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A Review on Hybrid System with Solar Energy

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***Abstract*: As the race for global industrialization begin late in 19th century, the developing technology made humans to depend on energy, so as the energy crisis begins, in this modern era, electricity become a most essential need of human beings, from household to industrial work. So, the purpose of the project is to generate electricity without using non-renewable resource and pollution. This work cover realization of hybrid energy system for multiple applications, which runs under a designed circuitry to utilize the solar energy and a designed circuitry for more efficient results, and inverters to convert the electrical energy as per demand.**

***Keywords*: Solar plate, PIC Controller, Boost Converter, Battery.**

1. Introduction

Hybrid Renewable Energy Systems are becoming popular as stand-alone power systems for providing electricity in remote areas due to advances in renewable energy technologies and subsequent rise in prices of petroleum products. A hybrid energy system, or hybrid power, usually consists of two or more renewable energy sources used together to provide increased system efficiency as well as greater balance in energy supply.

Solar hybrid power systems are hybrid power systems that combine solar power from a photovoltaic system with another power generating energy source. Review of hybrid renewable energy systems focusing on energy sustainability is reported Electricity is most needed for our day to day life. Electricity can be generated using either by using conventional energy sources or by non-conventional energy sources. Non-conventional energy sources are solar power, wind, biogas etc. Conventional energy sources are diesel, coal, nuclear and natural gas etc. The main disadvantage of these conventional energy sources is that they pollute the environment. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this, the combination of two energy resources is reported i.e. wind and solar energy for generation of electricity.

There is no electricity available to the remote areas in many countries. Added advantage of hybrid renewable energy systems is that, it is easy to install and use. The important role of hybrid energy and storage systems in the electrification of remote areas. A system that brings together two sources of energy is called a hybrid system. The concept of having hybrid power stations is not new, but has gained popularity in recent years Hybrid energy stations have proven to be advantageous for decreasing the depletion rate of fossil fuels, as well as supplying energy to remote rural areas without harming the environment

2. Ease of use

A. Solar Panel

Solar panel/PV panel are used to convert the renewable power coming from the sun into electrical energy. The principle of working solar panel is with semiconductors. Since, the whole eco-system on planet earth is dependent on sun energy and it's a huge source of never ending energy. Due to ace of availability, easily interpretation, amount of source and popularity it is preferred for project.

Solar panels are photovoltaic which, generates electrical energy using sun light radiations. Depending on the position and intensity of the sun radiation the amount of electrical DC energy will produced. For the proposed project specifications and design, a 12V, 150 watt off grid solar panel is required. The standard size of the panel, available in the market, 48inch x 22inch x 2inches is most suitable however, other sizes can be considered.

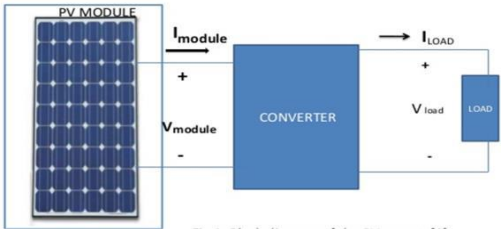

Fig. 1. PV system block diagram

B. Inverter

Inverter is an electronic system, converters direct current into alternating current, i.e. DC into AC. The stored electrical energy in the batteries is DC in nature. And it cannot utilized for various kinds of load. So, for delivering AC supply to the load inverter system is required. Inverter is either analog or digital kind. Digital inverter is microcontroller based which increase the buildup cost of the system also, is uses MOSFET technology providing more efficiency. But, considering the financial aspect and resolution the proposed project designs and

build the inverter analog in nature.

C. Batteries

The electrical energy produced by the system is need to be either utilized completely or stored. Complete utilization of all the energy produced by the system for all the time is not possible. So, it should be store rather than useless wasting it. Electrical batteries are the most relevant, low cost, maximum efficient storage of electrical energy in the form of chemical reaction. Hence, batteries are preferred.

3. Methodology

Table 1
Module sizing for the same load and battery capacity

40Wp panel	80Wp panel	120Wp panel
One panel	Two panels are connected in parallel	Three panels are connected in parallel
I_{sc} 2.5A	I_{sc} 5.0A	I_{sc} 7.5A
Disch.output thro.CFL 12h* 1.25A =15Ah	Disch.output thro.CFL 12h* 1.25A =15Ah	Disch.output thro.CFL 12h* 1.25A =15Ah
avg.current 1.25A for 6hrs =7.5Ah [charge]	avg.current 2.5A for 6hrs= 15Ah[charge]	avg.current 3.75A for 6hrs= 22.5Ah[charge]
Problems: Battery undercharging Negative plate sulphation Bulging of container	Problems: Daily input and output equal. Battery undercharging after sunless days.	Problems: Battery overcharging Water loss Grid corrosion, shedding of active mass

Solar energy is the energy which gets from the radiation of the sun. Solar energy is present on the earth continuously and in abundant manner. Solar energy is freely available. It is affordable in cost. It has low maintenance cost. Only problem with solar system it cannot produce energy in bad weather condition. But it has greater efficiency than other energy sources. It only need initial investment. It has long life span and has lower emission.

