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DC Micro Grid Connected Hybrid Energy Storage Structure with Renewable Energy Sources based on High Rating Super Capacitor

Md. Akram Alam[1], A. Thakur[2]
[1, 2]*School of engineering SSSUTMS SEHORE*

Abstract: ***The design of AC and DC systems needs to be modernized to meet the same load on grid and load. When a DC microgrid combines with renewable DC power and performance of storage resources, it is highly recommended for its high performance, durability, reliability or load performance. The main purpose of any DC microgrid is to provide direct power support for the measured power supply. Due to the unusual nature of renewable energy, batteries play a major role in load stability between DC microgrid. Existing power management strategies may be able to meet the loading demand. However, this technology does not apply to domestic energy systems. This study provides DC microgrid power management (EMS) strategies, using solar power, wind power, super capacitors, and batteries as indoor power sources. Typical construction methods take into account the high voltage super capacitor in the model and design of the controller. The conventional control of the control system can make the system unstable or introduce a noise in the DC bus volume in the lower super capacitor. The supercapacitor (SC), also called the ultracapacitor, is a high-capacity capacitance value far higher than other capacitors, but with lower power limits, closing the gap between electrolytic capacitors and rechargeable batteries. To date, the sensitivity of the DC microphone to the power switch on the super capacitor is analyzed and analyzed by the control mechanism to ensure the durability of the DC micronid in all operating modes. Design design and durability of DC microgrid with battery super capacitor system for storage under active voltage voltapacitor.***

Keywords: ***DC Microgrid, EMS, Super capacitor, air, diesel generator***

I. INTRODUCTION

The grid connected system is connected to a large independent grid, usually a public grid and provides power directly to the grid. The power supply to the grid requires an inchronous grid connected to the inverter (also called the interactive inverter grid) to convert the direct current to another current. If there is a public power grid, the hybrid other power system may be independent or connected to the grid. For stand-alone applications, the system should have sufficient control position to manage power changes from different energy sources involved. This type of system can be considered a microgrid with its reproductive capacity and load. With grid-connected applications, some Microgid power sources may release local and operational loads. With the latest additions that work, these DG resources can also be used to provide effective and efficient support for government power networks. If these applications are connected to a grid, the final volume of these applications may be smaller because the grid can be used as a system startup. However, when connected to the government's power grid, system management strategies set important requirements for performance and performance, such as power, frequency and harmonization rules.

Every morning, as you go around the sun, you get light and heat. There are regions with varying temperatures around the world, so they are transferred from one region to another. These rapid variations help to produce air: in warmer climates, the air is warmer and as a result under higher pressure, the air temperature under colder climates cools under lower pressure. Air is the movement of air from high pressure to low pressure. Electric turbines have been used for grain milling, pumping and other machinery installation for several years. There are now more than a million pairs of air conditioners still operating worldwide. Most of them are used for pumping water and generating electricity. Wind power provides a large amount of wind energy used for grain milling, pumping and other power installations extended over the years. However, the conversion of fossil fuels to fossil fuels has necessitated the extraction of fossil fuels since the late 19th century. Since 1930, little battery charging technology has been developed. Technology is constantly evolving, both cheap and reliable, so it can be expected that wind power will compete economically in the next few decades.

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1) *Hybrid System:* A hybrid system is a system that uses multiple energy sources. The integration of systems (wind and solar) has a major impact on electricity generation. Such a system is called a "hybrid system". The use of hybrid solar energy was found in this field, where energy will be used throughout the year without the risk of disruption. There may be several combinations of energy to meet the energy needs of hybrid energy, solar and wind energy systems. This assignment is similar to the energy from solar panels and wind turbines. The difference is that it is simply attached to the system. Photovoltaic solar panels or small wind turbines deep in the weather.therefore, solar power or wind alone is not enough. When both wind and solar energy are incorporated into a new body, many renewable energy experts say they have a satisfying hybrid energy source. In summer, when the sun's rays are strong, wind speeds are equally low. In winter or on sunny days they are relatively short, in contrast, the wind speed is much higher. The performance of these renewable systems shows diversity throughout the year. In other words, the two systems must support each other in order to maintain energy efficiency at all times.Depending on the environment, the energy needed for the system can be supplied separately from the wind or the atmosphere, or both resources can be used simultaneously. The control unit determines which power source is used to charge the battery according to the input power. Wind turbines first convert kinetic energy into mechanical energy and then convert it into electrical energy. The air turbine in the system consists of a tower, alternator, frequency converter (gearbox) and propeller. And photos of the built-in hybrid system.
2) *Super Capacitor:* Double-layer electrostatic capacitors (EDLCs) using carbon electrodes or high-strength electrostatic derivatives — a layer above the electrochemical pseudocapacitance, achieving a charge separation in a double layer of Helmholtz . The voltage difference is in the order of a few ångströms (0.3-00.8 nm), much smaller than a standard capacitor.Electrochemicalpseudocapacitors use iron oxide or form polymer electrodes with a higher amount of electrochemical pseudocapacitance added to the double-layer vein. Pseudocapacitance is obtained by Faradaic transmission of electricity by redox reaction, intercalation or electrosorption.Hybrid capacitors, similar to a lithium-ion capacitor, use electronics with different characteristics: one that exhibits greater electrostatic capacitance and the other more electrochemical capacitance.The electrolyte forms a harmonious ionic connection between the two electrons separating it from common electrolytic capacitors where the dielectric layer remains, and the so-called electrolyte, e.g., MnO2 or polymer, is actually part of of the second electrode (cathode, or well-fitting electrode). Supercapacitors are structurally divided into asymmetric electrodes, or symmetrical electrodes, for specific uses during manufacturing

II. RELATED WORK

An effective Microgididius control scheme can directly separate the oscillation and the DC portion of the current load between the distributed generation devices. The proposed control strategy includes current and power control blocks. The current control module includes a power sharing unit with a DC power sharing.

The main idea of the proposed method is to distribute the oscillation and DC bases according to the strength of the DG band by providing the appropriate amount of input and reduction. 'of the DG unit. Voltage control volts is a set of multiple voltage control systems for small volume controls. A detailed model of the proposed control proposal has been developed along with the capabilities of the system structure. Since the local coordinator integration uses only the information of the corresponding DG unit, the construction process disperses.

