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Wind-Solar Hybrid Project Identification and Formulation

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Abstract*—Hybrid energy is the need of the hour because it is sustainable and reliable than single source of renewable energy. To get clear overview of Hybrid energy because we are planning to identify and formulate hybrid project in our area. The world is however majorly concerned of the utilities to reduce the emissions from electricity generating plants by employing renewable energy and to supply and at low cost electricity to remote areas.*

Keywords--- Electricity, Hybrid Power System, PV cell, Renewable Energy, Solar Energy, Wind Energy

I. INTRODUCTION

Reliable Electricity supply through renewable energy generation has always been a challenge, which can be mitigated by implementing hybrid projects. Wind solar hybrid system seems to be promising in most of the parts of India. For this purpose, we have studied the five literatures. Which we will discussed in detail. Reviewing of different projects is done for better understanding and for hybrid project formulation in our own area. A comprehensive analysis and inference is made out of the study. Due to increase in concern of global warming and the alarming stage of fossil fuel. There for we are looking at solution to preserve the earth for the future generation. Renewable Energy sources such as Wind Energy and Solar Energy is the fastest growing source of clean energy. The Location of our project is Kumbharpada in Virar (E). These regions are endowed with climatic conditions long hours of sunshine, strong radiation and rich Wind Energy resources. Most of the Single renewable resource cannot be continuous and ensure stable power supply. But by using Wind and Solar technology we can effectively solve this problem. Due to installation cost, maintenance cost and space required for battery is not convenient. Hence we are not using batteries in our Wind-Solar hybrid System. There for we connect the Wind-Solar hybrid system with utility grid. The aim of this work is implementation and formulation of rural, remote area Solar-Wind hybrid energy system.

II. LITERATURE REVIEW

The literature search was mainly focused on topics related to Regenerative braking in Electric and Hybrid cars. The review of publications and research work revealed the basic guidelines and area of work need to be conducted exhaustively on a particular model of car, where a positive result is expected, in favor of society and future demand for the saving of fossil fuel and environment pollution point of view. The following data was surveyed for obtaining basic idea and knowledge of the project titled 'WIND SOLAR HYBRID PROJECT IDENTIFICATION AND FORMULATION'.

This hybrid model of VAWT and solar on highways have good source of green power. Present work of model experimentally shows the hybrid wind and solar power generation can be used to generate large amount of power at almost all time of day. This can be an alternative source of energy to the non- renewable resources. By using this model all the highways and small villages can be lighted without the use of conventional energy sources. This can be implemented instead of single source, to gain more power almost at all times. Finally, conclude that this paper can give electricity without pollution to many highways and small villages.

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To provide better power supply services four household the mini hybrid wind - solar power plant is use-full and in this paper we have studied the off grid electrification through hybrid power. Power is main issue for remote or isolated areas base station, because grid extension is not feasible. In these sites the above proposed renewable base hybrid system is most viable solution. These solutions of power supply to the households are cost effective and available throughout the year. The circumstance of each sites are studied in order to decide the feasible combination of alternative energy resources. Alternate power solutions are not commonly used in household system today but are actively evaluated for remote and isolated areas over worldwide. With the help of above pre-feasibility study the solar and wind hybrid energy system are most viable power solution for tribble belt in Indian sites over conventional grid supply system.

In this paper, a hybrid solar-wind energy system in combination with a grid tie inverter and a controller has been presented. The hybrid energy system has been presented with mathematical modeling, analysis and computer simulation which confirms that any voltage and power coming from solar and wind system can be controlled with LTC3784 controller which produces a constant output voltage and power that is being finally inverted using SPWM-based inverter circuit. The simulation results show that even if the input varies, the output power (240W) and voltage (220Vrms and 50Hz frequency) remain the same, which confirms that the proposed system is stable in terms of both power and voltage.

In this paper, we take some communications station in Qinghai Lake for example, make technical and economic analysis on the wind/solar hybrid system by HOMER, and try to achieve saving costs and maximizing efficiency when meeting the requirements of the load. After the analysis we find out wind speed has a great influence on the system costs, and it must be paid attention in the design process.

