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Fabrication of Portable Green Energy Hand Device Charging Station

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Abstract

People usually run out of phone and laptop charging while travelling. At such times there is literally no way of charging your phone laptop in an outdoor environment. Well we hereby solve this problem with a green energy system using a dual power generator solar plus wind energy charging system for mobile phones and laptop.Windmill is an essential product in non-renewable energy sources. When we are going with a windmill, it should produce an optimum output, when we get optimum output it will be cheaper than the conventional sources. So here we have done an efficient wind mill controller which turns to maximum air velocity position. And another two setups where rain water power generation and solar power generation process. Nowadays power demand is more. So this project has developed to generate the electrical power in order to compensate the electric power demand. This project is designed with fan arrangement, solar panel, dynamo, and gear arrangement, turbine, funnel and control unit.

Keywords: Design, fabrication, portable green energy, charging station, mobile laptop.

1. Introduction

Wind result from air in motion. Air in motion arises from a pressure gradient. On a global basis one primary forcing function causing surface winds from the poles toward the equator is convective circulation. Solar radiation heats the air near the equator, and this low density heated air is buoyed up. At the surface it is displaced by cooler more dense higher pressure air flowing from the poles. In the upper atmosphere near the equator the air thus tend to flow back toward the poles and away from the equator. The net result is a global convective circulation with surface wins from north to south in the northern hemisphere.It is clear from the above over simplified model that the wind is basically caused by the solar energy irradiating the earth. This is why wind utilization is considered a part of solar technology.

It actuality the wind is much more complex. The above model ignores the earth's rotation which causes a coriolis force resulting in an easterly wind velocity component in the northern hemisphere.There is the further complication of boundary layer frictional effects between the moving air and the earth's rough surface. Mountains, trees, buildings, and similar obstructions impair stream line air flow. Turbulence results and the wind velocity in a horizontal direction markedly increase with altitude near the surface.

Local winds are caused by two mechanisms. The first is differential hating of land and water. Solar isolation during the day is readily converted to sensible energy of the land surface but is partly absorbed in layers below the water surface and partly consume in evaporating some of that water. The land mass becomes hotter than the water, which causes the air above the land to heat up and become warmer than the air above water. The warmer lighter air above the land rises andthe cooler heavier air above the water moves into replace it. This is the mechanism of shore breezes. At night, the direction of the breezes is reversed because the land mass cools to the sky more rapidly than the water, assuming a sky. The second mechanism of local winds is caused by hills and mountain sides.

The air above the slopes heats up during the day and cools down at night, more rapidly than the air above the low lands. This causes heated air the day to rise along the slopes and relatively cool heavy air to flow down at night.Wind turbines produce rotational motion; wind energy is readily converted into electrical energy by connecting the turbine to an electric generator. The combination of wind turbine and generator is sometimes referred as an aero generator. A step-up transmission is usually required to match the relatively slow speed of the wind rotor to the higher speed of an electric generator.

In Indian the interest in the windmills was shown in the last fifties and early sixties. A part from importing a few from outside, new designs was also developed, but it was not sustained. It is only in the last few years that development work is going on in many institutions. An important reason for this lack of interest in wind energy must be that wind, in India area relatively low and vary appreciably with the seasons. Data quoted by some scientists that for India wind speed value lies between 5 km/hr to 15-20 km/hr. these low and seasonal winds imply a high cost of exploitation of wind energy. Calculations based on the performance of a typical windmill have indicated that a unit of energy derived from a windmill will be at least several times more expensive than energy derivable from electric distribution lines at the standard rates, provided such electrical energy is at all available at the windmill site.The charging station is a portable charging station so that it can be easily moved with an anti-theft feature to prevent any theft or mischief with the charging station. The green energy charging station offers a wide variety of features including:

- Dual power generation solar plus wind energy
- Vertical windmill for all direction wind generation
- 5V DC USB charging ports for mobile phones
- 230V AC socket for all laptop charging
- Inbuilt inverter and charge controlling circuitry
- Select the type of device and charging duration to activate port for charging
- Automatic charge cutoff on charging completion
- Anti-theft feature alert buzzer alarm in case of station robbery/damage attempt.