As the practice of combining renewable DC power and DC loads in power-sharing systems increases, DC microns attract more attention. Its high performance and simple control strategy is one of the main reasons for the construction of natural DC buildings. It consists of a collection of multi-distributed units (DG) connected to the end user of DC and AC loads using power converters. The current part of the oscillation is fed into the microgrid with a single phase and / or direct current associated with the inverter. Phase 3 of unequal AC load. In addition, modern distributed power sources can combine DC and AC microgid using connected converters (ICs) where any unbalanced load conditions on AC computers will generate alternating current components in DC Microphids. Therefore, the high intensity of one phase and the imbalance of the three empty phases will introduce double-shift pulses equal to the main frequency on the input side of the inverter. Combining different AC loads in Microgrobid DC can cause power sharing problems. The current oscillation shared between DG units depends on the price of inclusion between the DG and the protest sources. Therefore, when it comes to the reduction of communication cables and the distribution of communication signals, the distance between the micogravity structures has a significant impact on the distribution of energy between the DG groups. This effect may force some DGs to provide higher wind speeds than others, leading to energy safety for some DGs. In addition, the current oscillation element emits twice the frequency of DC power

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III. PROPOSED SYSTEM

The proposed DC microgide includes four other sources (Photovoltaic, wind, DG and battery). Photovoltaic energy products depend mainly on solar radiation and the available temperature. Wind speed depends on wind speed. PMSG is used to make electricity in engines. Wind power is connected to a DC microgrid via an AC / DC converter to minimize voltage changes and all DG sources use inverters. Electricity generated by extraordinary energy sources will not continue to supply loads due to its natural nature over time. Therefore, use batteries to ensure that there are no interruptions in power supply to consumers. HESS is used to properly determine DC microgidesIn traditional designs, a DC power supply controller is designed with a high nominal voltage. DC microgrid sensitivity test with super capacitor voltage changes Change the appropriate super capacitor voltage to consider in the design so that the Microbiid DC remains stable at all operating super capacitor voltages.

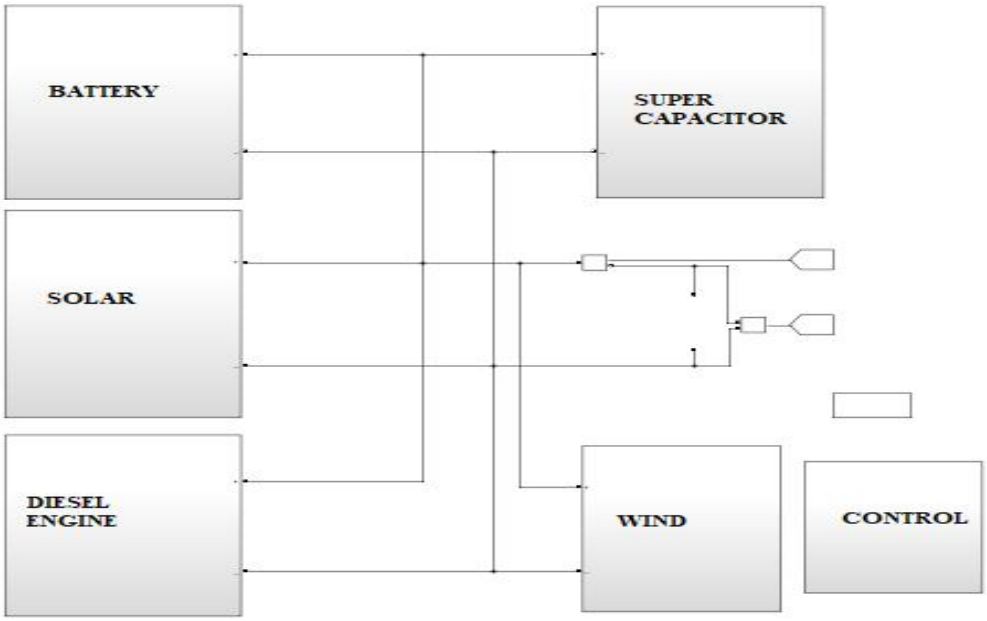
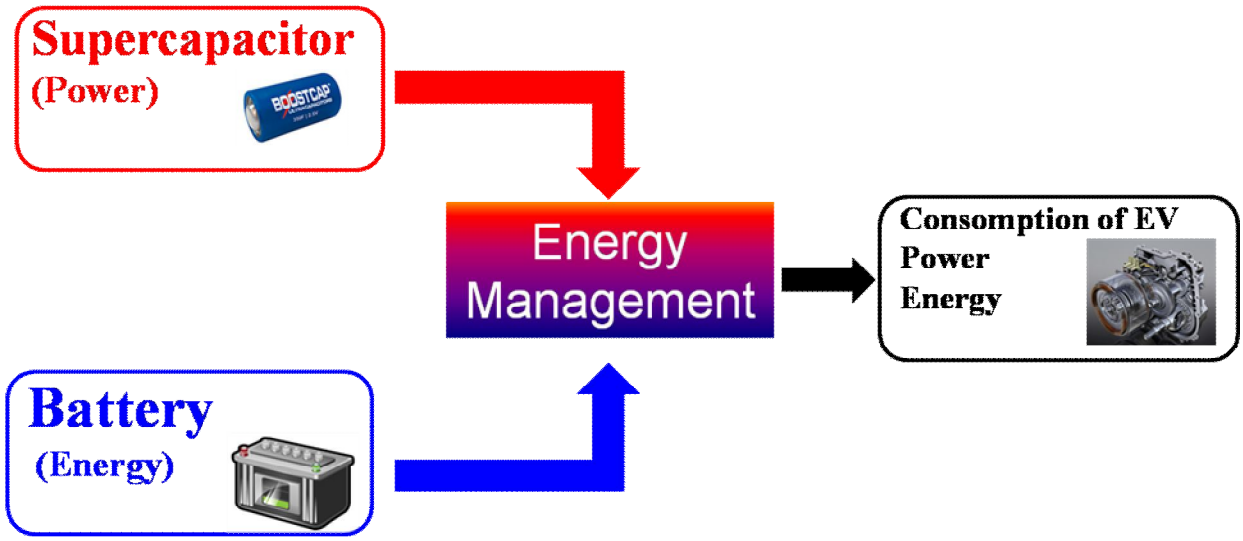


Fig 1 proposed block diagram



The control strategy proposed in this paper applies to the DC microphones considered for this function. There are four types of methods. This control device uses battery or photovoltaic power to control the gas of DC buses in all four operating modes. The four working methods are described below.

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1) *Battery Release Mode (BDM):* In this mode, the PV power is less than the load and the BatterySoC is below the limits. Therefore, the battery is discharged to adjust the DC bus voltage.
2) *Load Disposal Mode (LSM):* In this mode, the current PV is under load and the battery is completely discharged. Therefore, the load is cut off and the available power is used to charge the battery.
3) *Battery Charging Mode (BCM):* In this mode, PVpower is larger than the load and the SoC battery is below the limits. Therefore, the battery fixes the power of DClink by charging it with the available current metal.
4) *PV Off-MPPT (POM) Mode:* In this mode, the battery is fully charged, so PV operates in non-MPPT mode to control the DC bus gas. Under the operating conditions set by VSCO, the standard result and recommended DC wave computer was analyzed at 112V, 32V and 12V in the four above operating modes.

