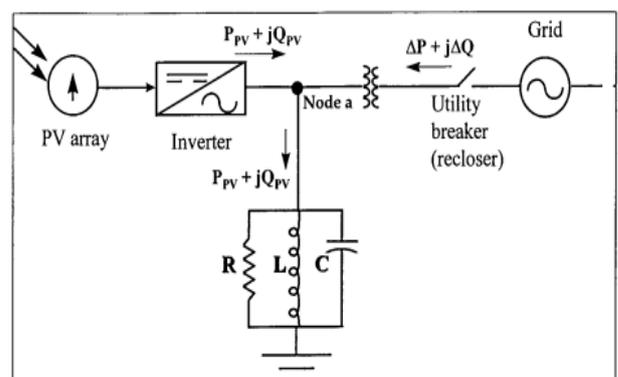


Figure 2.1 PV system/utility feeder configuration showing definitions of power flows and terms.

Various calculations have been utilized in the most recent decade or something like that. All the current techniques can be extensively partitioned into 3 classifications as appeared in Figure 1 and condensed as pursues:

- Passive methods;
- Active methods;
- Communications-based methods.

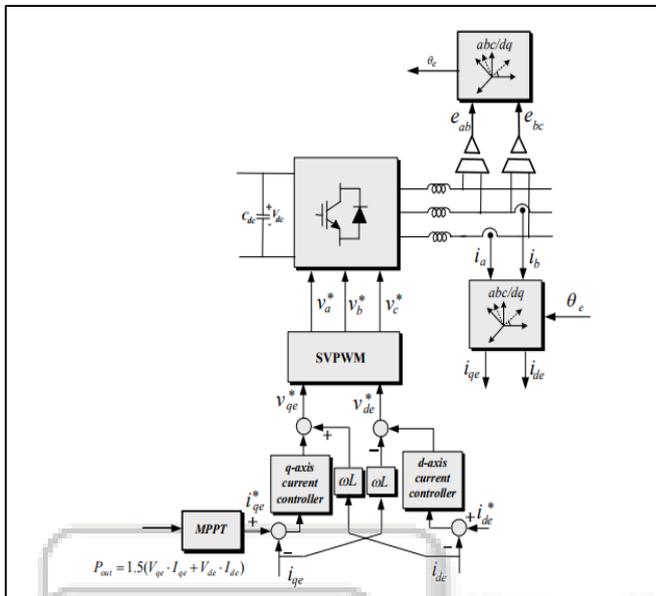


Figure 2.2 The control circuit for the PV system.

III. USING FACTS ISLANDING PREVENTION

From various surveys, we comprehend the difficulties and realities of intensity the executives and power quality for islanded PV lattice. The power the executives arrangements are proposed dependent on savvy the board framework w.r.t burden request and for improving the power quality keen Flexible AC Transmission Systems (FACTS) gadgets are proposed. Discoveries: The islanded PV framework a transformative answer for fulfill the vitality needs for savvy town or keen city. The canny control for power the executives and power quality will improve the dependability of islanded PV matrix in shrewd village[6-10].

A. Flexible Alternating Current Transmission Systems (FACTS):

Certainities AC transmission frameworks consolidating the power electronic-based to upgrade controllability and increment power move capacity.

Realities Controllers A power electronic based framework and other static hardware that give control of at least one AC transmission parameters.

B. Line-Commutated

- Thyristors
- Electrically Triggered (ETT)
- Light Triggered (LTT) Self-Commutated
- Gate-Turn off Thyristors (GTO)
- Insulated Gate Bipolar Transistors (IGBTs)
- Integrated Gate Commutated Thyristors (IGCTs).

C. Advantages of PV with FACTS Device:

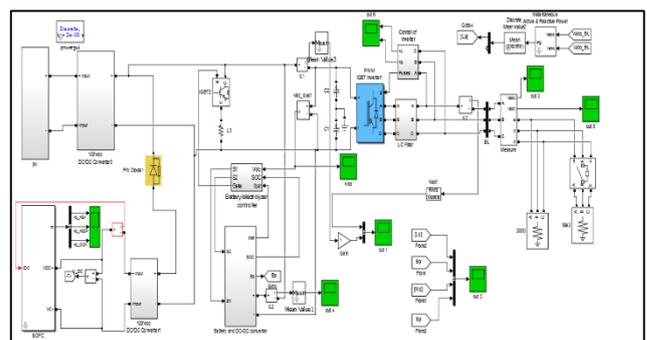
- No points of confinement in transmitted separation.
- Fast control of intensity stream, which suggests steadiness upgrades.
- Direction of intensity stream can be changed in all respects rapidly.
- HVDC can convey more power for a given size of conductor
- improved transient dependability
- Dynamic damping of the electric framework motions
- require less space contrasted with air conditioning for same voltage rating and size
- Ground can be utilized as an arrival conductor
- No charging current
- HVDC transmission cutoff points cut off.