2. Literature Review

Alireza zendehboudi et.al, this study aims to Conventional fossil fuels are depleting daily due to the growing human population. Previous research has proved that renewable energy sources, especially solar and wind, can be suitable alternative to the conventional energy sources that could satisfy global demand and protect the atmospheric environment.

Ali Mostafaeipour et.al, this paper presents an overview of the status of wind energy productivity and development issues in Iran. It also presents a summary of the present global work on offshore energy, including the most recent works as well as potential offshore wind energy resource in Iran.

Antoni Dmowski et.al, authors have worked for several years on standalone hybrid solar wind turbine power plant for supply telecommunication equipment. The main problem in such installations is how to guarantee power supply all year without interruptions. Weather conditions in Poland provide to breaks in winter and autumn. The paper shows proposition of a new power plant with fuel cell and solar panels.

R. J. Barthelmie et.al,we quantify relationships between wind farm efficiency and wind speed, direction, turbulence and atmospheric stability using power output from the large offshore wind farm at Nysted in Denmark. Wake losses are, as expected, most strongly related to wind speed variations through the turbine thrust coefficient; with direction, atmospheric stability and turbulence as important second order effects.

Binayak Bhandari et.al, several factors must be considered before adopting a full phase power generation system based on renewable energy sources. Long term necessary data (for one year if possible) should be collected before making any decisions concerning implementation of such a systems.

Jaime Fernandez Torres et.al, moving towards a sustainable society implies constant improvement in the way energy is supplied and consumed, with wider implementation of solar and wind energy facilities in stand-alone or hybrid configurations

Kevin Coxa et.al, the structural aspects of a 70 meter long blade in an upwind, horizontal-axis wind turbine were developed in this paper for use in a high wind speed location. A hybrid composite structure using glass and carbon fiber plies was created yielding a light-weight design with a low tip deflection.

Kondracki, Ryan et.al, solar powered charging station is designed so that devices can be charged outdoors and in an environmentally friendly way.

Makbul A.M. Ramli, et.al, in this paper, the potential of solar and wind energy based distribution generation(dg) in Saudi Arabia is simultaneously analyzed with the aim of maximizing the utilization of available resource.

Olly Roy Chowdhury et.al, mobile and other smart devices keep on running all the time anywhere and everywhere, draining its battery. Recharging mobiles need certain time and suitable place. Sudden shutdown of mobile phones due to lack of charge, creates huge embargo for people who is in rush to workplace, market, school, college, office, train and bus station.

Ragunath L et.al, the power demand in our country is increased so that there is a consistent power cut in rural areas. This is because of high power consumption by factories and also due to less availability of non- renewable energy resources

Ramesh Kumar Maskey et.al, several factors must be considered before adopting a full-phase power generation system based on renewable energy sources. Long-term necessary data (for one year if possible) should be collected before making any decisions concerning implementation of such a systems

Saikumar Pattabiraman et.al, the most commonly available and used energy resources are solar and wind. The objective presented here is charging of low power electronic gadgets using the wind energy available during travelling.

Shahab shamshirband et.al, nowadays, learning-based modeling system is adopted to establish an accurate prediction model for renewable energy resources. Computational Intelligence (CI) methods have become significant tools in production and optimization of renewable energies.

Tasneem Saliha et.al, the incorporation of renewable energy sources in the wireless communication network is becoming a more dominant application in Sudan where oil is one of the main sources of electricity.

Udayalakshmi J K et.al, the proposed system can be installed in any public places like market, bus stops and other shopping places or the places where people gather to charge their mobile phones The system is designed in such a way that any mobile phone can be charged.

Wilson R. Nyemba B et.al,they are unreliable due to the sporadic nature of their occurrence, if implemented as standalones. In Zimbabwe, solar street lighting has been implemented since 2014 as a solution to the erratic power supplies and outages.

Yaoyu Li et.al, the state-of-the-art advancement in wind turbine condition monitoring and fault diagnosis for the recent several years is reviewedthe existing surveys on wind turbine condition monitoring cover the literatures up to 2006, this review aims to report the most recent advances in the past three years, with primary focus on gearbox and bearing, rotor and blades, generator and power electronics, as well as system-wise turbine diagnosis.