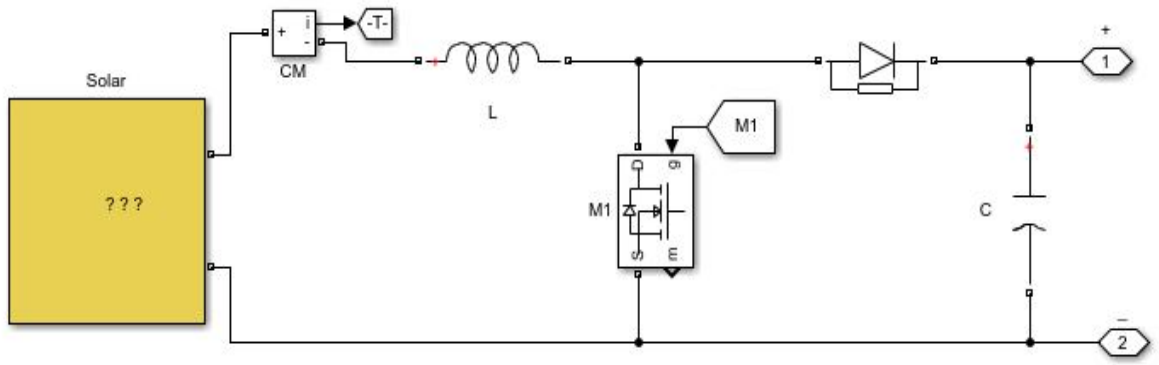

Fig 2 solar panel

The inverter used in the grid-connected photovoltaic system is responsible for controlling DC buses gas, grid-connected synchronization, and high-voltage electrical input. The inverter used on the side of the current invention grid is called a voltage source converter (VSC) and is responsible for synchronizing the electrical power of the system with electrical power. Power voltage and frequency are used to use a DC-AC inverter (inverter).

A. Wind Turbine

The electric motors produced undoubtedly are most electric motors transmitted through ac currents to the stator and rotor windings. Twice as many electrical appliances in the industry today are three-phase paralysis machines.

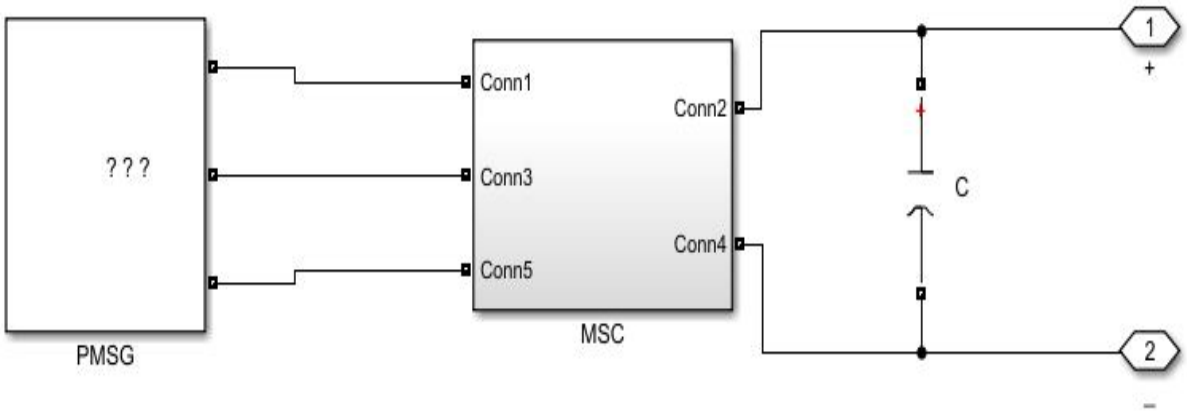

Fig.3 wind turbine system

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B. Diesel Generator DG Set

(Diesel engine unit and controller) is a tool that converts petrol (diesel oil) power into a diesel engine and then converts the mechanical energy into electricity for the ruler.

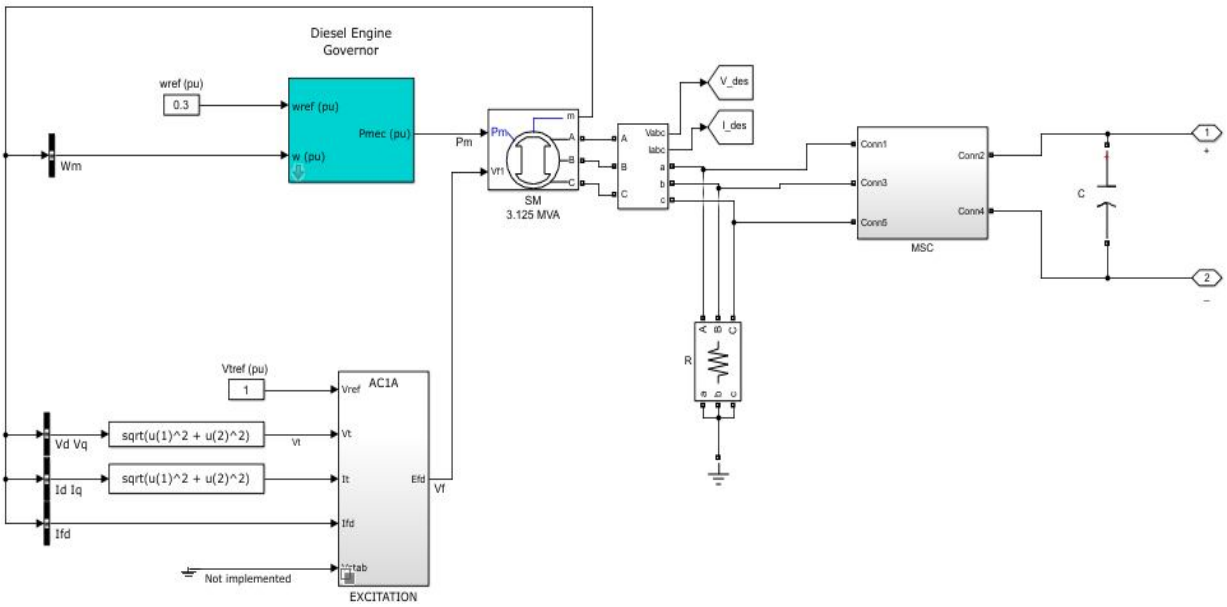

Fig.4 Diesel Generator system

C. Battery

A battery is a device made up of one or more electrochemical cells with external connections supplied to electrical devices such as flashlights, cell phones, and electric vehicles. When a battery supplies electricity, its positive end is in the cathode and its negative end is the anode. The improperly discharged terminal is a source of electrons that will travel in a non-electrical circuit to a good center. When the battery is connected to an external power supply,

