GRID VOLTAGE SYNCHRONIZATION FOR DISTRIBUTED GENERATION SYSTEMS UNDER GRID FAULT CONDITION

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ABSTRACT

Electrical energy can be obtained from conventional and non-conventional energy sources such as solar, wind, biomass, water, and coal, nuclear, oil, and thermal power plants, respectively. Synchronization has been a serious concern in the past due to the time spent estimating grid variables. For the purposes of this study, a battery-based distributed generator is examined. By 2030, the power share of renewable energy-based generation systems is expected to reach 20%, with wind and photovoltaic (PV) systems expected to be the most prominent instances of such system integration into the electrical network. As a result of the increased visibility of these technologies in the electrical network, transmission system operators (TSOs) are becoming increasingly concerned about their impact on grid stability; as a result, grid connection standards for distribution generation systems are becoming increasingly restrictive in all countries. Special limitations for the operation of such palnts under grid voltage failure conditions have earned a significant deal of relevance in previous grid code requirements (GCRs). For example, in fixed-speed wind turbines based on squirrel cage induction generators, the voltage drop in the stator windings can cause the generator to overspeed and trip. Similarly, due to the disconnection of the rotor side converter under such conditions, variable speed wind power systems may lose controllability in the injection of active/reactive power. PV systems, on the other hand, would be affected by the same lack of current. Low Voltage Ride Through (LVRT) is a voltage vs. time characteristic that describes such requirements. Although the LVRT criteria in various standards varied significantly, the first issue that generation systems must address when a voltage sag arises is the limiting of their transient reaction in order to avoid protective network disconnection.

Keyword: - *Introduction, Block Diagram, Component Description*

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1. Introduction:

Grid connection requirements for dispersed generation systems, primarily wind and photovoltaic (PV) systems, are becoming increasingly stringent. Low-voltage-ride-through regulations are of particular relevance to transmission system operators (TSOs). For existing power convertors in distributed generation plants, solutions based on the installation of STATCOMs and dynamic voltage regulators (DVRs), as well as advanced control functionalities, have contributed to improving their response under faulty and distorted scenarios and, thus, meeting these requirements. It is required to establish accurate and rapid grid voltage synchronisation algorithms, which can work under unbalanced and distorted settings, in order to get satisfactory results with such a system. The decoupled double synchronous reference frame phase locked loop (PLL), the dual second order generalised integrator PLL, and the three-phase improved PLL, all designed to perform under such conditions, are investigated in this research. PLLs were chosen because of their link with dq0 controllers, despite the fact that other systems based on frequency-locked loops have already been created.

1.1 Literature Survey

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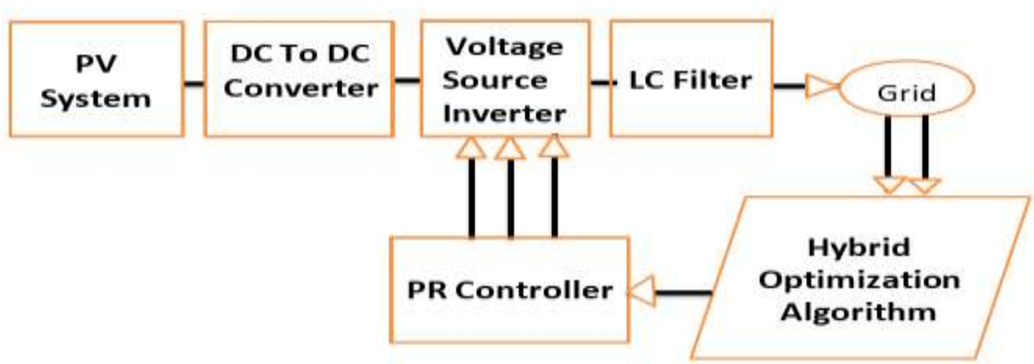
2. Block Diagram

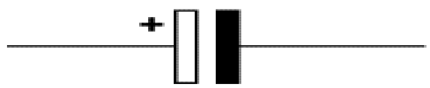


Block Diagram Discription:

1.Three Terminal Voltage Regulator: -

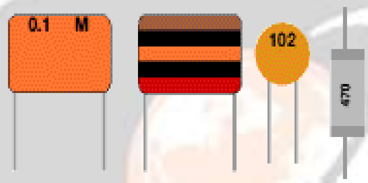
A three-terminal voltage regulator is one in which the output voltage is fixed at a specific value. There is no need for an external feedback connection with these regulators. As a result, such devices only require three terminals: input (Vin), output (Vo), and a ground terminal. The current limiting resistor is also internal to the device because the regulator runs at a predefined output voltage.

2. Polarised capacitors (large values, 1µF +):



Electrolytic capacitors are polarised and must be wired in the right direction; at least one of their lines will be labelled + or -. When soldering, heat has no effect on them. There are two types of electrolytic capacitors: axial and radial. Axial capacitors have leads attached to each end (220F in the illustration) and radial capacitors have both leads tied to the same end (10F in the illustration). Radial capacitors are smaller than axial capacitors and stand upright on the circuit board.

3. Unpolarised capacitors (small values, up to 1µF):



Small capacitors are unpolarized and can be connected in either direction. Except for one odd variety, they are unaffected by heat while soldering (polystyrene). Because there are so many various types of tiny capacitors and labelling schemes, finding their values can be challenging. Many small-value capacitors have their value displayed but no multiplier, so you'll have to guess what the multiplier should be based on your experience.