Table 2
Load demand profile

Sl. No.	Name of the appliances	Power rating, W	No. of hours used	Load Demand W
1.	CFL lamp	25	10	250
2.	CFL lamp	40	10	400
3.	Television	250	8	2000
4.	Fans	50	19	950
5.	Computer	200	6	1200
6.	Radio	20	3	60
7.	Refrigerator	700	24	16800
8.	A.C.	3.516 k	10	35160
9.	Washing machine	500	2	1000

A. Proposed Calculation

The total power generated by this system may be given as the addition of the power generated by the solar PV panel. Mathematically it can be represented as,

Calculations for solar energy:

To determine the size of PV modules, the required energy consumption must be estimated. Therefore, the power is calculated as,

PS = Ins (t) * AS*Eff(pv)

Where,

Ins (t) = isolation at time t (kw/ m^2)

AS = area of single PV panel (m^2)

Effpv = overall efficiency of the PV panels and dc/dc converters.

The overall efficiency is given by,

Eff(pv)= H * PR

Where,

H = Annual average solar radiation on tilted panels

PR = Performance ratio, coefficient for losses.

B. Cost

The total cost of the solar hybrid energy system is depending upon the total no of solar panels used. Therefore, the total cost is given as follows

Total cost = (No. of Solar Panels * Cost of single Solar Panel) + (No. of Batteries used in Battery Bank * Cost of single Battery)

CT = ((NS * CSP) + (NB * CB)

Where,

CT is the total cost in Rs.

CSP is the cost of single solar panel in Rs.

CB is the Cost of single Battery in Rs.

NS is the number of solar panels used

NB is the number of Batteries used in Battery Bank.

4. Observations and discussion

We have done survey of Solar PV and vertical axis maglev windmills monitor its daytime response. The output voltage of these sources measured from 10.00 A.M. to 8.00 P.M. for period of four days. The rating of Solar PV systems is 600W. Total four panels are used. Each panel is 150W with open circuit voltage 22.47Vdc, short circuit current 8.90A and efficiency of 14.91%. It was observe that output from solar PV is almost constant (~20V_{dc}) in active working period i.e.10.00 A.M. to 5.00 P.M. and it slowly decreases towards 0Vdc from 7.00 PM onwards. So, maximum power generation is possible within active working period using Solar PV while wind power is quite analogous in nature. It may be available for 24 hours depending upon sufficient amount of sun light.

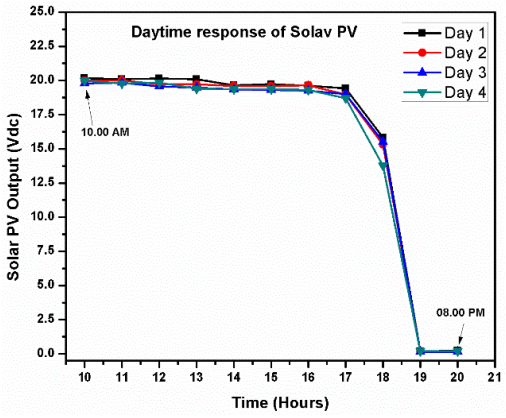

Fig. 2. Daytime response of Solar PV panel as a function of output voltage

5. Conclusion

The paper presents a feasibility study of hybrid renewable energy generation based on Solar PV system. Here we have discussed work reported on hybrid renewable energy systems and their associated controls based on the survey of available literature. Because the peak operating times for solar systems occur at different times of the day and year, hybrid systems are more likely to produce power when you need it. According to many renewable energy experts, a l "hybrid" electric system that combines solar PV (photovoltaic) technologies offers several advantages over either single system. Added advantage of hybrid system is that they produce clean energy. Thus hybrid energy systems will meet the need of alternate energy sources in most effective, efficient and economical means.

6. Future scope

In this proposed we has use hybrid system to operate load. That hybrid system is solar panel & AC main supply. But, when next situation is occurs, i.e. when solar panel & AC main supply is off that time we can operate the load by using wind energy.

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