III. IMPORTANCEOFWIND-SOLARHYBRIDPROJECT

Reliable Electricity supply through renewable energy generation has always been a challenge, which can be mitigated by implementing hybrid projects. Wind solar hybrid system seems to be promising in most of the parts of India. For this purpose, we have studied the five literatures. Which we will discussed in detail. Reviewing of different projects is done for better understanding and for hybrid project formulation in our own area. A comprehensive analysis and inference is made out of the study. Due to increase in concern of global warming and the alarming stage of fossil fuel. There for we are looking at solution to preserve the earth for the future generation. Renewable Energy sources such as Wind Energy and Solar Energy is the fastest growing source of clean energy. The Location of our project is Kumbharpada in Virar (E). These regions are endowed with climatic conditions long hours of sunshine, strong radiation and rich Wind Energy resources. Most of the Single renewable resource cannot be continuous and ensure stable power supply. But by using Wind and Solar technology we can effectively solve this problem. Due to installation cost, maintenance cost and space required for battery is not convenient. Hence we are not using batteries in our Wind-Solar hybrid System. There for we connect the Wind-Solar hybrid system with utility grid. The aim of this work is implementation and formulation of rural, remote area Solar-Wind hybrid energy system. Even during the equivalent day, in many regions worldwide or in some periods of the year, there are different and opposite patterns in terms of wind and solar resources. And those different patterns can make the hybrid systems the best option in electricity generation. An hybrid wind-solar electric system demands an higher starting investment than single larger systems: large wind and solar PV systems are proportionally cheaper than smaller systems. But the hybrid solution is the best option whenever there is a significant upgrade in terms of output and performance which happens when the sun and the wind resources have opposite cycles and intensities during the equivalent day or in some seasons.

IV. AIM OFPROJECT

4.1 THE AIM OF THIS PROJECT is to design and Formulation of Wind-solar Hybrid system. This work is expected to help to understand the basics of solar-wind power generation. A small part of daily electricity consumption with an efficient utilization of wind and solar power. Here we made a hybrid system where the solar power and wind power output fed to the utility grid. Because of the availability of wind is throughout the day and night whereas solar power is only available in daylight and for a limited time, here we not storing the wind power and solar power.

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4.2 IN BRIEF, THE OBJECTIVES ARE:

4.2.1 Wind solar generation
4.2.2 Solar power generation
4.2.3 Make a wind-solar hybrid power system

V. SITE INVESTIGATION AND SITESELECTION

5.1 SITE INVESTIGATION

5.1.1 Why This Area

We are the students of Viva Institute of Technology Shirgaon, Kumbharpada which is rural area. In this area reliable and clean electricity is yet unaccesed by all the people living in this area. So to mitigate the problem, we came of the idea of planning electricity generation plant which will be sustainable, clean, economical, and has engineering values.

5.1.2 Why Hybrid

This area having large wind flow throughout the year due to western ghat hilly geography. For our plant ample land is available. For solar plant in this area domestic and commercial rooftop is available. Due to hilly areas the land required for plant is available at quitly lowcost.

5.1 Images of Site

FIGURE 1: Image of Site Selection

5.2 Site selection

After analyzing with the investigation parameter we decided to site no. 1 to 4 for wind turbine system and site no. 5 for solar system. In this site the height for wind turbine is 40m to 50m and average wind speed is 4-5 m/sec almost throughout the year.

VI. MATERIAL ANDMETHOD

6.1 Flow ofproject

- Survey of location
- Selection of location
- Collection of data

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- Solar Radiance durationcurve
- Wind flow duration curve
- Analysis of data
- Bifurcate capacity for solar and wind
- Designing of project mathematically
- Designing of project in Simulink

VII. TECHNO-ECONOMIC FEASIBILITY OFPROJECT

7.1 TECHNICALFEASIBILITY

The technical feasibility of this project is geographical advantage in this area. This area is hilly area where average wind flow throughout the year. Minimum 190 solar lit days is available. This energy renewable energy which clean and eco-friendly. Due to hybrid project the accessibility of electricity to all for24*7.

7.2 FINANCIAL FEASIBILITY

After analyzing the project site areas, it was clear that a hybrid project of 50 MW capacity can be build. We are yet to study that how much will a 50 MW project in Shirgoan area cost. If we consider the costing of solar generation at Rs. 60000 per KW and 1.2 lakhs Rs. per KW for wind generation, then bifurcating 50 MW project will be done as follows.

30 MW wind plant
30000*1.2 lakhs = 36 lakhs
20 MW Solar plant
20000*0.6 lakhs = 12 lakhs
Total cost for hybrid system = 36+12 =48lakhs (Approx 50 lakhs)

