INTEGRATION OF GRID WITH HYBRID POWER SYSTEM FOR DISTRIBUTION NETWORK

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Abstract*— The usage of solar PV power generating system in conjunction with wind power generating system combinedly form a hybrid power network. This hybrid power network is connected to grid. The system provides continuous power supply due to combination of two power generating systems. And the generated power is a clean and green energy. No pollution is caused during generation and there will be no burning of any fuel. And these systems have better life, as they have low maintenance cost and many other advantages they have better future scope.

Keywords—Hybrid energy system, Solar (PV) system, Wind power Generating system, Converters, Inverter, Grid.

1. INTRODUCTION

The power generation can be possible by using either solar PV or wind turbines, or combination of both. Therefore, areas should be identified for the generationof electrical energy through solar and wind resources. As the atmospheric factor affect the power generation from hydro plants. Usage of renewable energy sources for electrical energy generation has a positive impact on the system reliability and growth. The usage of solar PV system and wind power generating system provide the continuous power supply and it helps the grid in island mode operation, it provides the power distribution to remote and OFF-Grid areas. The system provides voltage regulation and power quality improvement.

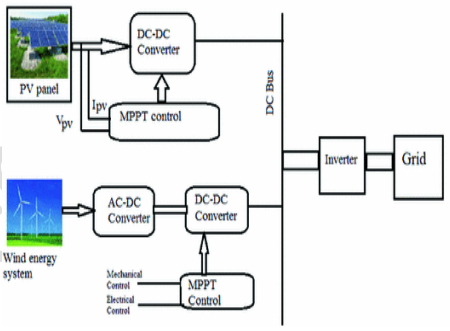

Fig.1: INTEGRATION OF GRID WITH HYBRID POWER SYSTEM FOR DISTRIBUTION NETWORK.

2. LITERATURE SURVEY

The solar-wind hybrid power system is a natural and effective way of power generation which provides the continuous and quality power supply, the system ensures in providing power to grid which helps the grid to operate in island mode operation and provides clean and green energy, the system is also helpful to provide power for remote and OFF-Grid areas. The objective of this study is to maximize the power supply by using solar and wind systems. By this the possible energy of the national grid is saved and the system can provide demand response for the consumers.

3. METHODOLOGY

The various components of the system are modeled using MATLAB/Simulink software, i.e., Solar PV system modeling, wind turbine modeling, modeling of inverter, modeling of grid are used in the system.

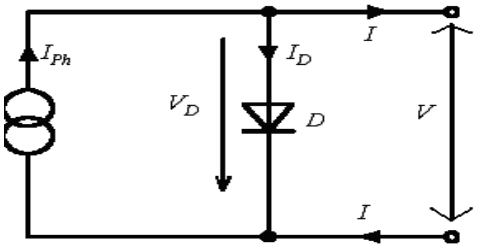

Fig: 2 Simulink model of solar cell modeling

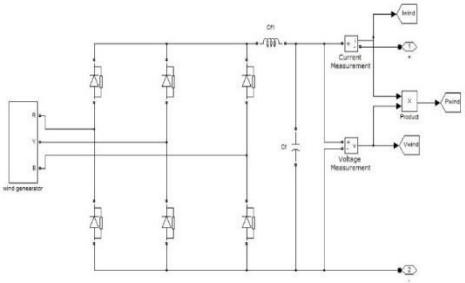

Fig: 3 Simulink model of wind turbine with three-phase bridge rectifier

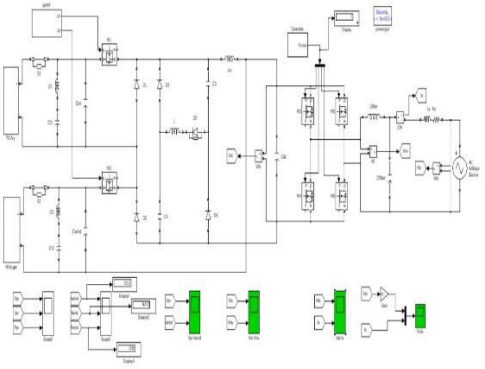

Fig: 4 MATLAB Simulink diagram of proposed system

4. SOLAR PANEL

The term "solar panel" is commonly used to describe a flat solar thermal collector, such as a solar hot water or air panel designed to heat water, air, or collect solar thermal energy. Furthermore, the term "solar panel" can also relate to a photovoltaic module, which is a collection of solar cells assembled to produce energy.

