POWER GENERATION SYSTEM USING WIND AND SOLAR ENERGY

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Abstract: 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 takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost.

Index Terms: Electricity, solar, power, wind, Cost

I. INTRODUCTION

Electrical energy demand increases in word so to fulfill demand we have to generate electrical energy. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel, and nuclear etc. The main drawback of these sources is that it produces waste like ash in coal power plant, nuclear waste in nuclear power plant and taking care of this wastage issystem." Hybrid energy system has good reliability, efficiency, less emission, and lower cost.In this proposed system solar and wind power is used for generating power. Solar and wind has good advantages than other than any other non-conventional energy sources. Both the energy sources have greater availability in all areas. It needs lower cost. There is no need to find special location to install this system.

II. HYBRID ENERGY SYSTEM

Hybrid energy system is the combination of two energy sources for giving power to the load. In other word it can defined as "Energy system which is fabricated or designed to extract power by using two energy sources is called as the hybrid energy

A. Solar Energy

Solar energy is that energy which is gets by the radiation of the sun. Solar energy is present on the earth continuously and in abundant manner. Solar energy is freely available. It doesn't produce any gases that mean it is pollution free. 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.

B. Wind Energy

Wind energy is the energy which is extracted from wind. For extraction we use wind mill. Ii is renewable energy sources.

The wind energy needs less cost for generation of electricity. Maintenance cost is also less for wind energy system. Wind energy is present almost 24 hours of the day. It has less emission. Initial cost is also less of the system. Generation of electricity from wind is depend upon the speed of wind flowing.The major disadvantages of using independent renewable energy resources are that unavailability of power for all time. For overcoming this we use solar and wind energy together. So that any one source of power fails other will take care of the generation. In this proposed system we can use both sources combine. Another way is that we can use any one source and keep another source as a stand by unit. This will leads to continuity of generation. This will make system reliable. The main disadvantages of this system are that it needs high initial cost. Except that it is reliable, it has less emission. Maintance cost is less. Life span of this system is more. Efficiency is more.

III. DESIGN OF HYBRID ENERGY SYSTEM

For desing of the hybrid energy system we need to find the data as follows

A. Data required for Solar System:

- Annual mean daily duration of Sunshine hours
- Daily Solar Radiation horizontal (KWH/m2/day)

B. Data required for Wind System:

- Mean Annual Hourly Wind Speed (m/sec)
- Wind Power that can be generated from the wind turbine

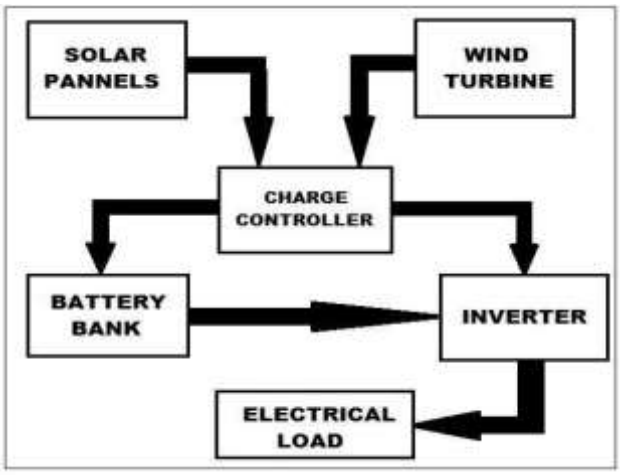

Fig. Block diagram of Hybrid energy generation system

Above figure shows the block diagram of the hybrid power generation system using wind and solar power. This block diagram includes following blocks.

- Solar panel
- Wind turbine
- Charge controller
- Battery bank
- Inverter

Solar panel

The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electron-proton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. Solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage.

Wind turbine

Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating.

Charge controller

It simultaneously charge battery and also gives power to the load. The controller has over-charge protection, short-circuit protection, pole confusion protection and automatic dump-load function. It also the function is that it should vary the power as per the load demand. It add the both the power so that the load demand can fulfill.

Battery Bank

We have to choose battery bank size per the load requirement so that it should fulfill the requirement of load for calculating the battery bank size we need to find following data

1. Find total daily use in watt-hour (Wh).
2. Find total back up time of the battery

For increase in battery bank size we need to connect cell in series so that we can get the larger battery bank size.

Inverter

The pure sign wave inverter is recommended in other to prolong the lifespan of the inverter. Inverter is need to convert DC power into AC power. As our load working on the AC supply so we need to convert DC power. The input voltage Output voltage and frequency, and overall power handling depends on the design of the specific device or the circuitry. The inverter does not produce any power. The power is provided by the DC source.

IV. PROPOSED CALCULATION

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.

Mathematically it can be represented as,

$P_T = N_W * P_w + N_s * P_S$

Where,

P_T is the total power generated

P_W is the power generated by wind turbines P_S is the power generated by solar panels N_W is the no of wind turbine

N_s is the no of solar panels used

A.Calculations for wind energy

The power generated by wind energy is given by, Power = (density of air * swept area * velocity cubed)/2

$P_W = ½. \rho (A_W) (V)^3$

Where,

P is power in watts (W)

ρ is the air density in kilograms per cubic meter (kg/m³)

A_W is the swept area by air in square meters (m²) V is the wind speed in meters per second (m/s).

B.Calculations for solar energy

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

$P_S = Ins (t) * A_S * Eff(pv)$

Where,

Ins (t) = isolation at time t (kw/ m^2) A_S = area of single PV panel (m^2)

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

Overall efficiency is given by,

Eff(pv)= H * PR

Where,

H = Annual average solar radiation on tilted panels. PR = Performance ratio, coefficient for losses.

C.Cost

The total cost of the solar-wind hybrid energy system is depend upon the total no of wind turbines used and total no of solar panels used. Therefore the total cost is given as follows

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

$C_T = (N_W * C_{WT}) + (N_S * C_{SP}) + (N_B * C_B)$

Where,

C_T is the total cost in Rs

C_{WT} is the cost of single wind turbine in Rs C_{SP} is the cost of single solar panel in Rs C_B is the Cost of single Battery in Rs

N_W is the number of wind turbine used N_S is the number of solar panels used

N_B is the number of Batteries used in Battery Bank.

Solar-wind hybrid energy systems needs only initial investment. It will compete well in generation with the conventional energy sources. When accounted for a lifetime of reduced or avoided utility costs. The cost of the system depends on the system chosen, wind resource on the site, electric costs in the area, and the battery bank required. Cost of the Wind-Solar Hybrid system is to be minimized. For minimize the cost of the system we need to increase the use of non conventional energy sources. So that production of solar and wind power generator will be increase. That will reduce cost of the whole system.

V. CONCLUSION

Power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. It only need initial investment. It has also long life span. Overall it good, reliable and affordable solution for electricity generation.

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