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DC Grid Synchronization

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ABSTRACT

This paper presents a grid synchronization between renewable energy system that is solar energy and AC supply from main power supply to fulfill the load demand. When our main grid(solar energy) does not satisfy the load demand then it is necessary to synchronise with another grid(i.e. AC supply) from main power supply to meet the load requirement. In this arrangement we have considered solar energy i.e. non-conventional energy as our main grid and another one is conventional energy as main power supply in order to maintain continuous supply to the comsumers.

Keywords: Solar supply, AC Supply, AVR, Relay.

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I. INTRODUCTION

In day to day life electrical energy becomes one of the most important needs of human being. To generate the electricity conventional energy sources are used such as coal, diesel, petrol, etc. Many times there is not enough coal to generate the full load demand. In this case we can use non-conventional energy sources such as solar, wind, biogas, etc. to compensate the power generated by conventional energy sources. Grid synchronization is the combination of two or more grids to fulfil the load demand. When main grid does not satisfy the load demand then it is synchronized with another grid to meet the load requirement. In this arrangement we are considering main grid as conventional grid and another one as non-conventional grid.

WHAT IS GRID SYNCHRONIZATION?

In order to maintain continuous supply to the consumer's different grids are synchronized with each other by means of various equipment's such as transformer, rectifier and inverter circuit etc. DC Grid synchronization is the process in which two or more grids are synchronized to each other on the basis of voltage. In DC synchronization the main condition for synchronizing the grids is that the voltage of both grids must be equal. As compared to ac synchronization dc synchronization is very easy and less complicated because in dc synchronization there is no need of matching the phase angle of voltage and current, frequency, phase sequence?

II. LITERATURE SURVEY

Energy from sun is used to generate electricity to run our commercial and industrial appliances. Use of renewable resource has saved electricity for future generation and made our project eco-friendly. This project will be of immense use in future when electricity will become costly.

1.G. Iwanski, W. Koczara performed experiment on Grid Connection to Stand Alone Transitions of Slip Ring Induction Generator during Grid Faults in 2006 in this paper a grid connected power generation systems based on the superior controllers of an active and reactive power are useless during a grid failures like grid short-circuit or line braking. Therefore the change of operation mode from grid connection to stand alone allows for uninterruptible supply of a selected part of grid connected load. However, in the stand alone operation mode the superior controllers should

provide fixed amplitude and frequency of the generated voltage in spite of the load nature. Moreover, a soft transition from grid connection mode to stand alone operation requires that, the mains outage detection method must be applied. A grid voltage recovery requires change of the generator operational mode from stand alone to grid connection. However, the protection of a load from rapid change of the supply voltage phase is necessary. This may be achieved by synchronization of the generated and grid voltages and controllable soft connection of the generator to the grid.

2.Deenesh Anil Patil, Nikhil Bhalerao, Onkar Katkar, Prof. Manoj Saruk performed experiment on DC Grid Synchronization on 2014. Grid synchronization is the combination of two or more grids to fulfill the load demand. When main grid does not satisfy the load demand then it is synchronized with another grid to meet the load requirement. In this arrangement we are considering main grid as conventional grid and another one as non-conventional grid.

3.Zeeshan Shahid, Sheroz Khan, Ahm Zahirul Alam and Musse Mohamud Ahmed performed experiment on Investigation on Grid synchronization for Grid-tied DC-AC Single phase inverter in 2014 in which paper represents a single phase grid-tied inverter for renewable energy systems, which can be used for obtaining small-voltage AC supply for powering small electronic devices or can be used in distributed grid system for utility supply. The issue of synchronization of these DC-AC inverters with the grid/utility system is explained and investigated thoroughly in this paper. The waveform generated by each stage of inverter and the issue of power loss causes by variation in phase and frequency due to inaccurate zero crossing is also discussed.

III. PROPOSED SYSTEM

Working of Block Diagram:

In first condition the voltage of main grid is sufficient to provide the supply to both industrial as well as residential load. When the voltage on main grid is reduces then it can't provide supply to both loads. Hence main grid provides supply to only industrial load and residential load is supplied by solar grid. When the fault occurs on main grid then its voltage drops and again sensed by AVR micro-controller. Then supply from main grid to CFL is cuts and it is provided by solar grid. During this condition the supply to residential load is not provided by solar grid. The main role of ADC in this scheme is to measure the voltages of both the grids which is in analog signal then convert it into digital signal and gives to micro-controller. Depending upon the condition of voltages of grid, micro-controller takes decision to switch the grid to required load. During this process of synchronizing and switching whatever is the condition of circuit, is displayed on the screen of LCD which is connected to port 0 of micro-controller. So we can read the message on LCD.