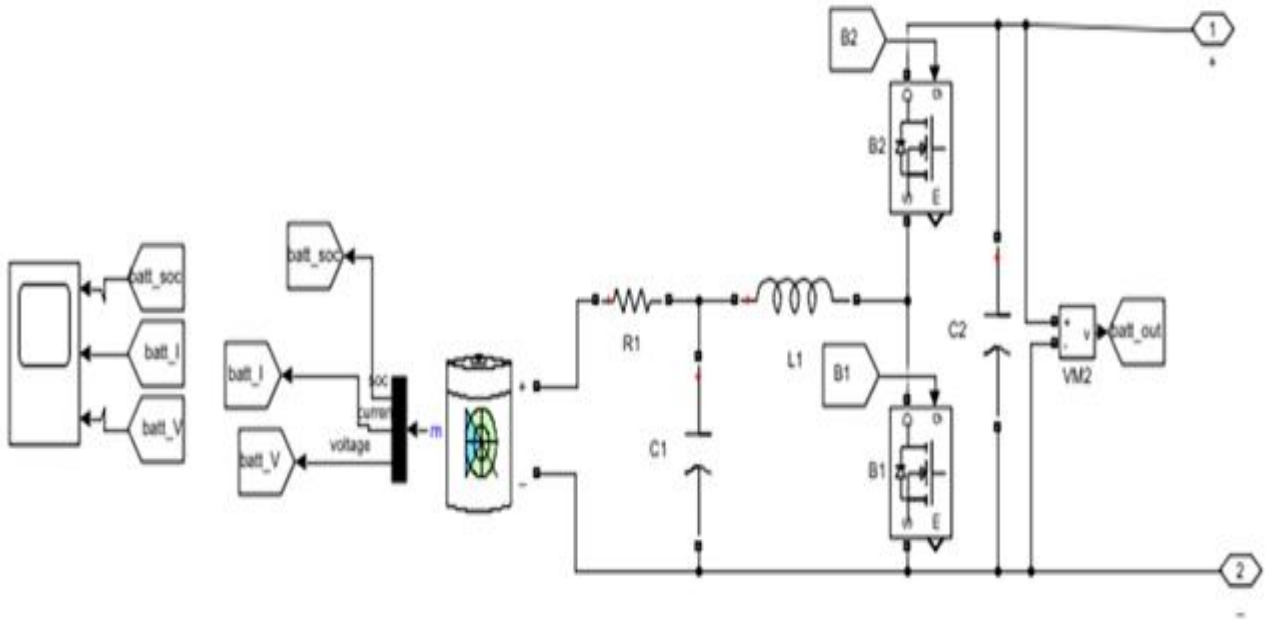

Fig.5 Battery Subsystem

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D. Super Capacitor

Super capacitors (or super capacitors) differ from conventional capacitors in two important ways: their plates actually have a large surface area, and the distance between them is very small because the divider between them and the normal dielectric operates differently.

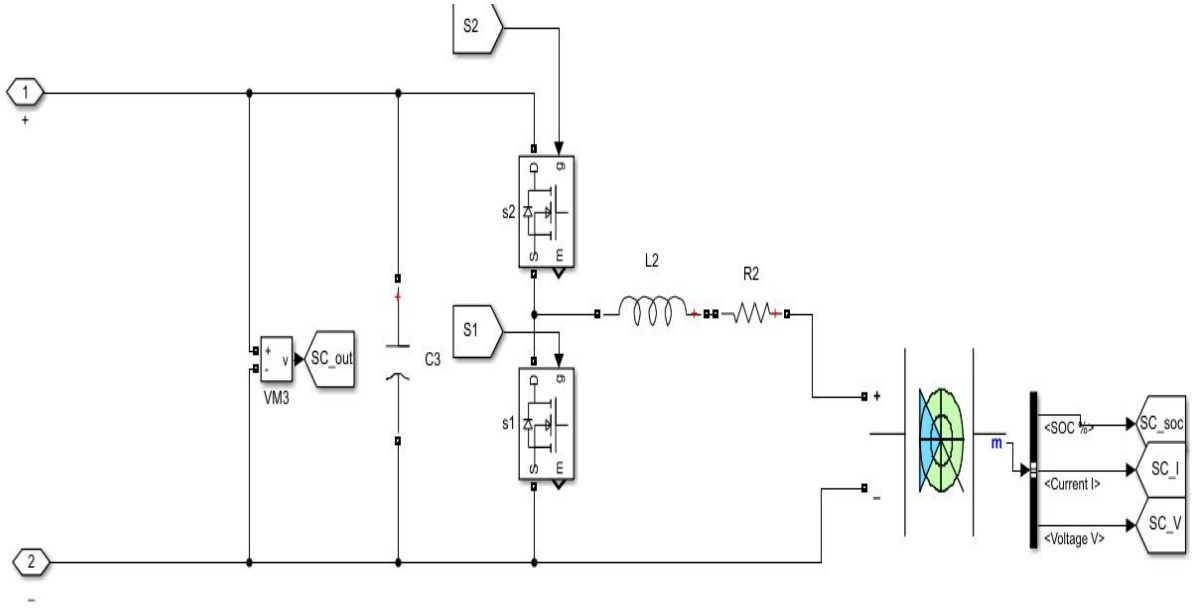

Fig.6 Super Capacitor

1) *MODE (i) Discharging Mode (BDM):* In this mode, the PV power is less than the load capacity and the SoC battery is below the limits. Therefore, the battery discharges the power to direct the DC power link.

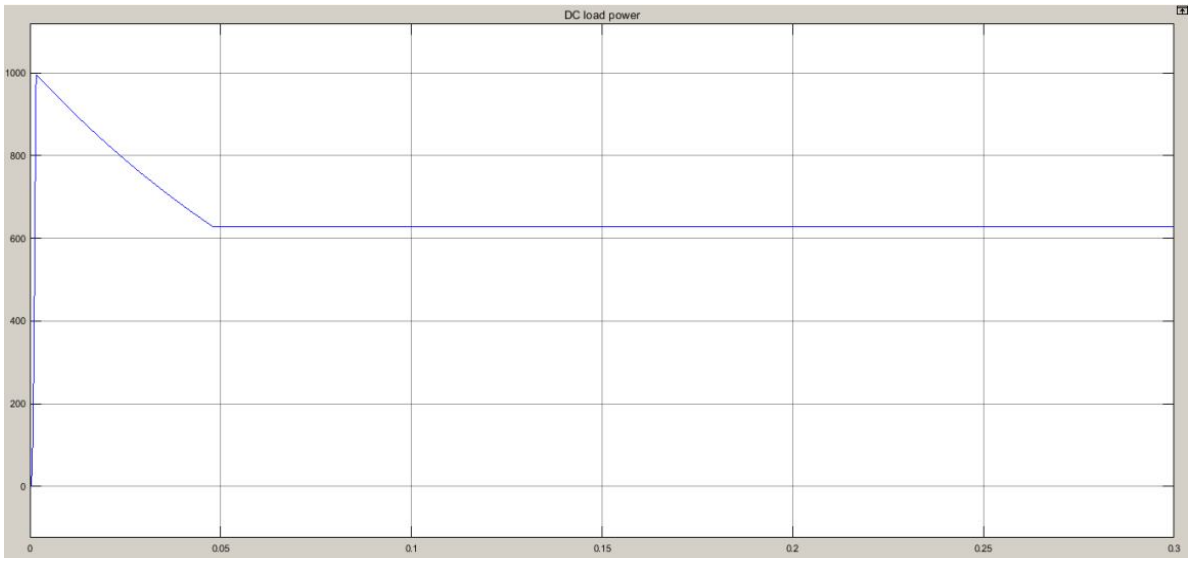

Fig.7 DC Load Power

Fig.8 shows a diagram of a PV cell in which a converter is connected to it. With the help of a high-power tracker the Photovoltaic cell emits electricity at a temperature of 25oC and an irradiation level of 1000 W / m2. and Photovoltaic measurement A Grid-connected system using Matlab. Converter or DC / DC converter and also applies this voltage to a DC / AC converter or inverter. Here, solar power of 600watts <630watts load is shown in fig 8