VIII WIND SOLAR HYBRID SYSTEM

8.1 BLOCK DIAGRAM

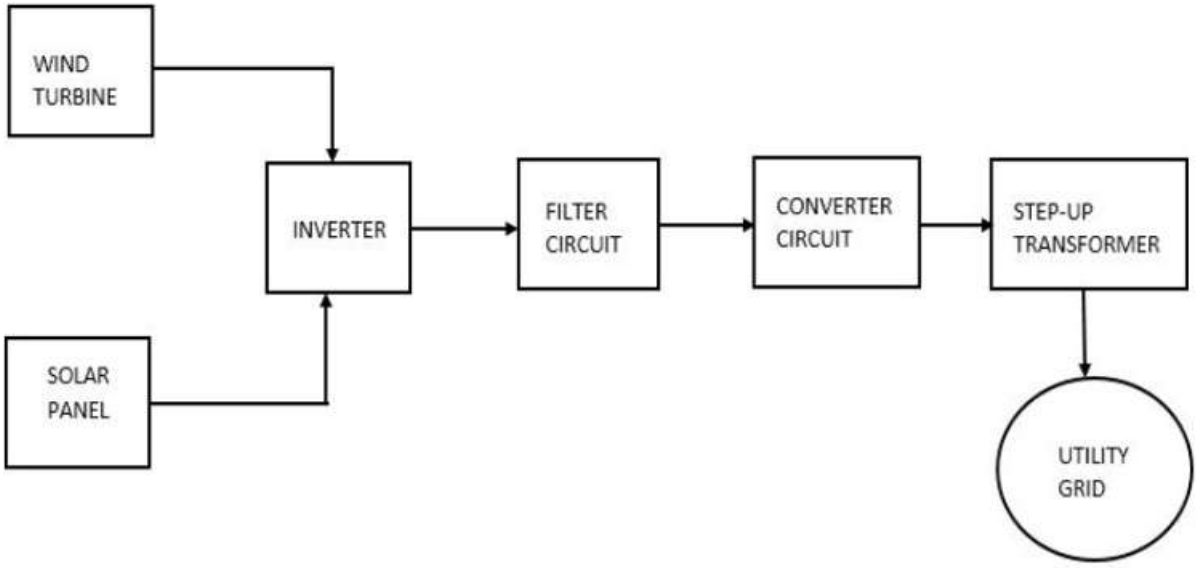

FIGURE 2: Block Diagram of Wind Solar Hybrid Project

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The two dc sources of energy are feeding the inverter, filter and converter circuit to get clean and controlled ac voltage. After getting pure ac voltage we fed this power to grid with the help of step up transformer.

8.1 SIMULINK MODEL OF PROJECT

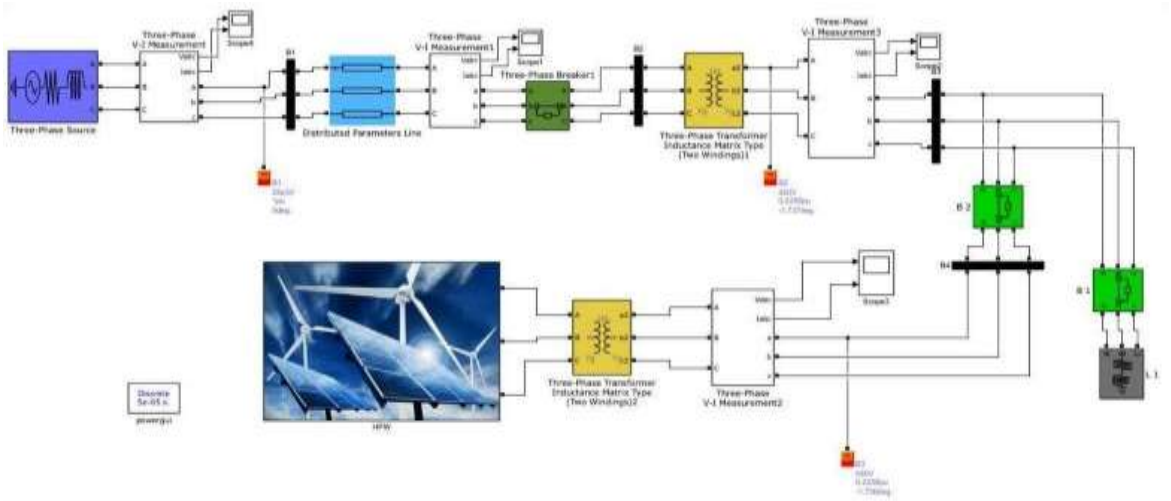

FIGURE 1: Design of Project simulink Model on MATLAB

The above diagram is shows that the Simulink model of wind-solar hybrid project on matlab. In this system we generate power from wind & solar and after filter and controlled the power it gives to utility with the help of step transformer.

VIII. CONCLUSION

The objectives of the project have been achieved as a hybrid power system based on wind and solar energy has been de-signed to meet the load of Kumbharpada Area. This project model can be develop in rural areas where the power cut-off is regular. With some modification in wind-turbine part and increasing the number of solar panel and wattage this model can be utilized as stand-alone system especially in offshore-onshore where the speed of wind is adequate. We will not use battery because its installation cost, maintenance cost is comparatively expensive also it is harmful to an environment.

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