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Hybrid Power Generation System by Using Wind and Solar Energy

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Abstract:
The main moto of this paper is to generate electricity power in economic and environmental way as these days power crises is becoming more problem ,so in this project power generation is done by using two renewable sources "solar & wind" energy. Now-a-days environmentally friendly solutions are becoming more prominent than ever as a result of concern regarding the state of our deteriorating planet. With increasing concern of global warming and the depletion of fossil fuel reserves many more looking sustainable energy solutions to preserve the earth for the future generations .other than hydro power. Wind and photovoltaic energy holds the most potential to meet our energy demands. This paper presents a new system configuration of frond end rectifier stage for hybrid wind/solar energy system. This configuration allows the two sources to supply the load separately or simultaneously depending on the availability of the energy sources.

I. INTRODUCTION:

Power can be generated in many ways as we know by using coal,fossils etc. we can generate power but by this way global warming is increased and there will be crises in these non-renewable sources.so by using solar and wind energy we can generate power as we all know this process,where this process includes more economical and high maintenance and wind turbine can't be installed in every place to install this its costs more and high skilled labor are required, but the method we introduced in this project is more economical and easily maintenance. The solar installation in rugged areas (villages) are not much and not familiar to users in those places.

Such that by keeping this point in mind, easily usable and easily maintenance method should be given to them. And solar and wind are not available in every place and they are not available at same time such that both power generation methods are installed in this paper. The consumption of fossil fuels effects the environment and may cause negative impact on environment. Powers are mainly delivered by fossil combustion. So we can use two renewable sources wind power and solar power, both these are available worldwide and no impact on environment these are more use full in villages and rural areas hybrid system of power generation.

The hybrid system involves in two ways of generating power , as we discussed earlier solar and wind are easily available resources ,by combining these two at one point more power can be generated the solar power which is received by sun light is used to run the gear box which has been fixed and this gear box increases the torque and runs the dc motor which act as generator (not generator) the dc motor has the permanent magnet inside when the magnet rotates the emf is developed the output is which is produced by dc motor is given as input to rectifier box .the main work of rectifier box is to create one way path of electrons as the output given by the dc motor is in dc current the rectifier box will create it in to one way path and given to load and remaining current is stored in battery.

The both methods which we know to generate power is combined together with perfect connections according to design. The wind section and solar section is designed in a way that both will combines together.

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We need to calculate the load we required and arrange the solar panel according to required capacity, which it can be generate,in the same way wind gears and motors are arranged according to our requirements.

II. GENERATION OF POWER FROM WIND SYSTEM

Requirements

- wind
- blades
- transformers
- generators

Wind energy:

The general way of producing electricity through wind turbine is the kinetic energy in the wind will used to rotate the wind blades these blades have high torque which leads to generate high power even when blades rotate in low speed this connected to inside magnet ,will rotate and develops current there is step up transformer inside this will increase current the current generated is sent to substations and again step up process is done and from the substations power is distributed to villages This involves in high process and more investment, and these are installed at high hill places and a generator is required to maintain constant emf.And inverter is required to convert dc to ac current.

The required wind velocity minimum is 6.5 m/s and maximum is 16.3m/s The blades are arranged in angle of 40 -60 degrees. Where anemometer is used to find wind velocity The wind resources was mainly on experimental data with thirty meter tower with anemometer the average wind speed shows the value of 4.5 m/s another important data to evaluate the wind potential is the rate of the registered wind speed with the final purpose of getting estimated wind energy according to heights it's been calculated by roughness factor.

III. GENERATION OF POWER FROM SOLARSYSTEM

Requirements:

- solar panels
- inverters
- net meter
- solar energy (sun light*)

Solar energy:

The solar power is arguably the cleanest, most reliable form of renewable energy available, and it can be used in several forms to help power your home or business. Solar-powered photovoltaic (PV) panels convert the sun's rays into electricity by exciting electrons in silicon cells using the photons of light from the sun. This electricity can then be used to supply renewable energy to your home or business.