L. Zhao, et.al, the composition of the solar wind can be used to determine its origin at the Sun. e.g., solar wind from coronal holes has demonstrably lower charge states than solar wind of other origins.

Z.W. Zhong et.al, just as the mobile phone allowed developing countries to leapfrog technology in personal communication. The delivery drone has the potential to have the same effect on traditional transportation infrastructure.

3. Problems Identification

- The output of the solar energy is low while using it separately.
- The output of the Wind energy is low while using it separately.
- The energy output from the respected energy sources are not compactable for the most of devices.
- Most of the devices are require more energy than the energy produced from the wind and solar energy.

4. Objectives

To make the technology environment friendly in case of energy sources. The implementation of both solar energy and wind energy combined in the project.

5. Methodology

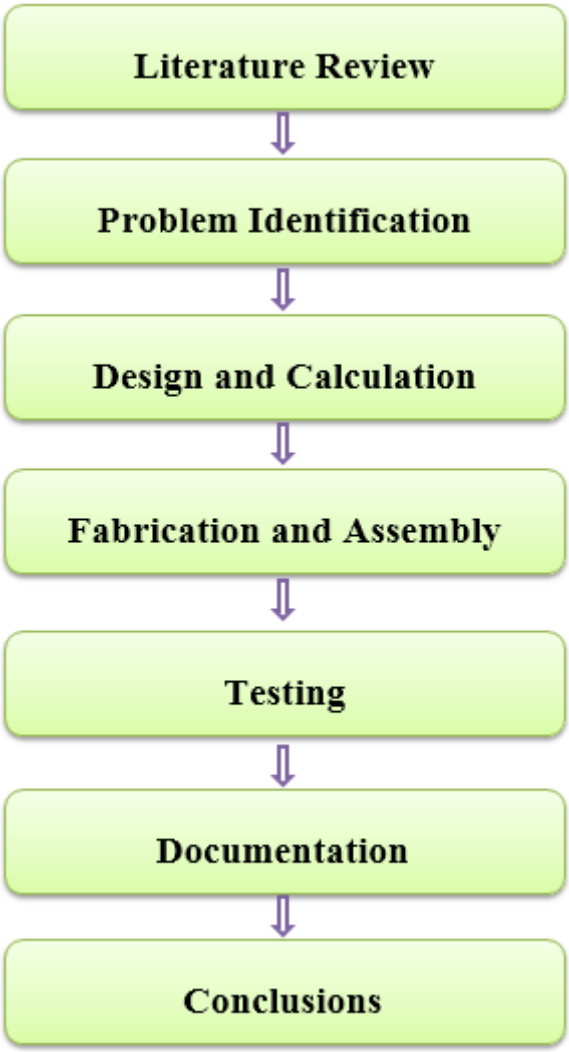

Figure 1. Methodology

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6. Design

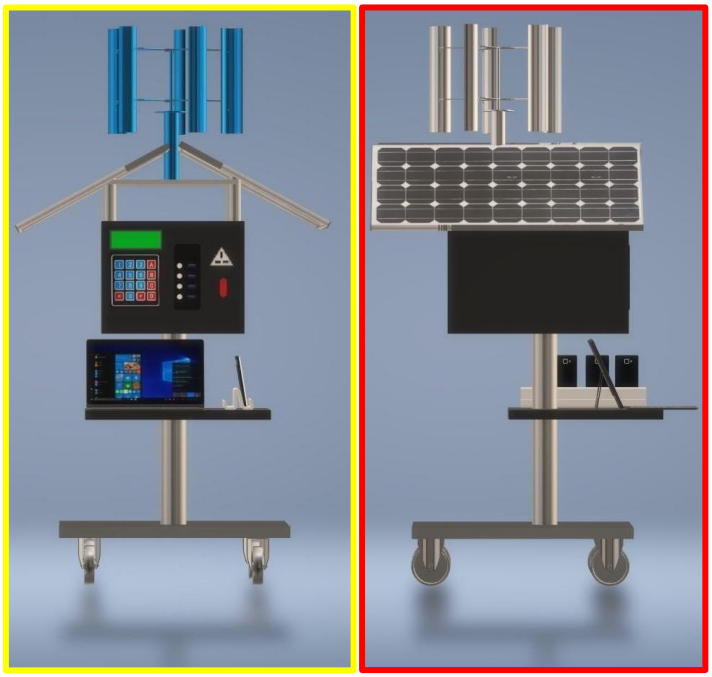

Figure 2. Front and Side View

7. Important Components and Concepts

7.1 Solar Panel

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output - an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module.A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includesa panel or an array of solar modules, an inverter, and sometimes a battery and solar tracker and interconnection wiring.

Figure 3. Solar Panel

7.2 Solar Energy

Solar energy is radiant light and heat from the sun harnessed using a range of ever-evolving technologies such as solar heating, solar photo voltaic, solar thermal energy, solar architecture and artificial photosynthesis.It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on the way they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.Solar energy is very large, inexhaustible source of energy. The power from the sun interrupted by earth is approximately 1.8/10MW, which are many thousands of times larger than the present consumption rate on the earth of allenergy sources. The quantum