

# Detecting Power Grid Synchronisation Failure on Sensing Frequency or Voltage beyond Acceptable Range

Bibhisen B Jadhav<sup>1</sup> Pawar Dnyaneshwar<sup>2</sup> Cholke Nivruti<sup>3</sup> M A Subhan<sup>4</sup>

<sup>1,2,3,4</sup>SND College of Engineering & RC Yeola, India

**Abstract**— The project is designed to develop a system to detect the synchronization failure of any external supply source to the power grid on sensing the abnormalities in frequency and voltage. There are several power generation units connected to the grid such as hydel, 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. This system is based on a microcontroller of 8051 family. The microcontroller monitors the under/over voltage being derived from a set of comparators. As the frequency of the mains supply cannot be changed, the project uses a variable frequency generator (555-timer) for changing the frequency, while a standard variac is used to vary the input voltage to test the functioning of the project. A lamp load (indicating a predictable blackout, brownout) being driven from the microcontroller in case of voltage/frequency going out of acceptable range. Further the project 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

**Key words:** Microcontroller, CT, PT

## I. INTRODUCTION

In day to day life electrical energy has evolved as one of the most basic needs of human being. As we know that electricity generated at generating station will be transferred to required location accounting into various losses. Though still it is not assured to transfer with required efficiency it is proved to be economical, as well as it will carry more losses, interruptions, voltage and frequency fluctuations. In this seminar grid is depending upon the demand of the power supply. There are several power generation units connected to the grid such as hydro, 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. This prevents in large scale brown out or black out of the grid power. 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.

In case these limits are exceeded and the demand for power is more than the demand for supply, it results in grid failure. GW in the next eight years which is almost double its current installed capacity of 210 gig watts (GW). There is growing energy inequity between rural and urban areas and also between the developed and developing states.

There are millions who are yet to be benefited from electricity in rural India. The scarcity of electricity in rural areas in comparison to urban areas seems to be biased in delivery through the centralized system. While the urban-rural difference in energy supply could be reduced through renewable energy, it is more complex to overcome the widening gap between developed and not so developed states.

In such situations, the feeder unit is completely disconnected from the grid, causing islanding situation. Thus synchronization is needed between the grid and the feeder unit. This paper defines a way to detect the variations in frequency and voltage of the power supply from the feeder unit to determine the synchronization failure. Here a frequency variation detection system and a voltage variation detection system are used. For frequency variation, voltage variations, and for the current variations we use the sensors here. In case of any voltage, frequency variations, the lamp is switched on. of any external supply source to the power grid on sensing the abnormalities in frequency and voltage.

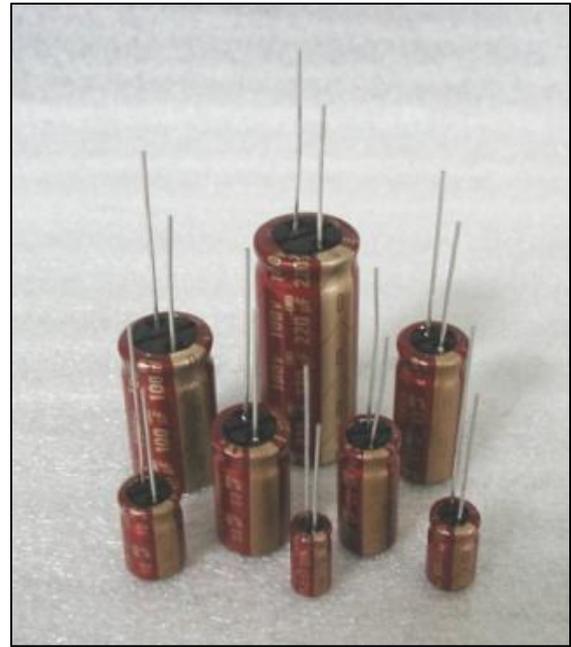
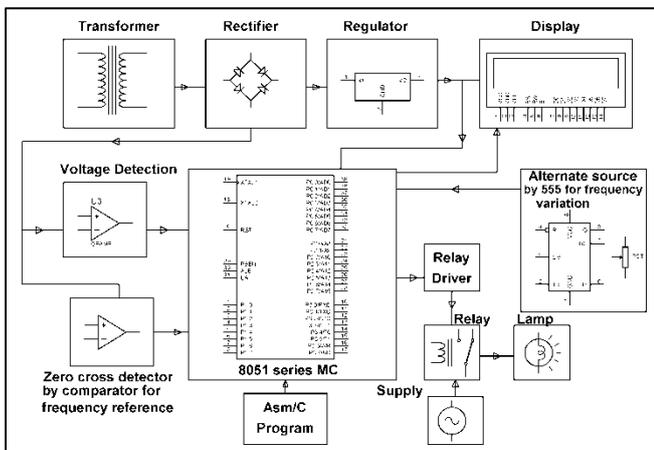
## II. ENERGY SCENARIO