D. Islanding DG with FACT:

The AC transmission framework has various points of confinement delegated stationary cutoff points and dynamic breaking points. These innate power framework cutoff points limit the power bargain, which manual for the underneath usage of the dynamic transmission assets. Ordinarily, fixed or precisely exchanged Series and arrangement capacitors, reactors and synchronous generators were being utilized to tackle a great part of the trouble. However, there are restrictions with regards to the utilization of this regular gear. Needed execution was not having the option to achieve proficiently. Mileage in the mechanical device and lazy reaction were the core of the inconvenience. There was better requiring for the substitute innovation made of strong state gadgets with fast reaction qualities. They require was extra fuelled by widespread reorganization of electric utilities, rising natural and effectiveness guidelines and trouble in acknowledgment approve and precise of procedure for the development of overhead transmission lines. This, together with the advancement of Thyristor switch (semiconductor contraption), opened the entryway for the development of intensity hardware gadgets known as Flexible AC Transmission Systems (FACTS) controllers. The way from recorded Thyristor based FACTS controllers to current situation with the ability voltage source converters based FACTS controllers, was prepared conceivable because of quick advances in high power semiconductor devices[10-12].

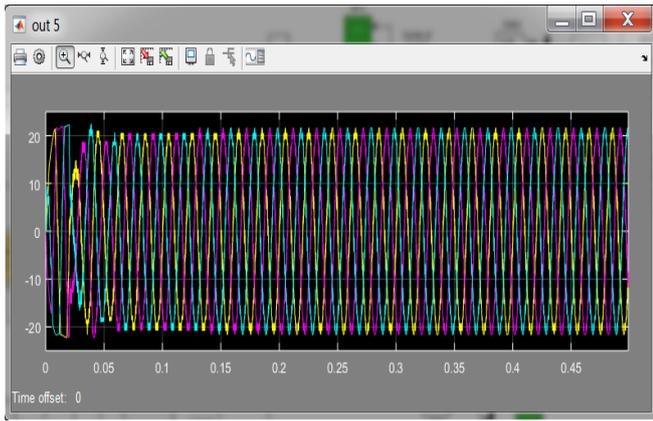
IV. RESULT AND SIMULATION

A. Case (1)Balanced DG without islanding System:

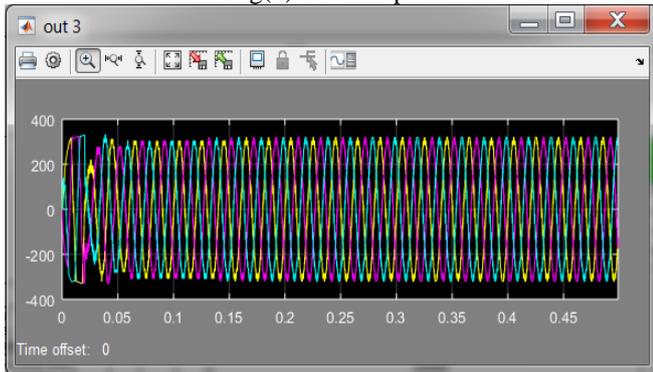


Fig(1) Balanced DG without islanding System.

B. Case (2) Effect of islanding and detection passive method based:



Fig(2) Iabc Output.



Fig(3) Vabc Output.

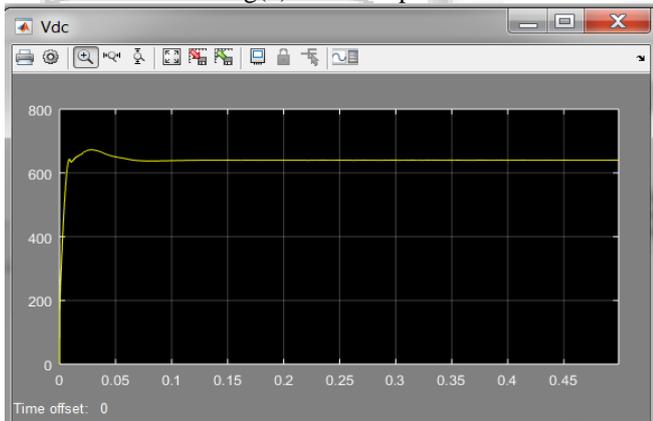


Fig (4) Transient and Steady state analysis.