. In both cases, these panels are typically flat and come in various grouping of solar-thermal panels or photovoltaic (PV) modules, which can heights and widths. An array refers to a be connected either in parallel or series depending on the specific design objective. Solar panels are commonly utilized in residential, commercial, and industrial applications to harness solar energy for various purposes.

5. INVERTER

The Inverter mainly works on two modes of operation they are 120-degree conduction mode and 180-degree conduction mode, and the inverter in this system is constructed using MOSFET'S, the controller in the circuit is used to provide and control the gate pulses for the inverter, the inverter in the circuit is used to convert DC current to AC current and the converted AC power is filtered and connected to grid.

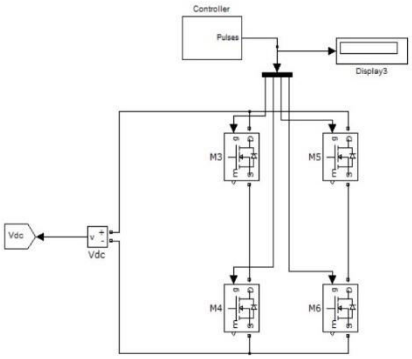

Fig: 5 Inverter constructed using MOSFET's

6. converters

The converters used in the work are DC-DC converter, And AC-DC converter, The DC-DC convertor is used to limit the fluctuations in the dc current and provides more stabilized DC current. And the AC-DC converter is used at the output of wind turbine due to its rotating action the power output of the wind system is AC and the converter

used here is three-phase bridge rectifier which converts the ac current to DC current.

7. MPPT CONTROL

The MPPT is pronounced as the Maximum Power Point Tracking (MPPT), it is used to track the maximum available power from the system under certain conditions, in this circuit the main use of MPPT control is to extract the maximum power from the solar power generation system and wind power generation system. This makes the system to work efficiently, and it increase the charging efficiency and power output of the system. A common or a single MPPT control system is used in the circuit for both generating systems.

ADVANTAGES & APPLICATIONS

Advantages

- The hybrid power system satisfies the load demand of the consumer.
- The system provides continuous and uninterrupted power supply.
- The system works efficient and easy for installation.
- It requires less maintenance cost.
- The system provides air-quality, public health and greenhouse gas emission benefits.

It has longer life.

Applications

- Voltage Regulation and Power Quality Improvement
- Demand Response
- Island Mode Operation
- Remote and Off-Grid Areas
- Integration of Energy Storage

8. RESULT:

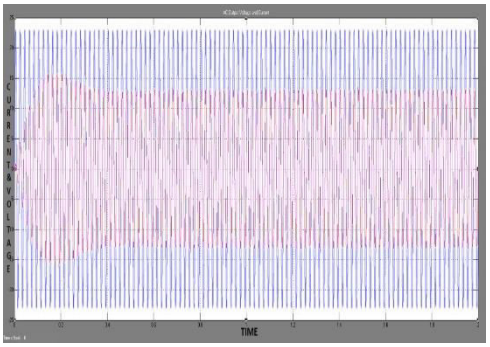

Fig: 6 output waveforms of voltage and current at Grid

9. CONCLUSION

- The demand required by the system is covered by using electrical energy produced by the hybrid solar and wind systems. This work considered the power demand of 200 kW, which is supplied by the hybrid system, which generated outputs of wind and solar PV generation are 168.5 kW and 173.3 kW, respectively.
- Therefore, the hybrid system can supply the power requirements of the system. Hence, it increases the reliability of the network.
- As a future enhancement of this work, the developed model can be utilized for the purpose of handling power quality issues of the network.

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