of energy India's land area receive from sun is equivalent to 15,000 time sits consumption requirement (500 billion kWh) as projected for 2004. In addition to its size, solar energy has two other factors in its favor. Firstly, unlike fossil fuels and nuclear power, it is an environmentally clean source of energy. Secondly, it is free and available in adequate quantities in almost all parts of the world people live. But there are some problems associated with its. The real challenge in utilizing solar energy is of and economic concern. One has to strive for the development of cheaper methods of collection and storage so that large initial investments required at preset in most applications are reduced, solar energy in India.

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Figure 4. Solar Energy

7.3 Photovoltaic Principles

The photo- voltaic effect can be observed in nature in a variety of materials that have shown that the best performance in sunlight is the semiconductors as stated above. When photons from the sun are absorbed in a semiconductor, that create free electrons with higher energies than the created there must be an electric field to induce these higher energy electrons to flow out of the semi- conductor to do useful work. A junction of materials, which have differentelectrical properties, provides the electric field in most solar cells for the photon interaction in semiconductor.

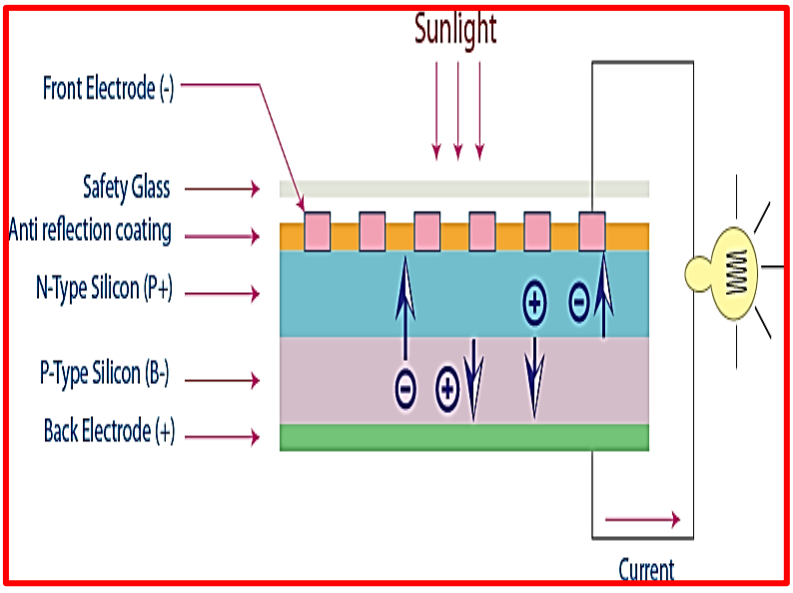

Figure 5. Photovoltaic Principles

Solar photovoltaic cells are essentially semi-conductors, which have electrical transmission properties like metal or salt water and insulators like rubber. Panels are constructed with sheets of doped silicon, primary element in beach sand with impurities added like phosphorus that allows electrons to flow.When the protons from the solar energy hit a photovoltaic cell, a flow of electrons starts which can be drawn off by a pair of wires, thereby creating direct current. A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module. Modules are designed to supply electricity at a certain voltage. The current produced is directly dependent on how much light strikes the module.