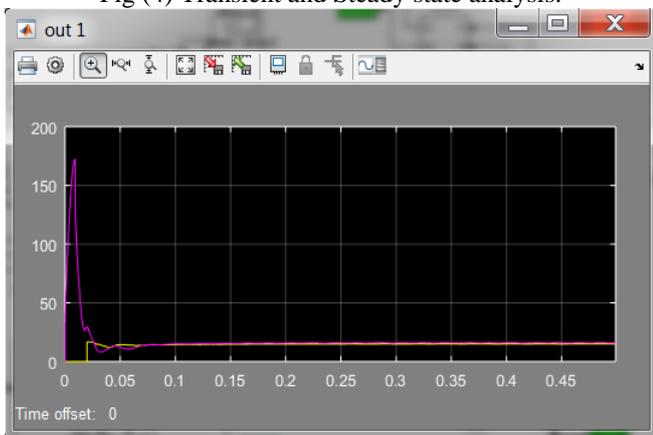


Fig (5) Voltage Regulation.

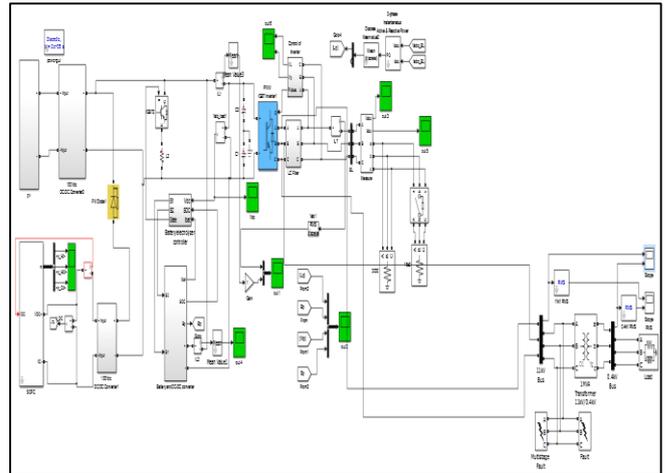
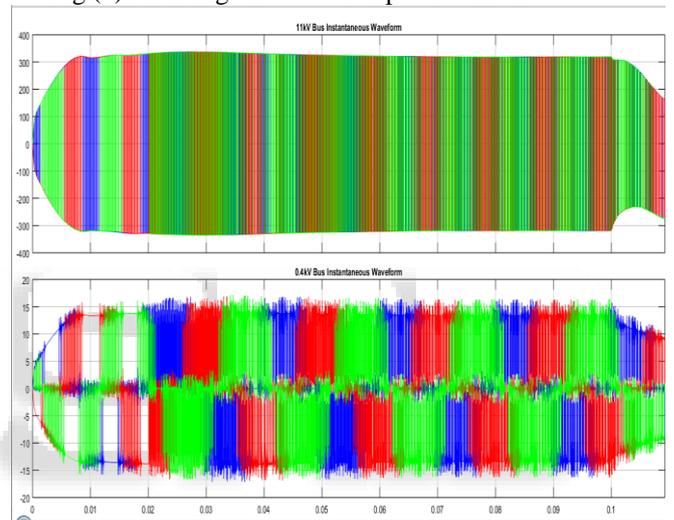


Fig (6) islanding and detection passive method based.



Fig(7) Vabc and Iabc Output Harmonic distortion.

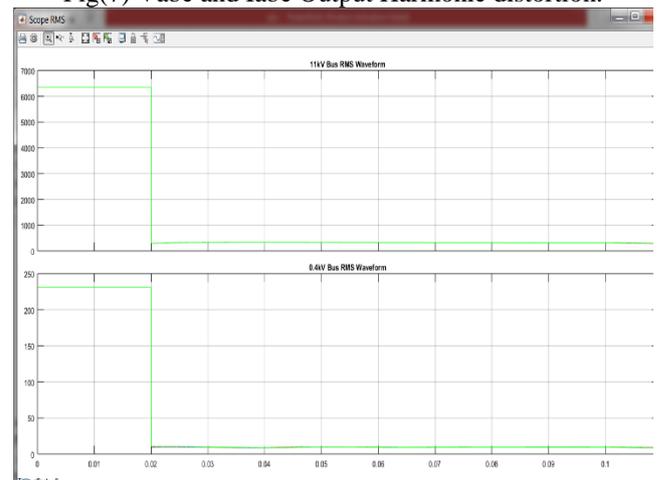


Fig (8) Phase Voltage Magnitude at Circuit breaker open connectivity at (t=0.02s) Frequency response.