In most **solar systems**, **solar panels** are placed on the roof. An ideal site will have no shade on the panels, especially during the prime sunlight hours of 9 a.m. to 3 p.m.; a south-facing installation will usually provide the optimum potential for your system, but other orientations may provide sufficient production. Trees or other factors that cause shading during the day will cause significant decreases to power production. The importance of shading and efficiency cannot be overstated.

In a solar panel, if even just one of its 36 cells is shaded, power production will be reduced by more than half. Experienced installation contractors such as now wind & solar use a device called a solar pathfinder to carefully identify potential areas of shading prior to installation. Not every roof has the correct orientation or angle of inclination to take advantage of the sun's energy. Some systems are designed with pivoting panels that track the sun in its journey across the sky. Non-tracking pv systems should be inclined at an angle equal to the site's latitude to absorb the maximum amount of energy year-round. Alternate orientations and/or inclinations may be used to optimize energy production for particular times of day or for specific seasons of the year.

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Solar panels:

Solar panels, also known as modules, contain photovoltaic cells made from silicon that transform incoming sunlight into electricity rather than heat. Solar photovoltaic cells consist of a positive and a negative film of silicon placed under a thin slice of glass. As the photons of the sunlight beat down upon these cells, they knock the electrons off the silicon. The negatively-charged free electrons are preferentially attracted to one side of the silicon cell, which creates an electric voltage that can be collected and channeled. This current is gathered by wiring the individual solar panels together in series to form a solar photovoltaic array. Depending on the size of the installation, multiple strings of solar photovoltaic array cables terminate in one electrical box, called a fused array combiner. Contained within the combiner box are fuses designed to protect the individual module cables, as well as the connections that deliver power to the inverter. the electricity produced at this stage is dc (direct current) and must be converted to ac (alternating current) suitable for use in your home or business.

IV. INVERTER:

The inverter is typically located in an accessible location, as close as practical to the modules. in a residential application, the inverter is often mounted to the exterior sidewall of the home near the electrical main or sub panels. Since inverters make a slight noise, this should be taken into consideration when selecting the location. The inverter turns the dc electricity generated by the solar panels into 120-volt ac that can be put to immediate use by connecting the inverter directly to a dedicated circuit breaker in the electrical panel. Dis advantages of normal wind & solar power generation These are the normally used systems and procedure and succeeded today but this cost more and high maintenance where normal people cannot install and wind turbines are big projects these are only done by government. Where normal people cannot install and to maintain this wind turbine high cost and big technicians are required.

Where installation of solar panels required inverters and etc.it costs more

Process followed by us to generate power through solar power

Equipment's

- Solar panel of 1.2 Amph
- Gear box of 1000:10 ratio
- DC motor
- Rectifier box

Sun activation:

Photons bombard and penetrate the cell. They activate electrons, knocking them loose in both silicon layers. Some electrons in the bottom layer sling-shot to the top of the cell. These electrons flow into metal contacts as electricity, moving into a circuit throughout a 60-cell module. Electrons flow back into the cell via a solid contact layer at the bottom, creating a closed loop or circuit. Powering homes with solar Current leaving a module or array of modules, passes through a wire conduit leading to an inverter this device, about the shape of a waffle iron, inverts direct current, which flows with a fixed current and voltage, into alternating current, which flows with oscillating current and voltage. Appliances worldwide operate on ac. from the inverter, the solar-generated power feeds into circuitry of a household, business or power plant and onto the region's electrical grid. A remote, or independent, power system also can form a self-contained circuit without connecting to the grid. The off-grid system, however, requires batteries to store power for times, such as night, when modules do not capture enough light energy from the sun.

