

# Energy Utilization By Integrating Renewable Energy Sources Like Solar And Wind Power Into One Unified System

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**Abstract**— In the world unlimited amount of renewable energy is present. Using this unlimited amount of renewable energy as a supplement of power is best possible choice today. If more than one energy is used for power generation then it is called as hybrid power system. This hybrid power system consists of renewable energy sources. This renewable energy sources are solar energy and wind energy. Solar and wind energy is best combination because during the day time solar energy provides the necessary power while during night time wind energy provides power. So hybrid system provides power to connected loads by using solar power, wind power or battery power. If excess power is available then it will charge the battery. This system will be present in home. Here utilization of power will be measured in every home. Every customer owns a card which provides information of power utilization. If power is not available by renewable energy sources then it will switch to grid power. By using this system energy can be managed properly.

**Keywords**- Renewable energy, energy management, PV power, wind energy

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## I. INTRODUCTION

Today there are different technologies of renewable energy sources are present and each of them has specific characteristics and positive and negative points. Solar energy, wind energy, fuel-cell technology these energy sources are widely used. From this most important and common source of renewable energy is the wind energy because wind energy is convenient, it is very cheap and it can be accessed everywhere. But sometimes we cannot predict wind speed and also the situation of weather is not easily forecasted. If system is used on large scale then there are some limitations on the maximum and minimum speed of the wind for generating electricity which is provided by operators and this maximum and minimum speed of wind should be met to provide a better situation for wind energy generations. Because of all such reasons, power systems cannot depend on wind energy only and there should be some back serves for the systems using wind generation to support them in case of calm weather [2]. Such back up services are provided with another sort of renewable energy source and the main back up for these services can be considered as solar to provide a hybrid system of wind and solar systems [2]. So to prevent a customer from lagging of power & to meet their demands hybrid power system is exact solution.



Figure 1 Solar-wind hybrid power system

In this paper focused a review on power management techniques in hybrid system.

## II. LITERATURE SURVEY

Solar power is the conversion of sunlight into electricity. Conversion is takes place either directly using photovoltaic , or by using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic convert light into electric current using the photoelectric effect.

It is interesting to look back and see how the Sun has been often used for its power in the past. We could for instance imagine that Archimedes is the father of Concentrated Solar Power. Indeed during the Battle of Syracuse (Italy, 213 - 221 B.C.) angle hexagonal mirrors were used to destroy the Roman fleet. Leonardo da Vinci also thought of using the Sun. He designed solar concentrator in 1515 already to use solar power.

Ahmed, N.A., Miyatake, M., and Al-Othman [3]. presented a hybrid system model. This system included three sources. One was wind, another was solar power and third was fuel cell system. The fuel cell system was used as a backup resource, where as the main energy sources were the solar and wind systems. Results demonstrate that the system is reliable and can supply high- quality power to the load, even in the absence of wind and sun .

Dihrab and Sopian [4] proposed a hybrid PV/wind system that would be used for grid-connected applications as a power source in three cities in Iraq. A simulation of the model was carried out on MATLAB, where the input parameters were determined by meteorological data from the three locations, as well as the sizes of the wind turbines and the PV arrays. Their results showed that their hybrid system would provide sufficient energy for villages in desert or rural areas.

Essam A. Al-Ammar , Nazar H. Malik , Mohammad Usman [5] performed simulation of the hybrid power system using HOMER software. For that Kingdom of Saudi Arabia a remote village called Al-Qtqt, was selected as a case study in order to investigate the ability to use a hybrid power system to provide the village with its needs of electricity. The load profile of the village as well as the solar emission and wind speed data were used as the inputs to the software. The output of the simulation was used for choosing the optimal case for the system and the optimal percentage of minimum renewable fraction. It is shown that the optimal case is the solar and grid combination and it represent a system connected to the grid with the addition of using renewable energy.

Sweeka Meshram, Ganga Agnihotri , and Sushma Gupta [6] presented a paper .In this paper, hydro (7.5 kW) and solar systems (10 kW) are taken as renewable energy sources and connected with the utility grid. As hydro and photovoltaic energy sources obtain at irregular intervals for continuous power flow utility grid is connected to the system. The hydro power generation system uses the self excited induction generator (SEIG) and converters. The AC/DC/AC converter is used as interface to connect the hydro turbine to the utility grid and therefore it adjusts the generated voltage to the utility grid voltage. The control of both the hydro and solar power plants is provided through the constant current controller.

If we analyze the electrification world map then it shows that rural areas are in great need of electricity for development. Hybrid systems can provide village electrification. When analysis was carried out then it found that photovoltaic/diesel hybrid system installed in 2006 in rural area of china provided electricity to 55 households & in Algeria around 12 households. Electricity was generated by coupling to DC bus line, AC bus line or AC/DC bus line.

Smart electricity grid technology is also having plenty of applications with better impact. It integrates more renewable energy sources (RES), electric vehicles and distributed generators into the network very safely. Power delivered through this technology is very efficient and reliable enabling consumers to have greater control over their electricity consumption and to actively participate in the electricity market .

Y. Jaganmohan Reddy, Y. V. Pavan Kumar, K. Padma Raju, and Anilkumar Ramsesh , [7] proposed hybrid power system to control load of a building describes the topology of retrofitting HPS with dc Motor-Synchronous Generator set instead of the use of inverter to an existing building power system. This can improve the power quality, reliability of the supply, and ensures stable plant operation. The proposed HPS topology can be used in small-to-medium sized isolated constructions like green buildings, industries, and universities. Different renewable energy sources like Photo Voltaics (PV), Wind Power (WP), and Fuel Cells (FC) are integrated to form HPS.