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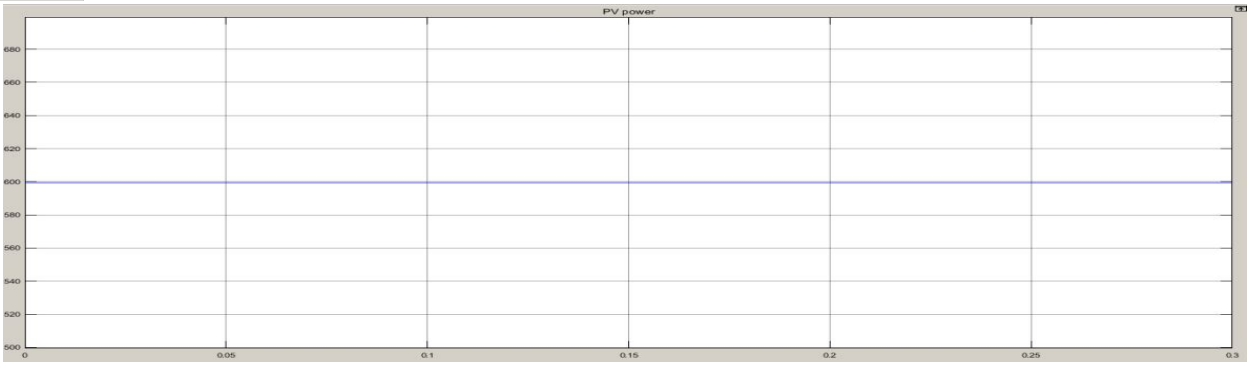

Fig .8 Solar (PV) Power

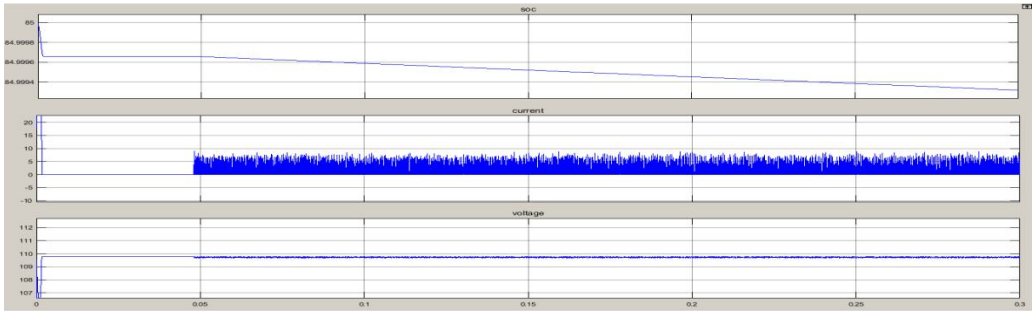

Fig. 9 Battery (SOC, Current, Voltage)

Here, the battery discharge to compensate the load power show in fig 9

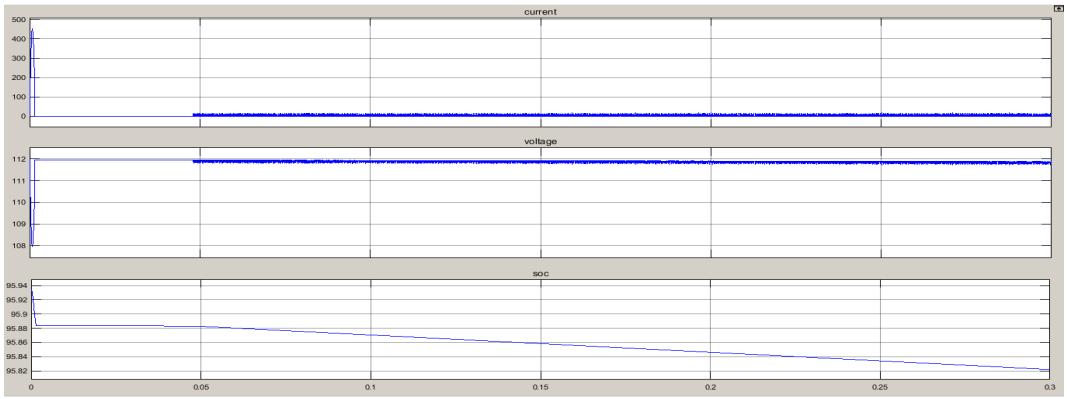

Fig 10 Super Capacitor (Current, Voltage, SOC)

Here, the super capacitor is discharge to compensate the load power show in fig 10

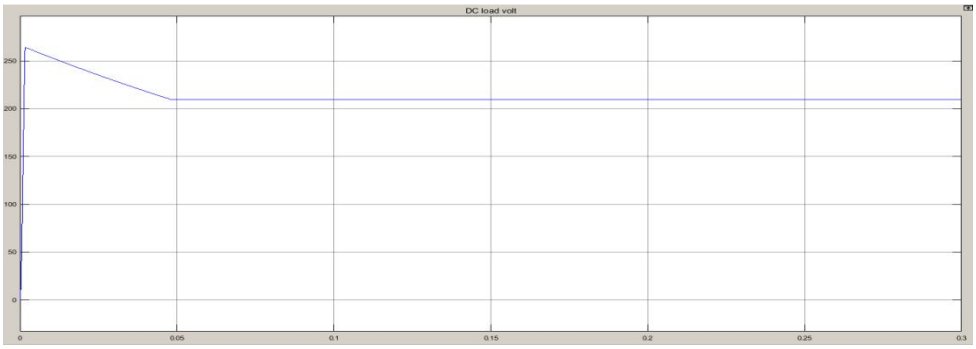

Fig 11 DCLoad Voltage

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Here, the dc load voltage is maintain constant show in fig 11