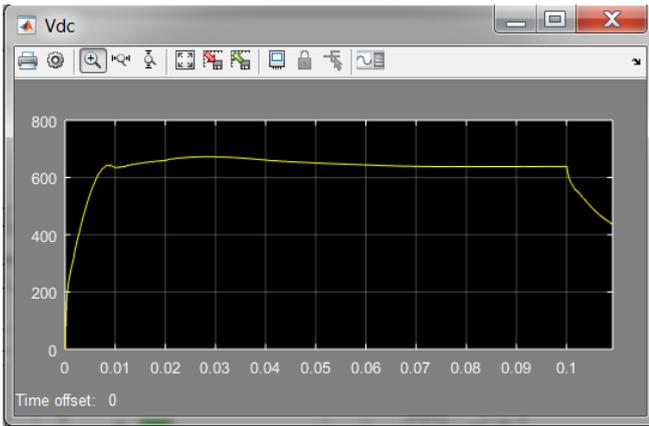


Fig (9) Transient and Steady state analysis.

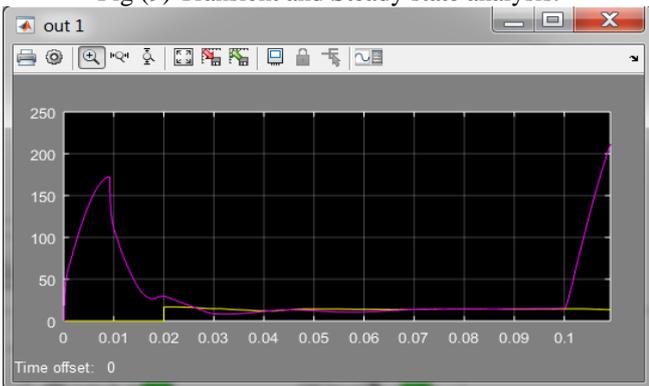


Fig (10) Voltage Regulation.

C. Case (3) Effect of islanding Reducing and Prevention system:

LC filter and VSC across output:

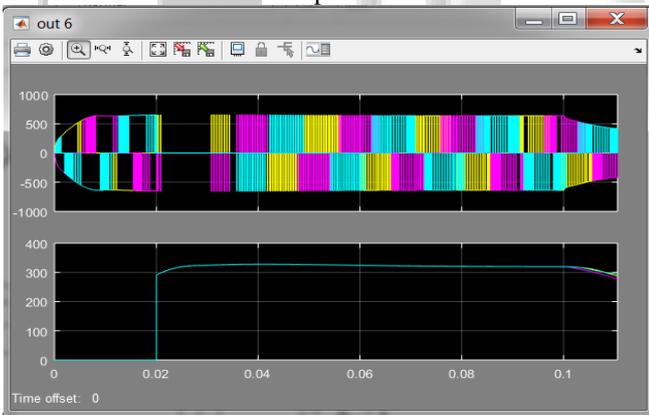


Fig (11.A)

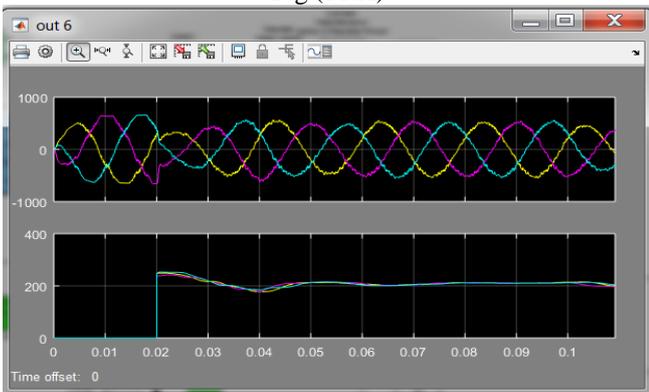


Fig (11.B)

Fig (11.A) Without LC filter based output Harmonic deviation and islanding time.

Fig (11.B) With LC filter based power compensation and regulation.

D. Time analysis of islanding mode and Prevention mode

Steady state time islanding mode	$t < 0.02s$
Transient time islanding mode	$t > 0.02s$
Transient state time Prevention mode	$t = 0.05s$ (Power breaker OFF)
Steady state time Prevention mode	$t = 0.05-0.1s$ (Power breaker ONN)

V. CONCLUSION

This paper features the ongoing pattern in coordinating disseminated ages and their effects during islanding Paradox. Henceforth, the significance in conceptualizing islanding mode identification sires different location strategies which render compact and coordinated outcomes. Aloof and dynamic islanding location plan were contrasted with deliver scientific outcomes to deflect predominance adjustments. This outcome shows time variety based islanding location with controlling methodology by utilizing LC FACT gadget. In uninvolved identification plans, OUV and OUF transfers were sent to evaluate their cohesiveness towards recognizing islanding-mode. Through commitment of preset resilience edge limits, islanding location citerions are built up and decided. In any case, through work of detached recognition approach, affectability and readiness in distinguishing conceivable islanding-mode is yet sketchy due to DZ wonder. In this way, embracing dynamic identification system guarantees precisions and mitigation towards potential DZ worldview. Dynamic location model, SFS calculation, demonstrates to be a quicker and worried.

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