R .Karthikeyan , P .Mahalakashmi, N. GowriShankar [8] studied a system which provides the information regarding Coordination and Control of Solar-Wind Hybrid System for Remote Telecom Towers Under various Climatic Conditions. As most of the telecom towers are present at remote areas in India. Energy source for these towers is mainly diesel generators. Such systems are very costly and they emit green house gases which are very malicious .They can be avoided

by using renewable resources . So the renewable energy sources satisfies all demands of energy and hence overcome the problem of emission of harmful gases. Also it reduces the cost of operating remote tower. Here they used PV, Wind and battery power.

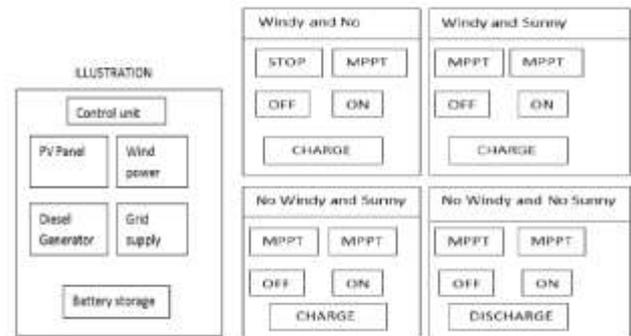


Figure.2. Various source connection and system operation for different climate conditions

Here they have simulated the working of system under four climatic conditions and control System is designed such that it uses the combinations of various power sources available to satisfy the load. So continuous power will be available for the system. Main source of supply is grid to which system is connected. In case during the failure of the grid the alternative Diesel generators are used to satisfy the load. Here the conditions are assumed such that Grid is always in on situation and climatic conditions are affected only for the renewable sources. The control system uses the Hybrid PV-Wind system and battery is available such that it charges and discharges during the desired situations.

Traffic light signal makes the use of a solar/wind power system for providing energy. Large number of traffic lights is present at cross roads across the world .So energy costs become a problem, since the maintenance of such a great system needs large amounts of energy. Consequently, LED light bulbs have been promoted at many large cities. However, because of the large number of installations, energy usage is still high. Applying solar panels and wind turbines to traffic light systems not only saves money, but also it can reduce the GHG (Green House Gases) emissions from electrical companies .Here DC/DC converter can give output i.e. constant voltage of electricity. The result from website reLI shows that 105 square feet of solar panel is required to be installed to power up the traffic light system[9].

### III. CONCLUSION

Our study focused on designing a model that would allow us to find the optimal system design parameters of a hybrid solar system, taking into consideration the number of solar arrays . The objective was to meet the load of different applications using our designed hybrid system, while minimizing costs. This power system is used to provide power to connected loads. When PV energy output is not sufficient for connected loads, the inverter will convert the Battery power or utility power to the loads. Depending on different power situations, this hybrid inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the utility.

REFERENCE

- [1] Yang, H., Zhou, W., and Lou, C. "Optimal Design And Techno-economic Analysis Of A Hybrid Solar-Wind Power Generation System", Applied Energy, Vol. 86, pp. 163-169, 2009.
- [2] Ekren, O., Ekren, B.Y., and Ozerdem, B. "Break-even Analysis And Size Optimization Of A PV/Wind Hybrid Energy Conversion System With Battery Storage – A case Study", Applied Energy, Vol. 86, No.7-8, pp. 1043-54, 2009
- [3] Ahmed, N.A., Miyatake, M., and Al-Othman, A.K. "Power Fluctuations Suppression Of Stand-Alone Hybrid Generation Combining Solar Photovoltaic/Wind Turbine And Fuel Cell Systems, Energy Conversion and Management, Vol. 49, pp. 2711, 2008.
- [4] Dhrab, S.S. And Sopian, K. "Electricity generation of hybrid PV/wind systems in Iraq", Renewable Energy, Vol. 35, pp. 1303-1307, 2010..
- [5] Essam A. Al-Ammar , Nazar H. Malik , Mohammad Usman "Application of Using Hybrid Renewable Energy in Saudi Arabia" ETASR - Engineering, Technology & Applied Science Research Vol. 1, No. 4, 2011, 84-89
- [6] Sweeka Meshram, Ganga Agnihotri, and Sushma Gupta " Performance Analysis of Grid Integrated Hydro and Solar Based Hybrid Systems Advances in Power Electronics ,Volume 2013, Article ID 697049
- [7] Y. Jaganmohan Reddy, Y. V. Pavan Kumar, K. Padma Raju, and Anilkumar Ramsesh, "Retrofitted Hybrid Power System Design With Renewable Energy Sources for Buildings", IEEE TRANSACTIONS ON SMART GRID, VOL. 3, NO. 4, Dec 2012,page no-2174-2187
- [8] R.Karthikeyan 1, P.Mahalakashmi 2, N.GowriShankar3 " Coordination and Control of Solar-Wind Hybrid System for Remote Telecom Towers Under various Climatic Conditions "International Journal of Advanced Research in Electrical and Electronics Engineering Volume: 1 Issue: 3 08-Feb-2014,ISSN\_NO: 2321-4775
- [9] Yang Liu "Determine the Feasibility of Using Isolated Solar/Wind Hybrid Power System to Augment Power at a Signalized Intersection" 8-1-2012