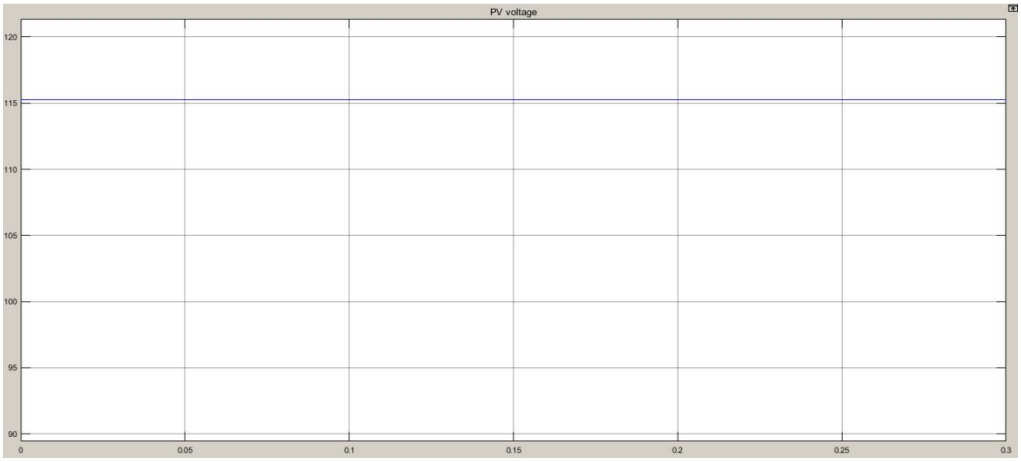

Fig.12 Solar(PV) Voltage

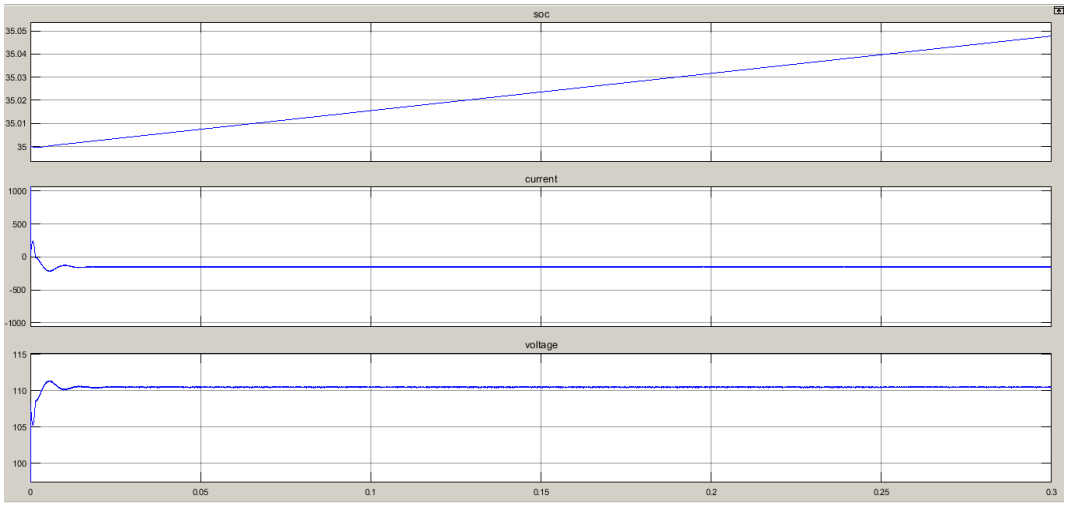

Fig. 13 Battery(Soc, Current, Voltage)

Here, the battery is discharged below the lower limitshow in fig 13

2) Mode (ii) Load Shedding Mode (LSM): In this mode, the current PV is under load and the battery is completely discharged. Therefore, the load is cut off and the available power is used to charge the battery.

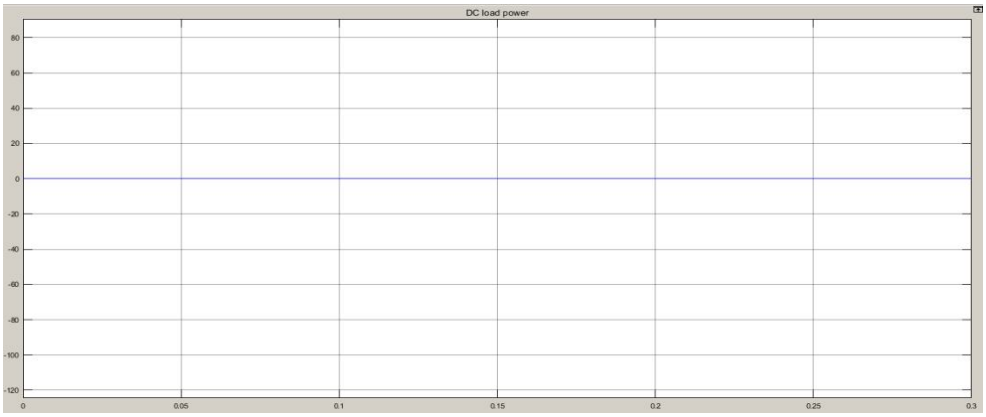

Fig 14 DC Load Power

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Here, the load is disconnected to charge the battery show in fig 14

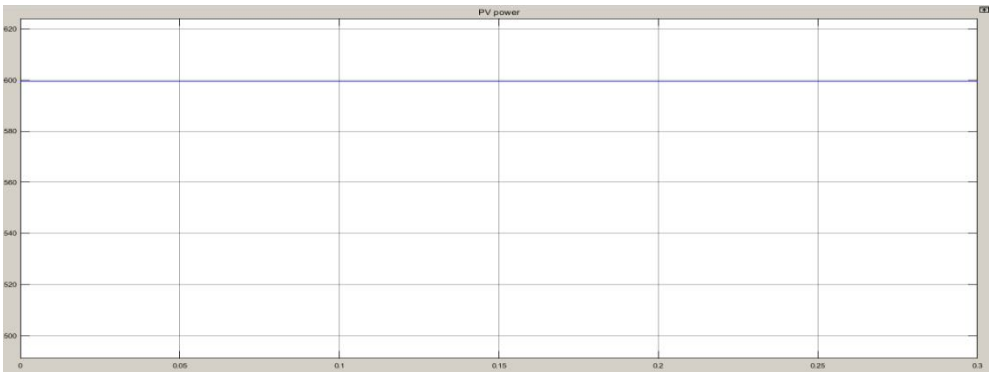

Fig .15 Solar (PV) Power

Here, the super capacitor also removes the battery charge The voltage (Vsofc) available from SOFC is increased by a DC / DC converter (power boost). When the load requirement is greater than the current PV, boost capacity (Vsofc_boost) is used to meet this requirement.

3) *Mode (iii) Battery Charging Mode (BCM):* In this mode, the current PV is larger than the load and the SoC battery is below the limits. Therefore, the battery adjusts the DC connecting power by charging it with an excessively available current

