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Electric Vehicle Charging Station Using Solar Power

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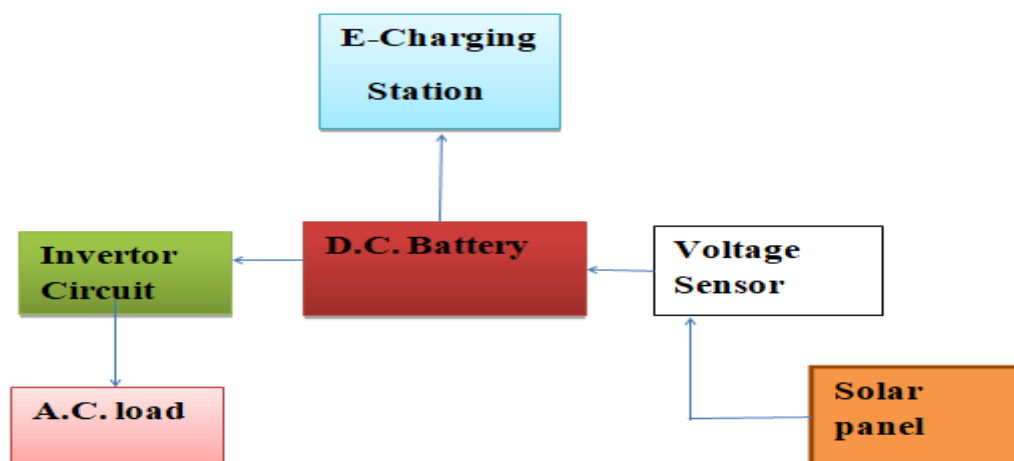
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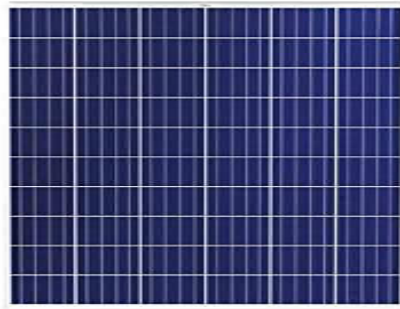
ABSTRACT: The fast depletion of conventional energy resources and the issue of global warming have encouraged researchers worldwide to come up with the best energy solution. Renewable energy resources such as wind and solar energy have been widely adopted as an alternative source of energy. In this work, an integrated solar and wind energy system were implemented aiming to produce the maximum possible output power from the available renewable energy resources such as solar irradiance and wind energy. The proposed system comprised two solar modules and horizontally rotating wind blades. An energy storage system plus a charge controller were also used aiming to improve the overall energy conversion efficiency.

I. INTRODUCTION

The escalated demand on the electrical power has been caused by the dramatic rise of population and city urbanization. This has led to a fast depletion to the conventional energy resources such as fossil fuels. Moreover, this has also risen the event of global warming as an urgent issue to be quickly addressed. Recently, the renewable energy industry of solar and wind in terms of production and demand have grown substantially in the last decade. The current technological advancements have facilitated the optimum utilization of the abundance of renewable energy resources such as solar and wind. Nowadays, the idea of hybrid systems by using solar and wind energy have become common approaches for power generation world widely. Therefore, various studies have been conducted on the dual systems of photovoltaic (PV) integrated with Wind Turbine (WT) aiming to maximize the conversion efficiency and then increase the utilization of renewable energy resources. It is worth to be mentioned that exploiting the green energy resources is not only for producing a clean and reliable electrical power, but it is also more economical than that comes from the conventional ways. However, since solar and wind are unpredictable sources of energy, the use of the hybrid systems approach could provide a better opportunity for a continuous power generation.



Solar Panel :



1. The PV modules must be PID compliant, salt, mist & ammonia resistant and should withstand weather conditions for the project life cycle.
2. The back sheet of PV module shall be minimum of three layers with outer layer (exposure to ambience) and shall be made of PVDF or PVF. The Back sheets for PV Module with 2 layered or 3 layered Polyester types or the back sheets with Polyester (PET type) at Air side material are not permitted for the empanelment; The minimum thickness of the core layers (without adhesive and inner EVA coated) must be 300 microns. The maximum allowed water vapor transmission rate shall be less than 2 g / m² /day and shall have a Partial Discharge > / = 1500V DC
3. The front glass shall meet the following specifications: a. The facing glass must be Tempered, PV grade with Low iron and high transmission. b. The transmission shall be > 93 % c. Thickness shall be min 3.2 mm d. Textured to trap more light. The glass shall have an Anti-reflective coating for the better transmission and light absorption. f. Tempered glass to meet the external load conditions
4. The encapsulant used for the PV modules should be UV resistant in nature. No yellowing of the encapsulant with prolonged exposure shall occur. The sealant used for edge sealing of PV modules shall have excellent moisture ingress Protection with good electrical insulation and with good adhesion strength. Edge tapes for sealing are not allowed.
5. Anodized Aluminium module frames of sufficient thickness shall be used which are electrically & chemically compatible with the structural material used for mounting the modules having provision for earthing.

Battery:



Lead Acid batteries have changed little since the 1880's although improvements in materials and manufacturing methods continue to bring improvements in energy density, life and reliability. All lead acid batteries consist of flat lead plates immersed in a pool of electrolyte. Regular water addition is required for most types of lead acid batteries although low-maintenance types come with excess electrolyte calculated to compensate for water loss during a normal lifetime.

Lead acid batteries used in the RV and Marine Industries usually consist of two 6-volt batteries in series, or a single 12-volt battery. These batteries are constructed of several single cells connected in series each cell produces approximately

2.1 volts. A six-volt battery has three single cells, which when fully charged produce an output voltage of 6.3 volts. A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts.

A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between. The plates are enclosed in a plastic battery case and then submersed in an electrolyte consisting of water and sulfuric acid (see figure # 1). Each cell is capable of storing 2.1 volts.

II. RESULT AND ANALYSIS

The subsection of the results' discussion and analysis is disciplined into three main sections which are started with the generated power outcomes of the proposed system, strength and strain analysis, and then ends with the CFD analysis for effective airflow characteristics around the windmills of the used system.

Details	Initial Power Capacity	Final Power Capacity After Charging					
		10 AM	11 AM	12 AM	1.0 PM	2.0 PM	3.0 PM
Voltage (V)	12.51	12.55	12.56	12.57	12.58	12.60	12.64
Current (I)	1.60	1.60	1.60	1.60	1.61	1.61	1.61
Power	20.02	20.08	20.10	20.11	20.25	20.29	20.35
Percentage of power saved		0.32	0.40	0.48	1.19	1.35	1.67

III. CONCLUSION

This research synopsis has discussed the performance of the dual power generation solar and windmill generator. This dual renewable power generation system was designed and developed. The proposed system comprises of four main ingredients which are solar PV module, horizontally rotating WT, energy storage system, and a microcontroller to control the charging power from the PV-WT system to ESS system. During the conducted experiments, the solar panels worked as the main source of the generated energy while the wind system acted as a secondary source of energy during the solar absent time.

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