

# Dc House: An Alternate Solution for Rural Electrification

Preeti Pawar Patil, Rutuja Kole Patil, Nikita Patil

Student, KITCOEK, Kolhapur, Maharashtra, India

**How to cite this paper:** Preeti Pawar Patil | Rutuja Kole Patil | Nikita Patil "Dc House: An Alternate Solution for Rural Electrification" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-4, June 2019, pp.4-7, URL: <https://www.ijtsrd.com/papers/ijtsrd23279.pdf>



Copyright © 2019 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



## INTRODUCTION

Electricity is most needed for our day to day life. There are two ways of electricity generation either by conventional energy resources or by non-conventional energy resources. 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 is very costly.

And it also damages he nature. The nuclear waste is very harmful to human being also. The conventional energy resources are depleting day by day.

Soon it will be completely vanishes from the earth so we have to find another way to generate electricity. The new source should be reliable, pollution free and economical. The non-conventional energy resources should be good alternative energy resources for the conventional energy resources. There are many non-conventional energy resources like geothermal, tidal, wind; solar etc. the tidal energy has drawbacks like it can only implemented on sea shores. While geothermal energy needs very lager step to extract heat from earth. Solar and wind are easily available in all condition. The non-conventional energy resources like

## ABSTRACT

In today's date, India is a large consumer of fossil fuel such as coal, crude oil etc. The rapid increase in use of Non renewable energies such as fossil fuel, oil, natural gas has created problems of demand & supply. Because of which, the future of Non renewable energies is becoming uncertain.

Now a day's electricity is most needed facility for the human being. 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. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

**Keywords:** Solar, wind turbine, Dynamo, electricity

solar, wind can be good alternative source. Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the electricity.

And in good weather condition we can use both sources combine.

## Current Scenario of Conventional Energy Sources in India-

At present India is a large consumer of fossil fuel such as coal, crude oil etc. Over a past few decades, energy is needed for everything. The electricity requirement is increasing at an alarming rate due to increased population & industrial growth. This rapid increase in use of energy has created problems of demand & supply.

Because of which, the future of Non renewable energies is becoming uncertain. India ranks sixth in the world in total energy consumption.

Coming to power generation in the country, India has increased installed power capacity from 1362MW to over 112,058MW since independence & electrified more than 50,000 villages. This achievement is impressive but not sufficient. It is matter of concern that 44% of households do not have access to the electricity & as many as 80,000 villages are yet to be electrified.

### HYBRID SYSTEM

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

### SOLAR SYSTEM



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.

### WIND POWER SYSTEM



Wind energy is the energy which is extracted from wind. For extract we use wind mill. It 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.

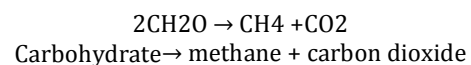
### HUMAN POWER USING BICYCLE MECHANISM

The main goal was to develop a simple and modular system that can be used at home without special mechanical or electrical skills. The basic idea is to connect a bicycle to a static system capable of transforming the rotation of the paddle into electric energy.

- This system is consist:
  - A. Mechanical Block - has the role to transfer the rotational movement of paddle and adapt it to the generator requirement.
  - B. Electrical Block - has the role to convert energy provided by mechanical block into electrical energy.

### POWER GENERATION USING BIOGAS

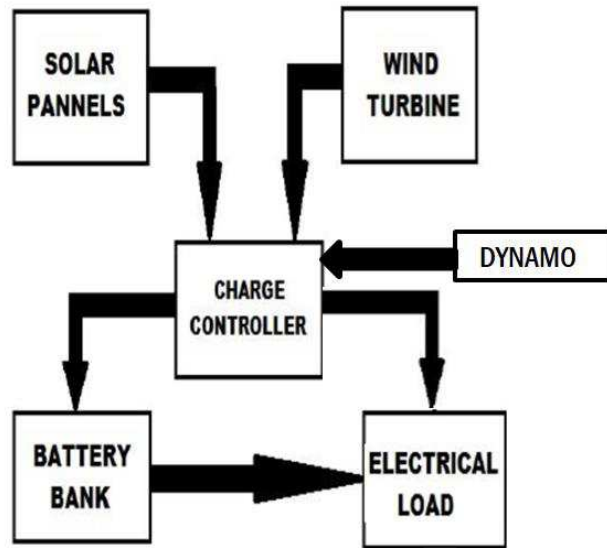
Energy generated from biogas can complete economically with conventional electricity generating systems in the most remote areas. Biogas is produced by the fermentation of organic matter including manure, sewage sludge and municipal solid waste, under anaerobic conditions. Biogas is gas combustible mixture consisting of methane and carbon dioxide together with several impurities.



### Biogas to energy

Biogas is a promising renewable source of energy. It can be directly converted into electrical power, e.g., in a fuel cell. It can be burnt, releasing heat at high temperature. It can be burnt in a CHP for the simultaneous production of heat and power. Finally, it can be fed into the natural gas network for energy saving purposes or it can serve as fuel for vehicles, being distributed by gas stations.

