# Hybrid Energy Generation For Residential Society

**Rani Borkar, Nagma Rafique , Prafulla Tagade, Mayuri Gadekar, Prof Ishraque Ahmad**

Electrical Engineering, RTMNU/ACET/, Nagpur, Maharashtra, India

## ABSTRACT

Renewable Energy is the energy that comes from natural resources such as sunlight, wind, rain, tides, waves and geothermal heat which are continually replenished. Hybrid power generation model mainly focuses on the renewable energy resources. Hybrid power system model is mainly to meet the increasing energy demand through nonconventional energy sources. In our proposed hybrid model Solar, Wind and tap water has been planned to use to generate electricity. This configuration allows the three sources to supply the load separately or simultaneously depending on the availability of energy resources. The objectives of the present study are to convert the solar, wind and tap water into electricity and to optimize the energy requirement using these nonconventional energy resources. It reduces the environmental pollution using clean or environmental friendly technology and creates awareness among people regarding renewable energy.

Keywords :  Solar Panel, Hydro Generator, Wind Turbine, MPPT Charge controller, Relay Module,  Wi-Fi module

## I.  INTRODUCTION

Renewable Energy is the energy that comes from natural sources such as sunlight, wind, rain, tides, waves and geothermal heat which are continually replenished.  Hybrid power generation model mainly focus on the renewable energy sources.  Hybrid power system model is mainly to meet the increasing energy demand through nonconventional energy sources.  In our proposed hybrid model Solar, Wind and hydro has been planned to use to generate electricity.

This configuration allows the three sources to supply the load separately or simultaneously depending on the availability of energy sources.

Energy is one of the most fundamental elements of our Universe and vital for the progress of any nation.

It is inevitability for survival and indispensable for development activities to promote education, health, transportation and infrastructure for attaining a reasonable standard of living and is also a critical factor for economic development and employment.

It is an ultimate factor responsible for development of agriculture and industrial in a country like India. Power consumption is steadily increasing for past few years. Power utilities in many countries around the world are diverting their attention towards more energy efficient and renewable electric power sources.

Generation of power through any *standalone* energy system cannot meet the requirements. So there is a need to correlate different types of energy systems to supply the economical and reliable power. Such generating system is known as '*Hybrid Power Systems*
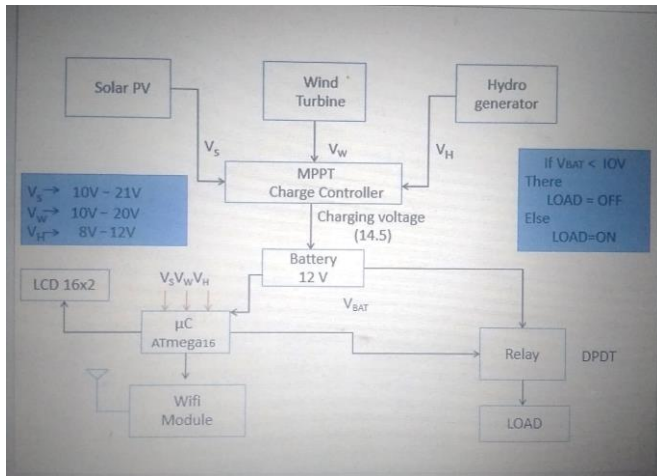
## II. METHODOLOGY

### Block Diagram



**Figure 1.** Block Diagram of Hybrid Energy Generation

### A. Solar Panel

Solar panels are the medium to convert solar energy into the electrical energy. Solar power is converted into the electric power by a common principle called photo electric effect. Solar panels installed on the rooftops absorb Sun's light from the Sun. The silicon and the conductors in the panel convert the sun light into Direct Current electricity which then flow into the inverter. The inverter then convert DC to AC electrical power which you can used at your home.



Figure 2. Solar Panel

### B. Hydroelectric Generator

The hydraulic turbine converts the energy of flowing water into mechanical energy. The hydroelectric generator convert this mechanical energy into electricity. The operation of a generator is based on the principles discovered by Faraday.



Figure 3. Hydroelectric Generator

### C. 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.



Figure 4. Wind Turbine.