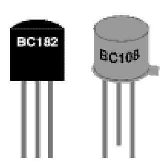
4. Presets

Miniature versions of the normal variable resistor can be found here. They're made to be installed directly on the circuit board and modified only after the circuit has been completed. To set the frequency of an alarm tone or the sensitivity of a security system, for example.a circuit that responds to light Adjusting presets necessitates the use of a tiny screwdriver or equivalent equipment. Because presets are less expensive than ordinary variable resistors, they are occasionally utilised in situations where a typical variable resistor would be employed.

5. Transistors:

Transistors magnify current, therefore they can be used to boost a logic chip's tiny output current so it can power a light, relay, or other high-current device. In a lot of circuits, aThe transistor is used to amplify voltage because the resistor converts changing current to changing voltage.

A transistor can be used as both a switch (completely on with maximum current) and an amplifier (totally off with no current) (always partly on). The current gain, symbol hFE, is the amount of current amplification.



6.PV System:

A photovoltaic system converts the Sun's radiation, in the form of light, into usable electricity. It comprises the solar array and the balance of system components.

7. DC To DC Convertor:

A DC-to-DC converter is an electronic circuit or electromechanical device that converts a source of direct current (DC) fromone voltage level to another. It is a type of electric power converter. Power levels range from very low (small batteries) to very high (high- voltage power transmission).

8. Voltage Source Invertor:

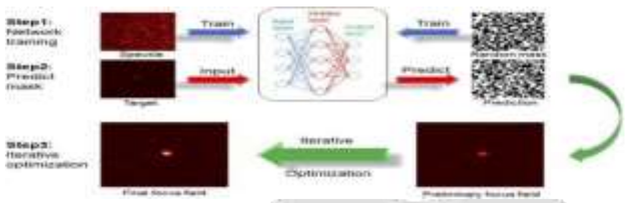
A voltage source inverter or VSI is a device that converts unidirectional voltage waveform into a bidirectional voltage waveform, in other words, it is a converter that converts its voltage from DC form to AC form. An ideal voltage source inverter keeps the voltage constant through-out the process.

9. LC Filter:

An LC filter combines inductors (L) and capacitors (C) to form low- pass, high-pass, multiplexer, band-pass, or band-reject filtering in radio frequency (RF) and many other applications. Passive electronic LC filters block, or reduce, noise (EMI) from circuits and systems, and separate, or condition, desired signals.

10. Hybrid Optimization Algorithum:

Hybrid optimizations choose dynamically at compile time which optimization algorithm to apply from a set of different algorithms that implement the same optimization.



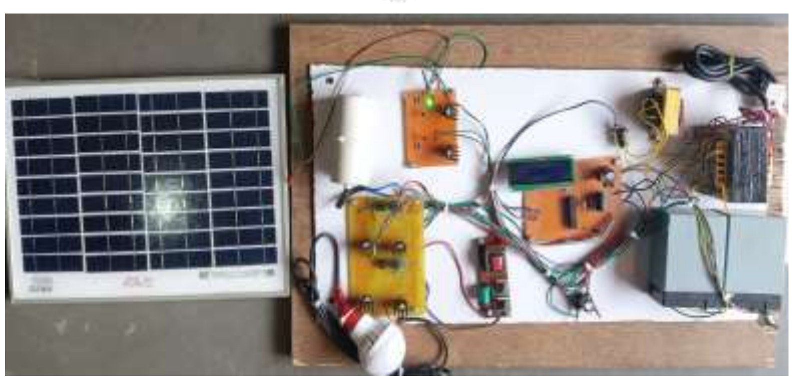
11. PR Controller

A Proportional - Resonant (PR) controller is used for replacing the conventional Proportional - Integral (PI) controller in this system. By comparison with the conventional PI control method, the PR control can

Microcontroller 89C51:

The AT89C51 is a low-power, high-performance CMOS 8-bitmicrocomputer with 4K bytes of flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.The AT89C51 is designed with static logic for operation down to zero frequency and supports two Software selectable power saving modes.The Idle Mode stops the CPU while allowing the RAM, timer / counters, serial port and interrupt system to continue functioning. The Power-down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next Hardware reset.

Project Image:



4. CONCLUSIONS

The algorithm used to ensure that the system converges as quickly as possible.
The yield of the inverter and the grid are practically identical. Under bad conditions, fast synchronisation can take up to 47.50 seconds.The current PI controller is used to examine the execution. The PV system is used to assess the P-V, I-V attributes of voltage, current, and power.With the PR controller, the suggested approach for deriving controller parameters gives This research found that quick synchronisation was associated with a lower THD proportion.

5. ACKNOWLEDGEMENT

It gives us immense pleasure to present our project report on “GRID VOLTAGE SYNCHRONIZATION FOR DISTRIBUTED GENERATION GENERATION SYSTEMS UNDER GRID FAULT CONDITIONS” under the guidance enables this task to path of completion. `We would like to extend our thanks to Miss. Prof. J.V. Satre (HOD) and all our professors, staff members and all our friends who extended their co- operation to complete. Finally yet importantly, we express our gratitude to our TCOER Office, Department Of Electrical and library staff and those who have helped us directly or indirectly during preparation of this project report.

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