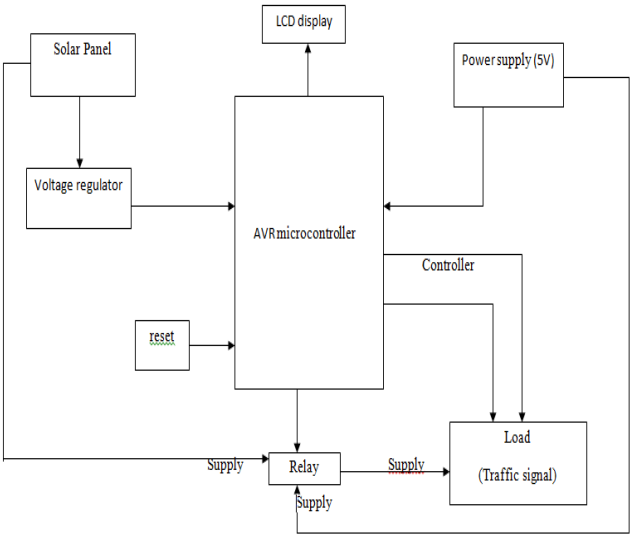

Fig 1. Block diagram

IV. ALGORITHM AND FLOWCHART

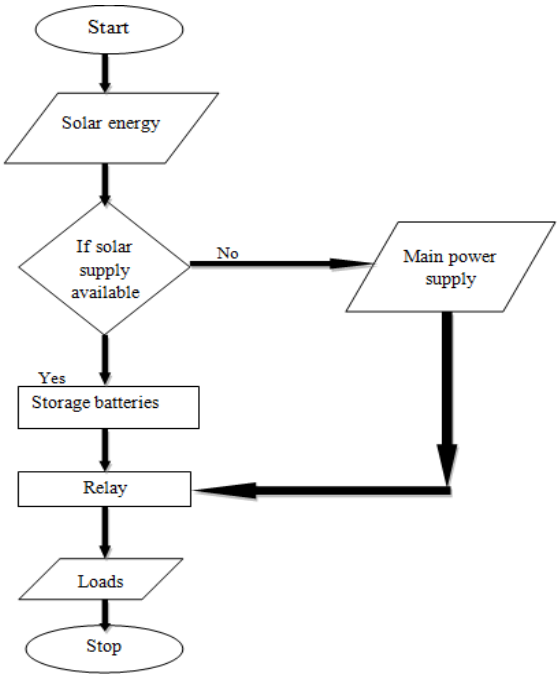

Fig 2. Flowchart

Algorithm:

1. Generate electricity from solar energy using solar panels.
2. Supply that solar power to load, simultaneously save that electricity in storage batteries.
3. If energy in storage batteries get discharged and no solar energy, switch to main power supply.

V. ADVANTAGES AND APPLICATION

Advantages:

1. Saving conventional energy resources.
2. Save electricity for future.

3. Less maintenance.
4. More use of non-conventional energy.
5. Reliable.
6. Eco-friendly.

Applications:

1. Commercial uses-DC grid synchronization can be used in commercial applications to run house appliances. Appliances like tubes, bulbs, fridge, washing machine, pc, etc. can run on this circuit.
2. Industrial uses- Big machinery and whole industry can run on this circuit. The only drawback is the cost increases as we have to attach large batteries in series. As the load increases the battery required also increases. We can thus use DC grid for industrial as well as commercial applications by attaching as many batteries as load requires.
3. It can be also used in colleges, bus stand, railway stations, airports, malls, offices, etc.

VI. CONCLUSION

After completing this project we came to a conclusion that by synchronizing two grids that is conventional and non-conventional we can maintain a continuous supply to the load. Conventional energies like fuel, coal, diesel, petrol, etc. are on extinction so non-conventional energies like for example solar is preferred largely. As non-conventional energy resource i.e. solar grid is used in our project is eco-friendly hence it does not cause any harm to environment and even avoid pollution. This issue of synchronization of these DC-DC grid systems is explained and investigated thoroughly in this project.

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