

# Hybrid Power Generation for Street Light Pole Application

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## ABSTRACT

The Hybrid Solar Wind Energy System combines the functions of wind turbines in parallel with solar panel hence having a higher total of renewable energy values. The system therefore allows for application in two modes therefore even though there is an in-balance in either wind speed or sunlight, generation of power is always there. Global warming, pollution and sky ricketing prices of the conventional energy sources have put the governments and the power industries under and increasing pressure to invest in the renewable energy sources. This research consists of a complete study on replacing the highways lights powered by conventional polluting energy sources by lights powered by hybrid Wind-Solar renewable energy systems. The results of this research show that the application of the hybrid power system will cut the electricity bill for the street and highways lights and reduce the pollution level caused by the use of the conventional sources of energy.

**Keywords:** Hybrid Solar Wind Energy System, replacing the highways lights, reduce pollution level.

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## I. INTRODUCTION

The hybrid energy system is the integration of two or more energy production systems in order to increase on the reliability and efficiency, for example; wind and solar energy systems. Windmills are machines designed to convert wind energy into mechanical energy using rotating blades. They were first built to automate the task of grinding grain and pumping water for irrigation, domestic use and for livestock. It is from technology that a wind turbine was developed to convert the kinetic energy of the wind, first into mechanical energy then to Electricity. The solar energy represents the entire electromagnetic radiation (visible light, infrared, ultraviolet, x-rays, and radio waves) that strikes the earth which can be converted into usable energy.

There is not much in use of wind turbines in India compared to the solar energy system yet they could be a solution to the unreliable supply of power to deliver both piped and natural water for domestic, irrigation and livestock farming. In a few cases where they have been put up, they are either inefficient in operation or fail to work completely from the time of erection. Failures of such windmills can be attributed to poor and rudimentary design practices that could have compromised some of the design factors.

These two energy systems can naturally work together as the solar hours are usually from around 7:00AM to 5:00PM where as good winds are usually from around 2:00PM to 7:00PM and morning hours from 9:00AM to 12:00PM. The integration of these two systems into a hybrid system could provide the best way to harvest significant amount of energy from the natural sources especially in rural areas where national grid is a dream, with no major impact on the environment.

Renewable energy sources such as solar and wind are being increasingly in demand by the electric power industries due to the unprecedented escalation of the fuel cost and the growing interest in living in a pollution-free environment. The investment capital in cleaner energy sources has steadily grown in the last twenty years all over the world especially in countries that have abundant renewable energy resources. This growth is driven from one side by the fear of shortages in the conventional energy sources and from another side by the incentive given to the producers of the clean energy from the concerned governments.

In this paper a case study on replacing the conventional High Pressure Sodium highways lights by Light Emitting Diodes powered by sustainable hybrid energy sources is presented along with an analysis of the ecological and economical impacts on the country.

## II. LITERATURE REVIEW

Light Emitting Diodes technology for street lighting is one of the most efficient lighting technologies used currently especially when it is powered with renewable energy sources like hybrid solar/wind systems; it consumes less power for the same output luminance.

Achieving a fully renewable electric energy system requires high investment cost. However, an 80% to 90% renewable system is achieved with significantly reduced investment cost. A comparatively small thermal capacity in a renewable-dominated system allows an efficient integration of renewable production, and maintaining the system reliability.

## III. PRINCIPLE OF OPERATION

### Hybrid Solar Wind Energy System

The structure of the wind-solar complementary sine wave power supply system which consists of photoelectric system, wind power system, controller, discharger, storage battery, and load etc.

We connect solar and wind power sources in parallel to battery. The in between the energy sources and battery we use charging-discharging kit. The working of charging-discharging kit is that the energy generated from two energy sources is connected to charging-discharging kit. The energy generated from two energy sources is connected to that kit as a input. When battery is charging the output terminals of the charging-discharging kit acts as short circuit whereas when battery is fully charged these terminals are open circuit and the current search new path before the output terminals we connect the npn transistor which acts as a short circuit and current is not passed towards the battery.

After the battery we connect the controller kit in this the display is mounted the LDR sensor sense the light intensity which is shown on the display after that LED is connected.

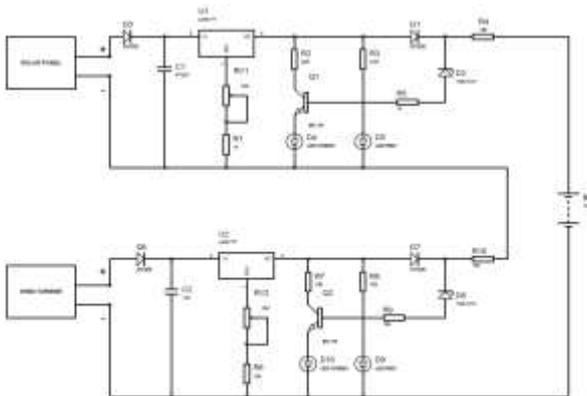


Figure1-Circuit Diagram

## Specification

- 1) Solar Panel =12V,2A
- 2) DC Motor =12V,1.5A
- 3) Battery =12V,7.6Ahr
- 4) DC LED = 76 Watt

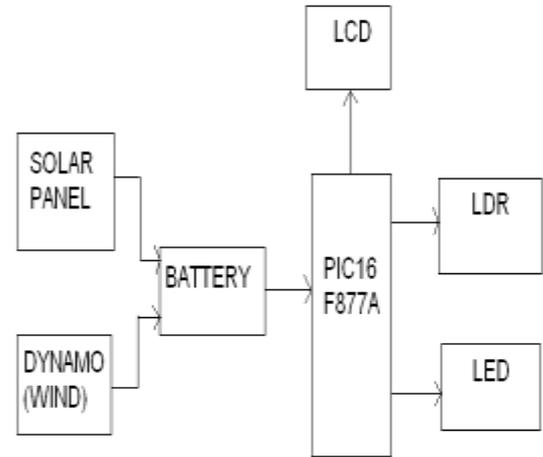


Figure2- Wind-Solar hybrid power generation system

## IV. VERTICAL AXIS WIND TURBINE

Vertical axis wind turbine are advocated as being capable of catching the wind from all direction ,and do not need yaw mechanisms ,rudders or downwind coning .Their electrical generator can be positioned close to the ground , and hence easily accessible. A disadvantage is that some designs are not self- starting.

There have been two distinct types of vertical axis wind turbines: The Darrieus and the savonius types.

New concepts of vertical axis wind machines are being introduced such as the helical type particularly for use in urban environments where they would be considered safer due to their lower rotational speeds avoiding the blade ejection and since they can catch the wind from all direction

## V. ADVANTAGES

1. Overall efficiency of the system increases due to use of hybrid system.
2. Source of energy is available free of cost.
3. Alternative operation of the system for continuous charging of battery.
4. Hybrid system is pollution free.
5. Noise free operation.
6. Conserving the conventional fuel.

## VI. DISADVANTAGES

1. Installation cost is comparatively high.
2. Limitation of storage system
3. System becomes more bulky because of overall Equipment.

## VII. APPLICATIONS

1. Remote area power generation.
2. Street Lightning.
3. In conventional generating sources.
4. Water pumping for irrigation.

## VIII. CONCLUSION

In the present work a Solar PV Wind Hybrid Energy System was implemented. A portion of the energy requirement for highways, farm house, a small company, an educational institution or an apartment house depending on the need at the site where used has been supplied with the electricity generated from the wind and solar power. It reduces the dependence on one single source and has increased the reliability. Hence we could improve the efficiency of the system as compared with their individual mode of generation.

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