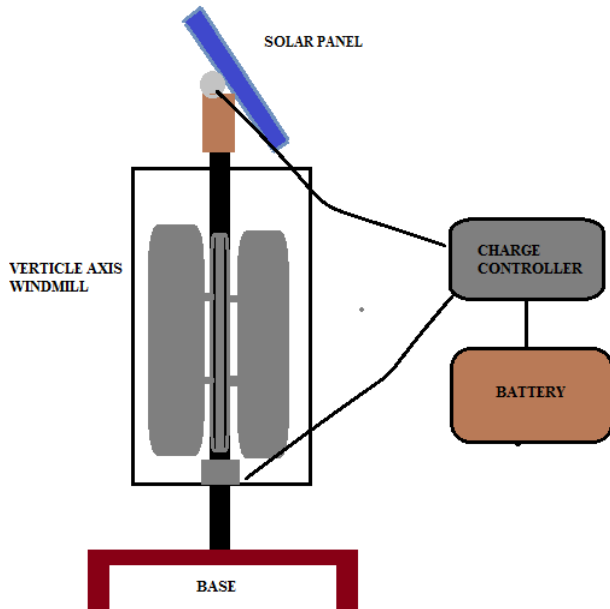
**BLOCK DIAGRAM**



**COMPONENTS OF SYSTEM**

1. Solar Panel
2. Wind turbine
3. Dynamo
4. Charge Controller
5. Battery Bank

**CONCEPTUAL DIAGRAM**



**1. Solar Pannel**

Solar panel is use to convert solar radiation to the electrical energy. The physical of FV 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 seriesparallel combination to generate the required current and voltage. Solar panels are the medium to convert solar power into the electrical power.

**> Calculation of solar photovoltaic power and energy.**

**Principle:** The principle of solar photovoltaic is to convert solar energy of light (photons) into electricity. When photons heat special materials they create a displacement of electrons that generate a continuous current. Solar cells are connected in series to form photovoltaic panels that are connected together to crate a PV generator. This generator can be connected to an inverter to transform continuous current in alternative current 3-phase or single phase and connected to the grid or to a storage system.

The global formula to estimate the electricity generated in output of a photovoltaic system is :

$$E = A * r * H * PR$$

- E = Energy (kWh)
- A = Total solar panel Area (m2)
- R = solar panel yield or efficiency(%)
- H = Annual average solar radiation on tilted panels (shadings not included)
- PR = Performance ratio, coefficient for losses (range between 0.5 and 0.9, default value = 0.75)

**2. 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. For obtain the non-fluctuating power we have to store in battery and then provide it to the load.

**> Power calculations**

The wind turbine works on the principle of converting kinetic energy of the wind to mechanical energy. The kinetic energy of any particle is equal to one half its mass times the square of its velocity,

$$K.E = \frac{1}{2}mv^2$$

Where,  
 K.E = kinetic energy m = mass  
 v = velocity,

M is equal to its Volume multiplied by its density ρ of air ( M = ρAV)

We get,  
 $K E = \frac{1}{2}\rho AV.V^2$   
 $K E = \frac{1}{2}\rho AV^3watts.$

Where,  
 A = swept area of turbine.  
 P = density of air (1.225kg/m<sup>3</sup>)V=windvelocity.

For 35 Watt power, calculate design parameters of turbine, P=35 watts.

Considering turbine efficiency as 25% and generator efficiency 85%, P = 35/ (0.25\*0.85)

$$P= 166 watts. = \frac{1}{2}\rho AV^3$$

For wind velocity 6.67 m/s (18mph) Density of air (1.225 kg/m<sup>3</sup>)

$$166 = \frac{1}{2} * 1.125 * A * (6.67)^3 \quad A = 1 \text{ Sq.m}$$

$$A = D * H \text{ (Sq.m)}$$

$$D = \text{diameter of the blade}$$

### 3. Dynamo

The Pedal Operated Power Generator which uses dynamo is a type of generators in which the source of mechanical power is provided by the human effort while spinning a shaft, with its corresponding angular speed and torque. Usually, a sort of mechanical transmission system is needed to adapt these variables into the generator's required ones. Then, this mechanical power is turned into electric power by the generator. The basic physics of power generation and transmission indicates that high speed and low torque are more efficient to create than low speed and high torque. Dynamos are inherently current-limited. The current limit is because the permanent magnet has a fixed magnetic strength this places a limit on the current it can induce in the dynamo windings. There is no voltage limit, the faster you ride the more open-circuit voltage the dynamo will provide. To get more power out use a higher resistance (and ride faster) maximum output will be by matching the dynamo resistance and riding at extreme speed, maximum practical output will likely be somewhat lower.

### 4. Charge controller

Charge controller has basic function is that it control the source which is to be active or inactive. 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. And when power is not generating it should extract power from battery and give it to the load.

### 5. Battery

Batteries store electrical energy produced by RE resource in a reversible chemical reaction. Most batteries employed in

RE systems use the lead-acid batteries typically encased in plastic and wired together in series and parallel strings by the installer. However, batteries do not belong inside the living space due to the dangerous chemicals in them and hydrogen and oxygen gas put out while being charged. Battery capacity is rated in amp-hours, which 1 amp-hour is the equivalent of drawing 1 amp steadily for one hour. A typical 12-volt system may have 800 amp-hours of battery capacity. This is the equivalent of 1,200 watts for eight hours if fully discharged and starting from a fully charged state. There are many brands and types of batteries available for RE systems and the two most common batteries are the L-16 and golf cart sizes.

### CONCLUSION

Obviously, a complete hybrid power system of this nature may be too expensive and too labor intensive for many Industrial Technology Departments. However, many of the same benefits could be gleaned from having some subset of the system, for example a PV panel, batteries, and an inverter, or even just a PV panel and a DC motor. The enhancements to instruction, especially in making electrical power measurements more physical, intuitive, and real world are substantial and the costs and labor involved in some adaptation of the ideas in this paper to a smaller scale setup are reasonable.

### REFERENCES

- [1] IEEE Papers on:
- Electricity generation using solar.
  - Human power using bicycle Mechanism
  - Power generation using biogas: Application to rural areas / Industries. –
  - Self electricity generation and energy saving by solar using Programmable system on chip (PSOC).
- [2] Renewable energy source: Policies of India.
- [www.livemint.com](http://www.livemint.com)
  - [wikipedia.org](http://wikipedia.org)
  - [www.reasechgate.net](http://www.reasechgate.net)