# SMART GRID AND SMART METERING MANAGEMENT SYSTEM

K.Saravana Kumar[1], G.Ramu[2]
PG Scholar[1], Assistant Professor[2]
Bharat University
kskbe1985@gmail.com

**Abstract—The worldwide demand for electric power is rapidly increasing. Smart grid is an intelligent electricity network which optimizes the energy efficiency. Understanding that embedded control and integrated connectivity will be at the heart of smart grids. This project presents a new system configuration of the solar and wind mill for providing energy and for communication technology onto the existing network. Depending upon the source availability the type's loads is selected. This modern smart grid system increases the efficiency of the electrical environment.**

**Index Terms—Energy conversion, photovoltaic power systems, pulse width modulated power inverters. Wind energy etc.**

## 1.INTRODUCTION

INDUCTION about this project is these guidelines this configuration allows the two main sources for generating alternative energy. One is solar cell, it is a structure that converts solar energy directly to DC electric energy. Another source is wind mill, it captures wind energy and then uses a generator to convert it to electrical energy. A wind turbine obtains its power input by converting the force of the wind into torque (turning force) acting on the rotor blades. The amount of energy which the wind transfers to the rotor depends on the density of the air, the rotor area, and the wind speed. With the help of these two sources the energy will store in charging battery. Each battery connects with the automatic changeover. This changeover system uses an electronic control circuit involving integrated circuits, transistor and electromechanical devices and it is used to change over the power to transformer. Each transformer output connects with microcontroller. PIC microcontroller provides proper supply to the particular load and controls the energy with the help of relay. This project will able to deliver electricity at lower cost and supply the load separately or simultaneously depending on the availability of the energy sources.

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## I. BLOCK DIAGRAM

, In this block diagram three sources are involved. First source is PV cell which generates 12v from the solar radiation and another 12v supply is collected from the wind energy, then the collected energy is stored in battery. The collected output from the inverter is given to the automatic changeover 1, EB supply is given to the automatic changeover 2. Both source voltage reference given to the PIC, when the EB supply is switched off, the automatic changeover get actuated and the supply is given to the load. So the continuity of supply is maintained through the renewable energy. According to the input supply heavy load or normal load is drive with the help of relay unit.

The solar and wind energy generation and consumption of load are displayed in LCD. Two different modes of operation also displayed in LCD.
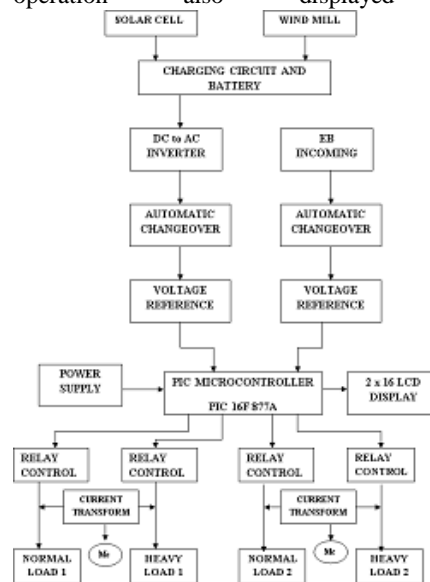


FIG.1

HARDWARE REQUIREMENTS
- PIC16F877A-Microcontroller
- Solar cell
- Wind mill,
- Current transformer
- Relay control
- Inverter

SOFTWARE REQUIREMENTS

- Embedded C programming

## II. CIRCUIT DIAGRAM
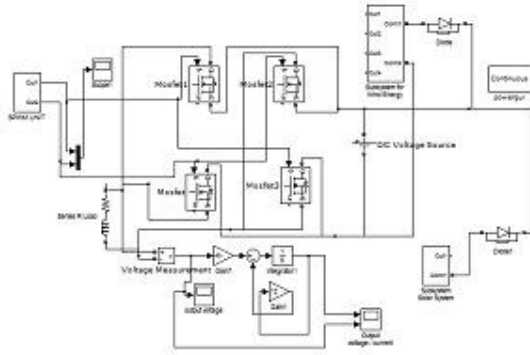
### 1. Load Side DC to AC Converter Model



Fig-2

In our Project, we are getting a uninterrupted power from two sources. First one is from Solar Energy and the Second one from the Wind energy source. Then we combined and stored the energy to the battery source, and then Invert that dc supply into Ac by the full wave inverter circuit and providing that supply into the ac loads. It shows in Fig.2.Here we are having the two sources,

