SMOOTHING CONTROL OF PHOTOVOLTAIC (PV) AND WIND POWER GENARATION FLUCTUATIONS USING BATTERY ENERGY STORAGE STATION (BESS)

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ABSTRACT:

A hybrid energy system consisting of wind, photovoltaic and fuel cell. Battery storage is designed to supply continuous power and to provide the power when the combined wind and photovoltaic sources can meet the net load demand. To improve the management of wind power generation and increase its penetration in the overall electrical energy production.

A smoothing control method and real-time battery energy storage station (BESS) based power allocation are proposed to reduce wind/PV hybrid output power fluctuations and regulating battery SOC under the typical conditions. The utilized power electronics modules in the wind turbine system can pursue many different goals, such as maintaining the voltage stability, frequency stability, providing the available and predetermined output active and reactive power**.**

Keywords: BESS(Battery Energy Storage Station), SOC(State Of Charge), Hybrid power generation, Smoothing Controller.

1.INTRODUCTION

The BESS can provide flexible energy management solutions that can improve the power quality of renewable energy hybrid power generation system. Under the pressure of limited available energy resources and environmental policies, electrical power generation using renewable energy has rapidly increased. A small size wind turbines could enable more household to have accesses to electricity. Power fluctuations smoothing are main sources to generate the needed electrical power. The major problems created with the fossil fuel use are the air pollution and the depletion of fossil fuel resources. So, solar and wind technology are the most rapidly increasing system among all renewable resources. Wind energy is not only the biggest renewable energy resources but also it is one of most reliable sources as well. BESS based hybrid power system requires an effective output power regulator and battery State of Charge (SOC). When using BESS to control photovoltaic (PV) and wind power (WP) fluctuations.

When a large number of renewable power generation access to power grid, the following issues deserve further consideration and study in order to maintain power quality of utility-and micro-grid power system.

1. Smooth power quality of interconnected (islanding) system.
2. Smooth output fluctuation of PV and WP generation.
3. Quantify the economics of new energy generation.

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4. Effectively integrate intelligentized multi user power system.
5. Determine optimal energy generation storage capacity etc.,

On solution of these issues is incorporate Wind Power Generating Systems (WPGS) and Photo Voltaic Generating System (PVGS) with the energy storage system.

2.EXISTING SYSTEM

This section describes about the power storage system by using battery. Here this method use hybrid energy sources (solar and wind) to produce or generate power. The generated power can reduced the fluctuations and store the power in single battery. Here, we use lead-acid battery for good charging. But there is no sufficient power savings by using only one battery. So we have moved to Battery Energy Storage Station (BESS). The following sessions describes about the BESS.

DRAWBACKS:

1. Reliability is low
2. May chance to over charging
3. Life time of battery is low

3.PROPOSED SYSTEM

This section describes about the power storage system by using Battery Energy Storage Station (BESS) (Number of batteries connected in series or parallel connection for charging the sufficient amount of power is called BESS). Here this method use hybrid energy source (wind and solar) to produce or generate power. From solar DC supply is generated and from wind AC supply is generated. Here AC supply from the wind is converted into DC supply by using rectifier. Here the two generated DC power is in more fluctuations/ oscillations. By reducing or removing the fluctuations by Chopper (DC-DC) (variable DC to fixed DC). The fixed DC supply is given to the battery. If the battery 1 is fully charged relay acts as a switching device to disconnect the battery 1 automatically by using microcontroller. Relay acts as a switching device. LCD display the amount of charge stored in battery. These processes continuous until the batteries are charging. Relay acts a switching device to stop the supply. The stored energy or power given to the load.

ADVANTAGES:

1. SOC is used for relay operation.
2. Fuel flexibility.
3. Efficiency.
4. Environmental friendly.
5. PIC microcontroller is used for automatic control of charge and discharging.

