ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 5, May 2019

Detection of Power Grid Synchronization Failure

Rushikesh Katore [1], Shivam jagtap [2], Gajendra Naikwadi [3], Kamal Kant [4]

U.G. Student, Department of Electrical Engineering, PES's Modern College of Engineering, Pune, Maharashtra, India[1,2,3]

Associate Professor, Department of Electrical Engineering, PES's Modern College of Engineering, Pune, Maharashtra, India[4]

ABSTRACT: Synchronization means the minimization of difference in voltage, frequency and phase angle between the corresponding phases of the generator output and grid supply. An alternating current generator must be synchronized with the grid prior to connection. It can't deliver the power unless it is running at same frequency as the network. Synchronization must occur before connecting the generator to a grid. Synchronization can be achieved manually or automatically. The purpose of synchronization is to monitor, access, enable, and automatically take the control action to prevent the abnormalities of voltage and frequency. There are some situations where the generators and some local loads have become disconnected from main distribution lines. Due to this reduction in quality of supply, and it may prevent automatic reconnection of devices. This is called as islanding. For this reason, islanding must be detected immediately and producing power must be stopped immediately. The project is designed to develop a system to detect the synchronization failure of any supply source to the power grid on sensing the abnormalities in frequency and voltage. It can be enhanced by using power electronic devices to isolate the grid from the erring supply source by sensing cycle by cycle deviation for more sophisticated means of detection. It can also be used to protect electric load from voltage and frequency beyond acceptable range.

KEYWORDS: Synchronization detection; Power grid; Microcontroller; Voltage and frequency; Relay

I. INTRODUCTION

The entire power system is consisting electrically of power plants, sub-stations and transmission lines, distribution feeders and power consumers. Detecting the synchronization failure between generators and power grid is the major advantage such as saving the energy. Then we can avoid the loss of power consumption by disconnecting from the power consumption devices. When there is an Under/over voltage or under/over frequency, then the comparator will detect the difference the actual power and reactive. If there is no failure of power grid synchronization then the detectors will give the zero values. Based on the Under/over voltage and under/over frequency values the power suppliers will be disconnected if any out of limitation values are observed. There are several power generation units connected to the grid such as hydroelectricity, thermal, solar etc. to supply power to the load. These generating units need to supply power according to the rules of the grid. These rules involve maintaining a voltage variation within limits and also the frequency. If any deviation from the acceptable limit of the grid it is mandatory that the same feeder should automatically get disconnected from the grid which by effect is termed as islanding. This prevents in large scale brown out or black out of the grid power. So, it is preferable to have a system which can warn the grid in advance so that alternate arrangements are kept on standby to avoid complete grid failure. The limits allowing for synchronization are:

1. Phase angle- +/-20 degrees
2. Maximum voltage difference – 7%
3. Maximum slip frequency – 0.44%

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

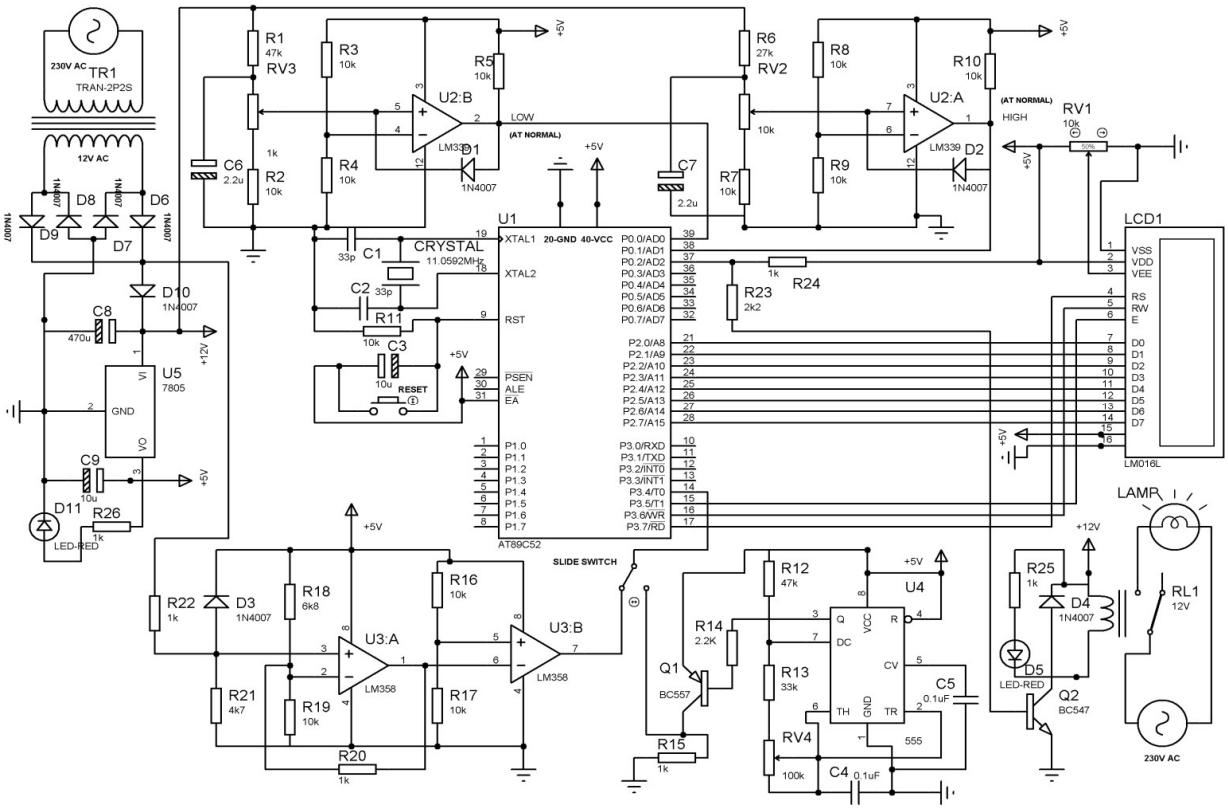
Website: www.ijircce.com

Vol. 7, Issue 5, May 2019

II. HARDWARE REQUIREMENT

HARDWARE COMPONENTS:
1. Transformer (230 – 12 v ac)
2. Voltage regulator (lm7805)
3. Rectifier
4. Filter
5. Microcontroller (at89s52/at89c51)
6. Liquid crystal display
7. 555 timer
8. Lm358
9. Lm339
10. Relays
11. Push buttons
12. Bc547
13. Led
14. In4007
15. Resistors
16. Capacitors

III. SCHEMATIC DIAGRAM



ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 5, May 2019

IV. SOFTWARE REQUIRMENT

• **Keil Compiler**:

Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the µVision IDE sets all compiler, assembler, linker, and memory options for you. Compilers are programs used to convert a High-Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example, compilers for Dos platform is different from the Compilers for Unix platform So if one wants to define a compiler then compiler is a program that translates source code into object code.

V. OPERATION

Islanding of grid is basically to manage two parameters. One parameter is voltage and other parameter is frequency. Since we cannot change the frequency, we have taken a 555 timer in a free running astable mode, the frequency of which can be varied by adjusting a variable resistor. We know that by the Resistor & Capacitor combination, the multi-vibrator mode of the 555 timer output can be generated at different frequencies. This output is given to the MC pin 3.0 of port 3 of MC which has the provision of changing the frequency 46Hz – 54Hz by varying R as explained above through selector slide switch. So, the microcontroller will get the changed frequency at pin 3.0 of port 3. We also have provision of feeding the direct frequency at pin 3.0 of port 3 by the selector slide switch since we are not sure of the direct frequency and it could be somewhere always near 50Hz it is difficult to test it. This is the reason why we use a 555 timer for giving precisely 52Hz or 50 KHz or 49 KHz which has to be tested by the program. In the program it is so written that if the output from 555 timer which is fed to the MC goes to below 48 KHz or above 52Hz the corresponding outputs of MC will go high, which will result in switching "ON or OFF" a load to indicate that the islanding has taken place. (Frequency related).

As far as the voltage is concerned, we have taken 2 comparators. Both the comparators are given to i.e., one for inverting input and other for non-inverting input which are given at a particular voltage. Initially they are so set that the output of these two comparators going to MC pin 0.1 and pin 0.2 of port 2 remain high for low voltage and for the high voltage it is held low. So, when the input voltage changes at R8 which is a rectified voltage which is coming from the DC voltage, when the input voltage changes i.e., if it goes high, and if it goes low to the microcontroller. That is how the low-high, high-low commands are handled by microcontroller then the program takes ones.

VI. CONCLUSION AND FUTURE WORK

This paper presents the future requirements for single-phase grid-connected electrical power sources e.g. PV systems under grid faults. It can be concluded that the future grid-connected systems will be more active and "smarter", which means the future grid-connected systems should have some ancillary functionalities as the conventional power plants do in presence of an abnormal grid condition.

A simple simulation case is studied at the end in order to give a better understanding of the overall system performance under grid faulty conditions. This work showed that the micro-grid architecture is a viable solution for including distributed generation in a power system.

Having demonstrated the technical feasibility of micro-grid functions, Research and Development efforts are now needed to accelerate commercial deployment. The work will pay special attention to the economic drivers outlined in

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 5, May 2019

the solicitation: economic dispatch responsive to pricing signals and demand management programs, customer willingness to pay premiums for increased power reliability and quality, etc.

REFERENCES

1. Borghetti, C.A. Nucci, M. Paolone, G. Ciappi, and A.Solari, "Synchronized Phasors Monitoring during the islanding maneuver of an active distribution network" Transcation on smart grid, pp.160-170, 2011.Hong-ryeol Gil1, Joon Yoo1 and Jong-won Lee2 ,'An On-demand Energy-efficient Routing Algorithm for Wireless Ad hoc Networks', Proceedings of the 2nd International Conference on Human. Society and Internet HSI'03, pp. 302-311, 2003.
2. Shahi Li, Julio Pronaos, Dong Zang. IEEE paper on "Micro grid power flow study in grid connected and islanding modes under converter control strategies". IEEE 2012.DilipKumar S. M. and Vijaya Kumar B. P. ,'Energy-Aware Multicast Routing in MANETs: A Genetic Algorithm Approach', *International Journal of* Computer *Science and Information Security* (IJCSIS), Vol. 2, 2009.
3. "The 8051 Microcontroller and Embedded systems" by Muhammad Ali Mazidi and Janice Gillispie Mazidi, Pearson Education.D.Shama
4. N. Dhaka, Developing Islanding Arrangement Automatically for Grid on Sensing Voltage or Frequency Beyond Range, IJERMT Mag., vol.2, Mar. 2015.
5. "Power grids.: Power restoration complete in Delhi & northeast, 50% in eastern region". The Economic Times. 31 July 2012. Retrieved 31 July 2012.
6. ShoreTel, Steffen Rebennack, Fred, Glover, Syst. Eng. & Opera. Res., George Mason Univ., Fairfax, VA, United States. IEEE paper on "Transmission-Capacity Expansion for Minimizing Blackout Probabilities".