## D. MPPT Charge Controller

**Maximum power point tracking** (**MPPT**) is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions. Although it primarily applies to solar power, the principle applies generally to sources with variable power: for example, optical power transmission and thermophotovoltaics. PV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads. Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load.
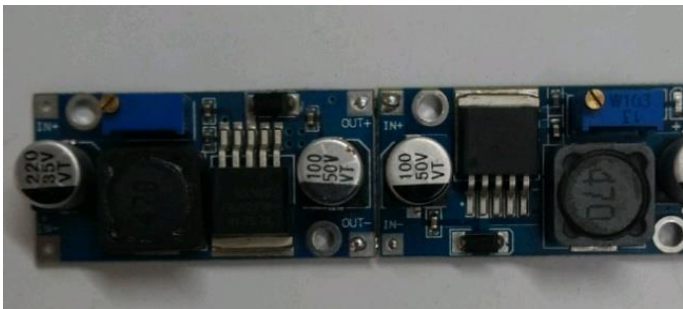
Figure 5. MPPT Charge controller

## E. Wi-Fi Module

Wi-Fi technology may be used to provide local network **and** Internet access to devices that are within Wi-Fi range of one or more routers that are connected to the Internet. The coverage of one or more interconnected access point (*hotspots*) can extend from an area as small as a few rooms to as large as many square kilometers. Coverage in the larger area may require a group of access points with overlapping coverage. For example, public outdoor Wi-Fi technology has been used successfully in wireless mesh network in London. An international example is Fon.

Figure 6. Wi-Fi Module.

## F. Relay module

The relay module is an electrically operated switch that allows you to turn on or off a circuit using voltage and/or current much higher than a microcontroller could handle. There is no connection between the low voltage circuit operated by the microcontroller and the high power circuit. The relay protects each circuit from each other. The each channel in the module has three connections named NC, COM, and NO. Depending on the input signal trigger mode, the jumper cap can be placed at high level effective mode which 'closes' the normally open (NO) switch at high level input and at low level effective mode which operates the same but at low level input.

Figure 7. Relay Module.

## G. Microcontroller ATMega16

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC Architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.



Figure 8. ATMega16

## III. COMPONENTS USED

Following components are used for this complete system

- Transformer
- Inverter
- LCD Display
- Potentiometer
- Power MOSFET
- Battery
- Capacitors
- Resistor

## IV. CONCLUSION

Hybrid 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. People should motivate to use the non-conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy Resources. It is cost effective solution for generation .It only need initial investment. It has also long life span. Over all it goods, reliable and affordable solution for electricity generation.

We study the various data about the wind, solar and hydro for generating the hybrid at small level that help to the decision makers to study the various factors in construct a hybrid Generation plant with a various minimum cost with highest generating capacity .The result shows by the experimental an theoretical data that has been able to Predict the energy generation through the Hybrid system. For future scope different time period has been used for calculating the power and efficiency. This method motivates the engineers to install small scale solar, wind, and hydro system. The government of India take a major decision towards the hybrid energy source.

## V. REFERENCES

[1]. Arjun A. K. et al, 2013. Micro-Hybrid Power Systems – A Feasibility Study, Journal of Clean Energy Technologies, Vol. 1, No. 1.

[2]. Lingade Gitanjali Vasant , V R Pawar 2017 . Solar Wind Hybrid Energy System Using MPPT.

[3]. Shamim Kaiser et al, 2006. Hybrid Options for Power Systems in St. Martin's Island, Journal of engineering and applied sciences (1) 3: 257-261.

[4]. M. Muralikrishna and V. Lakshminarayana, 2008. Hybrid (Solar and Wind) Energy Systems

for Rural Electrification, ARPN Journal of Engineering and Applied Sciences, VOL. 3, NO. 5,, ISSN 1819-6608.

[5]. Ghassan Halasa et al, 2009. Wind-Solar Hybrid Electrical Power Production to Support National Grid: Case Study – Jordan, Asian Research Publishing Network (ARPN).

[6]. Sunanda Sinha and S.S.Chandel, 2013. Pre-feasibility analysis of solar-wind hybrid system potential in a complex hilly terrain, International Journal of Emerging Technology and Advanced Engineering , Volume 3.

[7]. S.Williamson, B.Stark, (2013) Performance of a low-head pico-hydro Turgo turbine, Applied Energy 102 1114–1126.

[8]. J. Chukwuneke, C. Achebe,(2014 ) Experimental Investigation on Effect of Head and Bucket Splitter Angle on the Power Output of A Pelton Turbine, Vol.4, No.10. J.Ujam J. Chukwuneke, (2014) Modelling The Effect of Head and Bucket Splitter Angle on The Power Output of A Pelton Turbine, Aug.. Vol. 5. No. 03.

[9]. B. Nasir ., (2013) Design Of High Efficiency Pelton Turbine For Micro hydropower Plant Volume 4, Issue 1, January- February pp. 171-183.

[10]. O. Paish (2002)Micro-hydropower: status and prospects. Proc Inst Mec Eng – Part A: J Power Energy;216:31–40

[11]. Anagnostopoulos J. and Papantonis D., Pumped storage wind/hydro plants in noninterconnected, HYDRO 2008, Ljubljana, Slovenia, October 6-8, 2008