4.BLOCK DIAGRAM

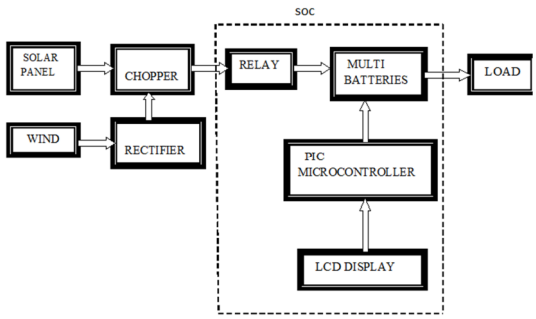

Fig:1 Block Diagram of BESS

BLOCKDIAGRAM:

A Solar panel is flat construction resembling a window, built with technology that allows it to passively harvest the heat of the sun or create the electricity from its energy through photovoltaics. Wind turbines generate electrical power in the same way as all other generation technologies. The only

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difference is in the source of the mechanical power supplied to the electrical generator: wind, rater then a diesel engine or steam turbine, pro-vides the energy. Blades capture energy in the wind and turn the turbines. A rectifier is an electrical device composed of one or more diodes that converts alternating current (AC) to direct current (DC). A DC-DC convertor is an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. A lead acid battery is a secondary cell, meaning that it is rechargeable. It is very common in cars and trucks. It contains plates of lead and lead (IV) oxide in a sulfuric acid solution. The lead (IV) oxide oxidizes the lead plate, making an electrical current.

5.CIRCUIT DIAGRAM

The solar panel is connected to the battery. The 12Vsupply is stored on the battery. The regulated power supply is to provide the 5V DC fixed voltage. Then the 5V is given to the PIC microcontroller.

To obtain wind power, the kinetic energy of wind is used to create mechanical power. A generator converts this power into electricity so that it may be used for the benefit of mankind. Recently, different types of electricity generation have been a frequent topic of debate amongst experts.

The micro controller is connected with gate pulse driver circuit. The gate driver circuit can connect to MOSFET. Then the high voltage is produce from gate pulse driver circuit, which is used to continuously ON and OF the switch.

In an output side voltage divider is used which is used for the output will obtain proper manner. The voltage divider is connected to microcontroller.

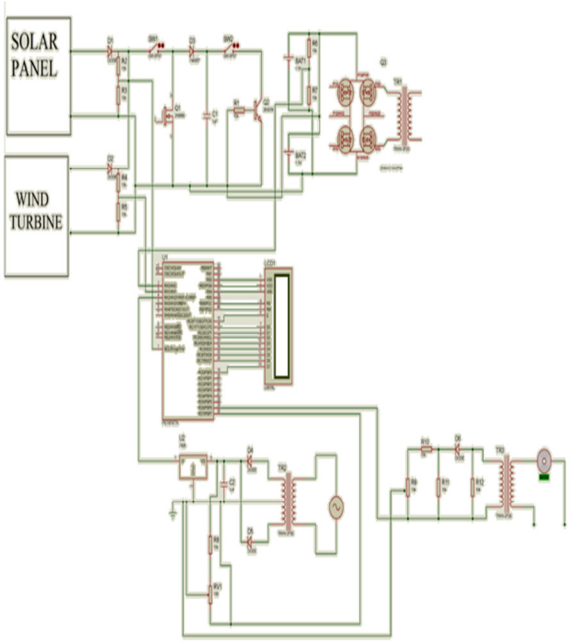

Fig.2 Circuit Diagram of BESS

6.RESULT

From solar radiation solar panel produces a voltage and wind turbine produces a certain output voltage for charging of battery. If the stored battery voltage is less than 12V the battery become charging due to voltage produced by solar and wind. Due to relay operation the battery level is below 12V the battery is automatically disconnected the load connection and charging by microcontroller. This level is measured by State Of Charge (SOC) and is displayed in LCD display.

7.CONCLUSION

The disadvantage of PV and wind power generation is their unstable power output, which can impact negatively on utility- and micro-grid operations. One

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means of solving this problem is to integrate PVGS and WPGS with a BESS. For such hy- brid generation systems, control strategies for efficient power dispatch need to be developed. Therefore, in this paper, a novel SOC-based control strategy for smoothing the output fluctuation. Of a WP and PV hybrid generation system has been proposed. Additionally, the SOC feedback control strategy and the real- time power allocation method for timely regulation of battery power and energy are presented. Simulation results demonstrate that the proposed control strategy can manage BESS power and SOC within a specified target region while smoothing PVGS and WPGS outputs. At present, how to control the SOC of the energy storage system is an ongoing research topic. We also need to combine the characteristics of the battery, and do further research and exploration.

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