V. GRID CONNECTED SOLAR SYSTEMS

Full wave rectifier

This method is suitable for low power applications it is unstable to applications which need a steady and smooth dc supply voltage. One method to improve on this is to use half cycle of the input voltage instead of every other half-cycle the circuit which allows us to do this is called a full wave rectifier. Like a half wave circuit, a full wave rectifier circuit produces an output voltage or current which is purely dc or has some

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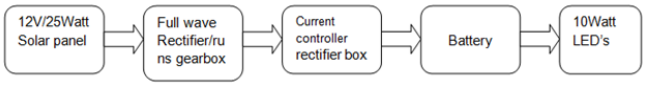
specified dc component. Full wave rectifiers have some fundamental advantages over their half wave rectifier counterparts. The average (dc) output voltage is higher than for half wave, the output of the full wave rectifier has much less ripple than that of the half wave rectifier producing a smoother output waveform. the full wave rectifier circuit consists of two power diodes connected to a single load resistance with each diode taking it in turn to supply current to the load .when point a of the transformer is positive with respect to point c diode d conducts in the forward direction as indicated by the arrows. the power received from the sunlight is about 1.2 ams that will take as output and act as fuel to run the gear box of ratio 1000:10 where the torque increase form high speed The high speed gear will become high torque is used to run the dc motor which has the permanent magnet will develop emf in side that will generate power. The dc motor here act as generator but no additional fuel is need to run the dc motor except gear box

Fig 1: Wind power representation

Solar section:



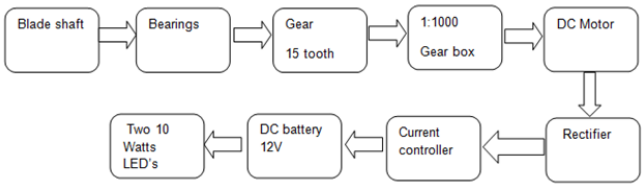
As till now we got to know about gear box and dc motor the power developed at the dc motor is given as in put to the rectifier box the solar power rectifier box has 2 diodes the main work of rectifier box is to create single path flow of electrons (one way path). The rectifier box will receive dc current and creates it to ac and given to loads in this project proto type we have arranged an output supply to rectifier box where remaining current will be saved in to battery.

As in this way power is generated in solar hybrid system by using mechanical components.By installing mechanical components like dc motor and gear boxes we are increasing output by 10x by eliminating inverters etc, as torque increase the dc output will also increase.

Fig 2: Rectifier

Fig 3: Prototype of hybrid power generation system

Wind section



VI. WORKING PROCEDURE:

the process is started by assuming the wind velocity of 6.2 kmph, where the two bearings which is used to rotate wind blades and another bearing is worked as anemometer that turns wind blades into wind direction. After the arranging of bearings we arrange 15 teeth gear to the end of wind bearing, this will attached to 3 dc gear motors each has capacity of generate 6volts and rotates at speed of 1000 rpm when wind velocity is high.

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Work of rectifier in prototype in this rectifier box two connection are given to the box as this is hybrid power generation at same time two powers are available, to control those flow of current the rectifier box has two different types of diodes one for solar and another for wind both are included in one but works in two different ways As solar generates current in single way so that only two diodes are required for solar it makes the electrons to flow in one direction. and wind can generate in two directions as blades (i.e. wind blades) can be rotates in any way clock wise or anti clock wise so power which is generate will flow in two ways this leads to return emf so to overcome that problem rectifier is used,the rectifier section for wind section has 4 diodes which act as bridge rectifier it makes electrons to flow in one direction even when blades rotates in clock wise or anti clock wise direction.

Fig 4: Rectifier box for prototype model

VII. CONCLUSION:

The conclusion goes in two ways one for solar another for wind as we know the general process of solar generation involves more investment and wind turbine can't be installed on homes, so to overcome such problem this method was introduced. In this method by eliminating electrical components like generator, transformer in wind section half of the amount is reduced on investment and both solar and wind powers are not available at same time in every place, In the solar section by replacing electrical components like inverters with mechanical components like gearbox and dc motor the power generating is increased to 10times. The main motto of this paper is to generate electricity in simple way, which can also be used by rural people.

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