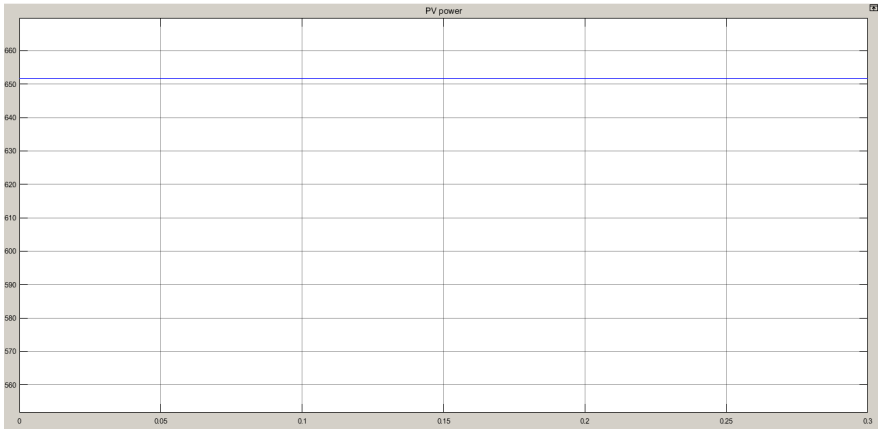

Fig 16 Solar (PV) Power

Here, the load power is 630 watts < solar is power 652 watts show in fig 16

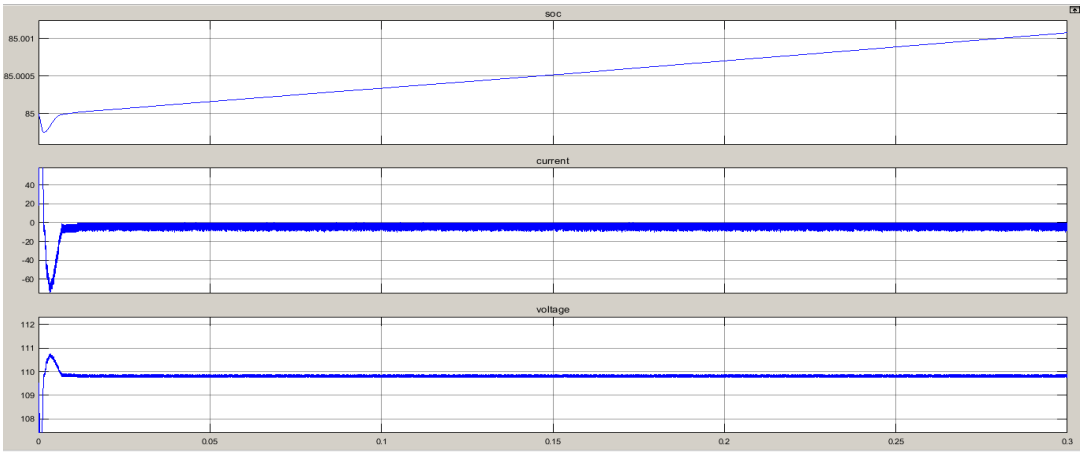

Fig 17 Battery(SOC, Current, Voltage)

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Here, the battery is charging show in fig 17

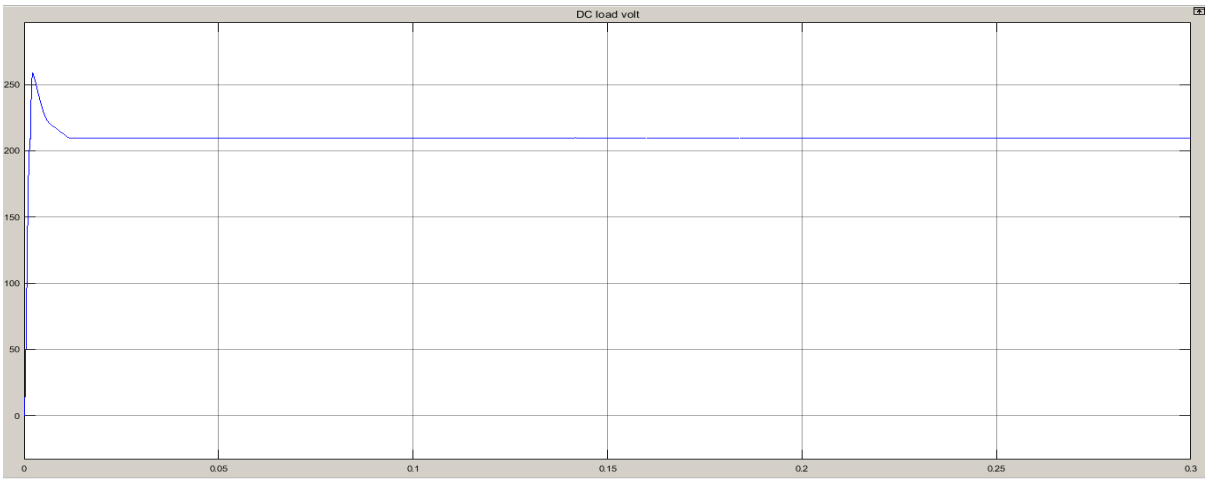

Fig 18 DC Load Voltage

Here, the load voltage is maintained at 210volt constant. When the load is directly connected to the solar panel, the working area of the panel does not reach pump capacity. Disruption detected by the panel determines the working environment of the solar panel. Therefore, with the change of disturbance observed in the panel, the operating point can be moved to a higher power level.

4) *Mode(iv) PV Off-MPPT Mode (POM):* In this mode, the battery is fully charged, therefore, PV operates in off-MPPT mode to control the power of the DC bus. MPPT opened the exhibition on fig 19

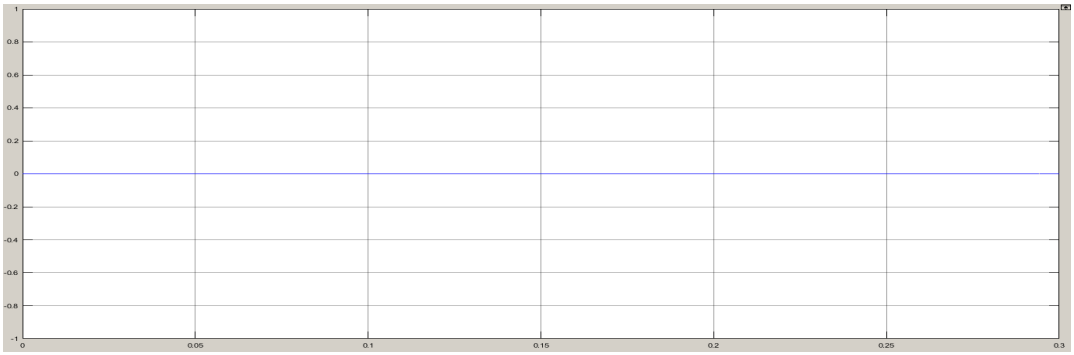

Fig.19 MPPT OUTPUT

The MPPT monitors the output of the PV module, compares it to the battery voltage, and determines the maximum power the PV module can generate to charge the battery, and then converts it to a higher volume to provide the maximum current to accommodate the battery. . It can open DC loads connected directly to the battery.

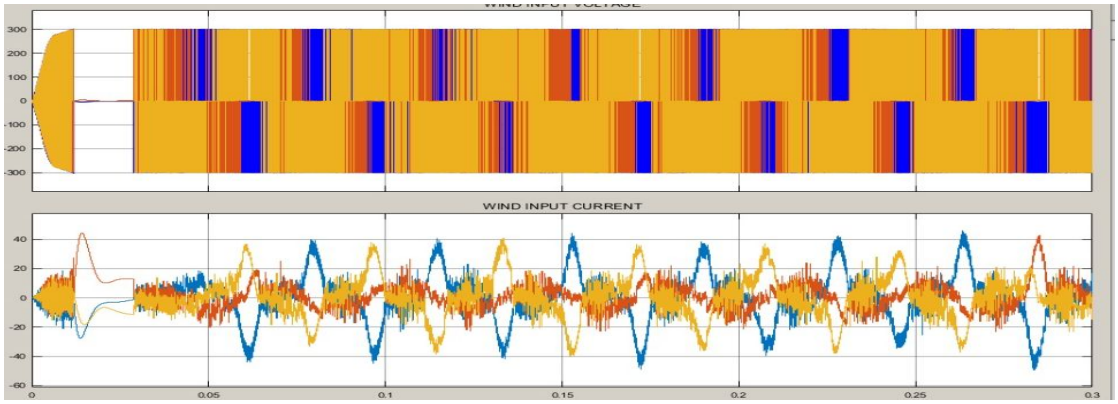

Fig. 20 wind output

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The output from the wind turbine depends on the size of the turbine and the wind speed using the rotor. An offshore wind turbine with a capacity of between 2.5-3 MW is capable of generating more than 6 million kWh of electricity per year, enough to power 1,500 ordinary households in the EU.