A solar cell consists of

- Semiconductor in which electron hole pairs are created by the absorption of incident solar radiation.
- Region containing a drift field for charge separation.
- Charge collecting front and back electrodes.

7.4 Wind Turbine

The rotor of the wind turbine is coupled to the generator shaft with a fixed-ratio gearbox. At any given operating point, this turbine has to be operated basically at constant speed. On the other hand, modern high-power wind turbines in the 2-10 MW range are mainly based on variable speed operation with blade pitch angle control obtained mainly by means of power electronic equipment, although variable generator rotor resistance can also be used. These wind turbines can be mostly developed using either a direct-in-line system built with a direct-driven (without gearbox) PMSG grid-connected via a full-scale power converter, or a doubly-fed induction generator (DFIG) system that consists of a DFIG with a partial-scale power converter connected to the rotor windings. Based on these concepts, the most commonly applied wind turbine designs can be classified into four wind turbine concepts, as described below. This topology corresponds to the constant or fixed speed controlled wind turbine, with asynchronous squirrel cage induction generator (SCIG) directly connected to the electric grid using a step up power transformer, as depicted in Fig. 4. Since the squirrel cage induction generator always draws reactive power from the AC network, this concept requires a reactive power compensator, such as a capacitor bank, in order to reduce or even eliminate the reactive power demand from these turbine generators to the grid. It is typically achieved by continuously switching capacitor banks (5- 25 steps) according to the active power generated. A smoother grid connection occurs by including a soft starter. Regardless the power control principle in a fixed speed machine, the wind fluctuations are converted into mechanical fluctuations and further into electrical power fluctuations. These can cause voltage fluctuations at the point of common coupling (PCC) of the wind turbine to the electric grid when the network is weak. Because of these voltage fluctuations, the fixed speed wind turbine draws fluctuating reactive power from the utility grid (in the case of no use of capacitor bank), which increases both thevoltage fluctuations and the line losses. Fixed speed systems have the advantage of simplicity and low cost; however, the main drawbacks of this concept include the inability of supporting speed control, the requirement of a stiff grid (fixed

voltage and frequency), and the necessity of a robust mechanical structure in order to support the high mechanical stress caused by wind gusts. This topology corresponds to the partial variable speed controlled wind turbine with variable generator rotor resistance, aka OptiSlip by the Danish manufacturer VestasTM Wind Systems (Krüger & Andresen, 2001), as presented in Fig. 5. It uses a wound rotor induction generator (WRIG) and has been used since the mid-nineties.

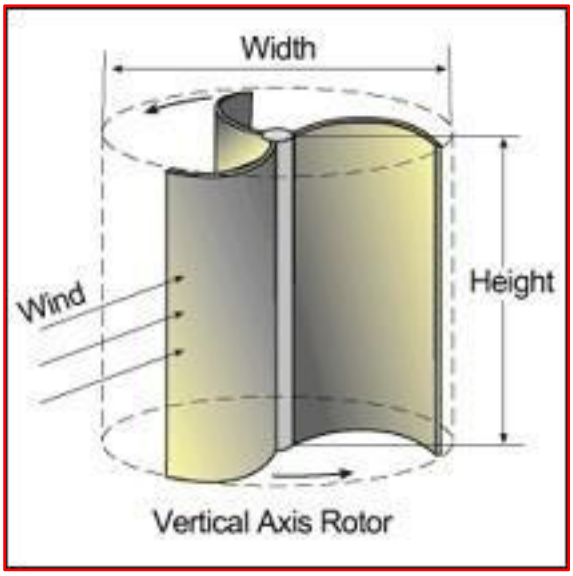

Figure 6. Wind Turbine

8. Conclusions

A strong multidiscipline team with a good engineering base is necessary for the development and refinement of advanced computer programming, editing techniques, diagnostic software, algorithms for the dynamic exchange of informational different levels of hierarchy. Simulation techniques are suitable for solving some of the problems. But a good quantitative model and a test set-up will help to understand the systems. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

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