proposed a methodology of Islanding Detection about the Photovoltaic Grid-Connected Generation Systems. a the photovoltaic grid-connected generation system is rapidly developed and applied due to the cleaning, renewable and wide distribution of solar. This paper is to solve the problem about islanding detection brought by the photovoltaic grid-connected generation system. First of all, it analyses the reason happened and potential hazards of the Islanding and introduces the existing detection method and islanding detection. Then, in view of the insufficiency of the existing method, it put forward a new solution that combined the negative sequence voltage positive feedback voltage with active power positive feedback to the islanding detection. The amount of change of the frequency and the voltage is introduced to the voltage - active power positive feedback, which can effectively and fast detect the islanding idea of Detecting Power Grid Synchronization Failure on Sensing Bad Voltage or Frequency Documentation in which they described in modern power system, electrical energy from the generating station is delivered to the ultimate consumers through a huge network of transmission and distribution. There are several power generation units connected to the grid such as hydro, thermal, solar, wind etc to supply power to the load. Thus, for satisfactory operation of loads, it is desirable that consumers are supplied with substantially constant voltage and frequency.[2]

Detecting Power Grid Synchronization Failure on Sensing Frequency or Voltage beyond Acceptable Range. The system to detect the synchronization failure of any external supply source to the power grid on sensing the abnormalities in frequency and voltage. There are several power generation units connected to the grid such as tidal, 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 will occur then automatically disconnect the grid line. 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. This system is based on a microcontroller of 8051 family. The microcontroller monitors the under/over voltage being derived from a set of comparators. As the frequency of the mains supply cannot be changed, so by using variable frequency generator (555-timer) frequency can be changed. A lamp load (indicating a predictable blackout, brownout) being driven from the microcontroller in case of voltage/frequency going out of acceptable range.

### III. BLOCK DIAGRAM



A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors. An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage. The properties of capacitors in a circuit may determine the resonant frequency and quality factor of a resonant circuit, power dissipation and operating frequency in a digital logic circuit, energy capacity in a high-power system, and many other important aspects.

### IV. SYSTEM SCOPE

It secured the power of the grid coming from different power stations by detecting the abnormal conditions of frequency and voltage beyond its acceptable range. It prevents the synchronisation failure between power grid and feeder. It requires less maintenance and less time for performing the operation of detection. It does not require more expensive parts, so it is very cost effective and economical. It is more reliable and flexible.

This detection process totally depends upon the microcontroller 8051 so that, if the microcontroller gets failed then the whole process will stop. The detection is possible by sensors and controllers are used if, they may get stop then need of replacement.

### V. CONCLUSION

In this way, to develop a system to detect the synchronization failure of any external supply source to the power grid on sensing the abnormalities in frequency and

Micro controller is a true computer on a chip. Microprocessors are intended to be general-purpose digital computers whereas micro controllers are intended to be special purpose digital controllers. Generally microprocessors contain a CPU, memory- addressing units and interrupt handling circuits. Micro controllers have these features as well as timers, parallel and serial I/O and internal RAM and ROM. Like the microprocessor, a microcontroller is a general-purpose device, but one that is meant to read data, and control its environment based on those calculations. The contrast between a micro controller and a microprocessor is best exemplified by the fact that microprocessors have many operational codes for moving data from external memory to CPU; microcontrollers may have one or two. Microprocessors may have one or two types of bit-handling instructions; micro controllers will have many. The microprocessor is concerned with the rapid movement of code and data from external addresses to the chip; the microcontroller is concerned with rapid movements of bits within the chip. The microcontroller can function as a computer with the addition of no external digital parts; the microprocessor must have many additional parts to be operational. Generally 8-bit microcontrollers are intended for use in large volumes as true 1-chip computers.

voltage. There are several power generation units connected to the grid such as hydro thermal, solar etc. To supply power to the load. The rules of grid 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. This prevents in large scale brown out or black out of the grid power by sensing abnormalities of voltage and frequency. This seminar is based on the microcontroller 8051.that are having lot of advantages by changing programming. So that alternate arrangements are kept on standby to avoid complete Grid Failure.

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