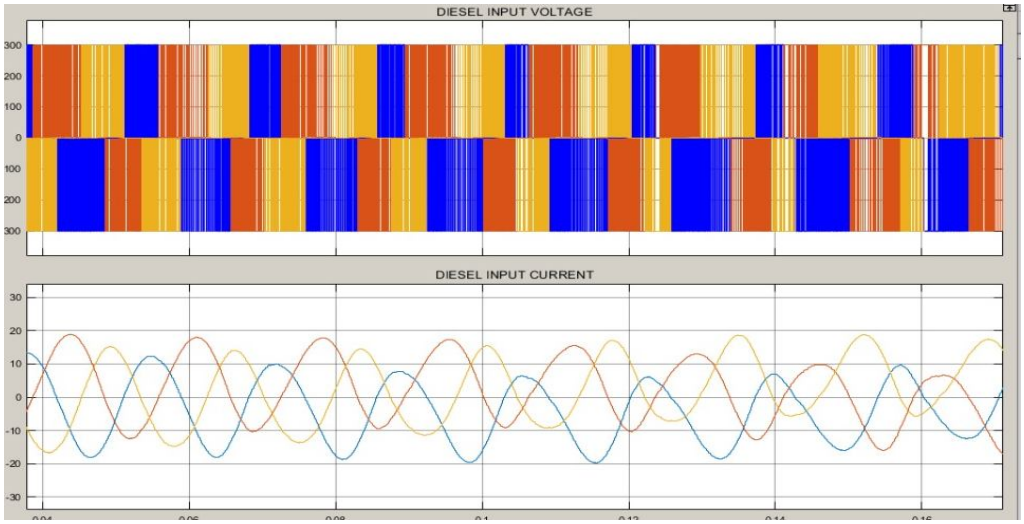

Fig.21 Diesel Input

The generator can output limited power. The company uses watts to test the effect of generating electricity. Power is calculated by multiplying the voltage by the amperage of electrical equipment (watts = volts x amps). The diesel generator converts mehendi (motion) energy into electrical energy and passes it through wires. The generator can be considered as an “electric pump” that causes the current to flow through the cables

IV. CONCLUSION

Using its precise small-scale signal model, the effect of supercapacitor power conversion on DC microgrid stability is analyzed. A good design of DC bus gas-powered buses based on the proposed supercapacitor power is to ensure adequate availability and value for money at all volercapacitor voltages. The simulation results and test results confirm that the proposed design has a greater advantage and cost ratio compared to conventional design. Therefore, the proposed control design can achieve a positive positive response with several variations of supercapacitor performance. In the proposed method, we tested it with batteries and a supercapacitor, and we had to misuse it on the grid system. The system can be used in all other renewable energy systems. Bidirectional inverters used in energy control systems are considered solar panels. Batteries with supercapacitor and loads can be connected to the grid using inverters.

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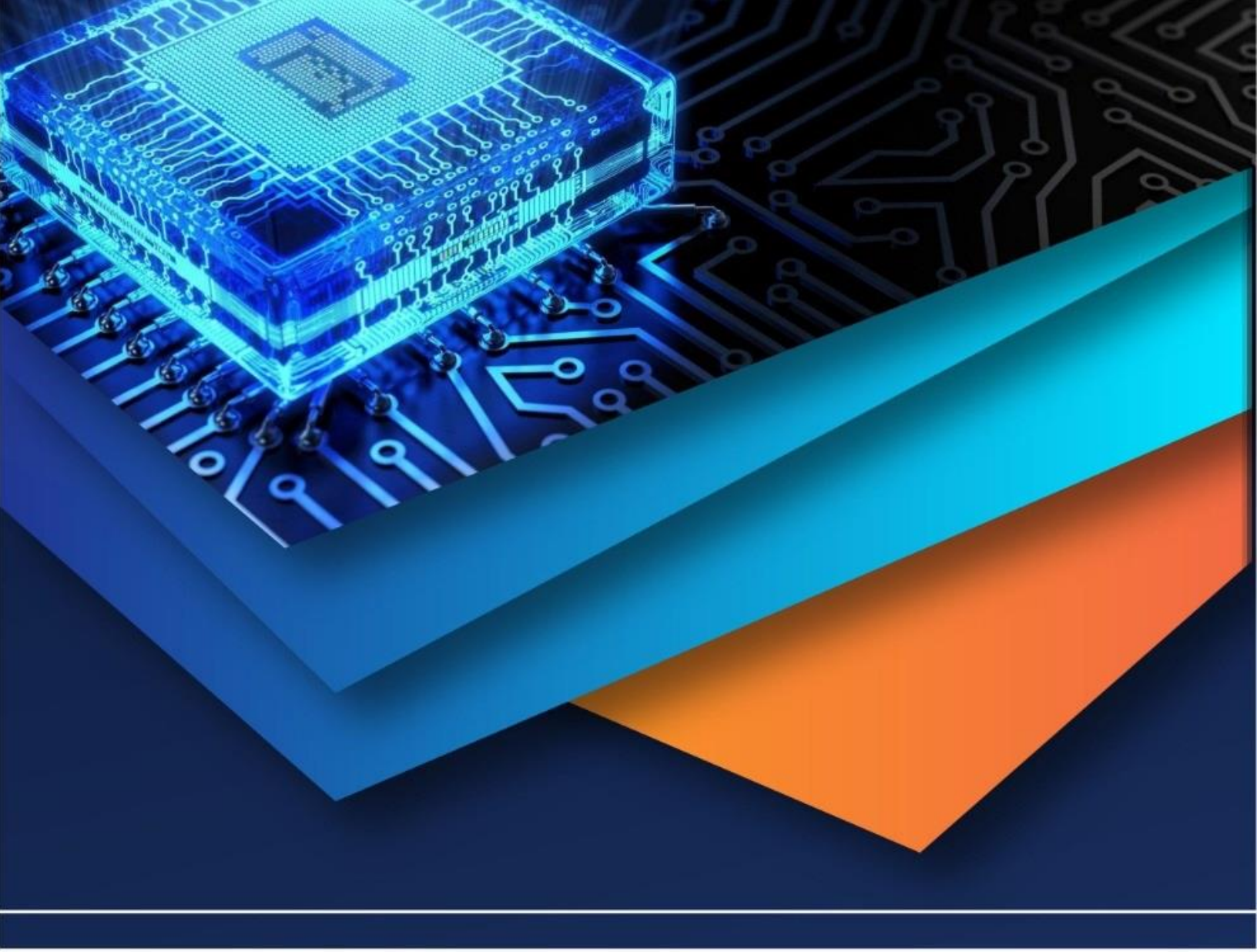

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