    i. Solar Energy
    ii. Wind energy

### 1. SOLAR PANEL SIDE DC TO DC CONVERTER MODEL
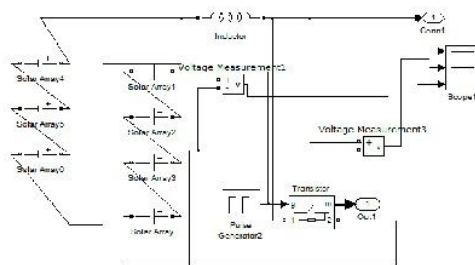


Fig-3

In the Solar Panel side No of Solar arrays are connected in series and the dc supply getting from solar panel will be given to the battery source via Smooth inductance to remove the harmonics and ripples. Here the output from the source is DC supply and the DC to DC will be handled by the step up chopper to get the high voltage from the Solar panel to the battery Source. It is shown in Fig-3

### 2. WIND GENERATOR AC TO DC CONVERTER MODEL

In the Wind generator side the output supply from the Wind generator  is AC. We need to convert that into DC to store in the battery. So here we are using the full wave rectifier to convert the AC supply from the Wind generator to battery source. It is Shown in Fig-4.
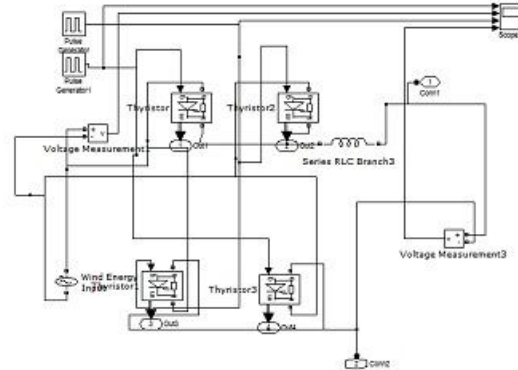


Fig-4

## III. OUTPUT WAVEFORMS

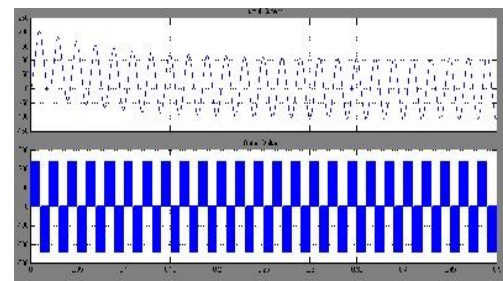1. OUTPUT LOAD VOLTAGE AND CURRENT FOR RL Load:



Fig-5

The Output current and Output voltage waveforms of our project for the RL-load is shown in Fig-5. While we are using the wind energy means we will get the output current and voltage will be like this only.

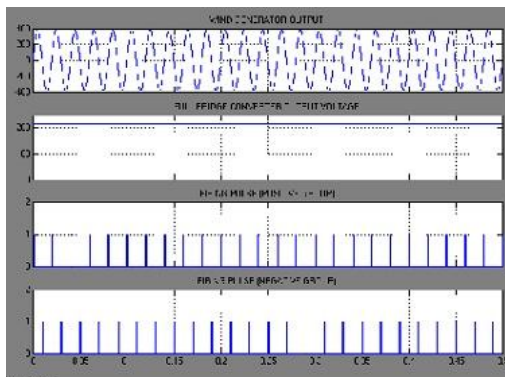2. OUTPUT WAVEFORM OF WIND GENERATOR SIDE AC-DC CONVERTER

Fig-6

The Output current and Output voltage waveforms of Wind generator is shown in Fig-5. While we are using the wind energy means we will get the sine wave and after the AC-DC conversion waveforms with the firing pulses are shown in Fig-6.

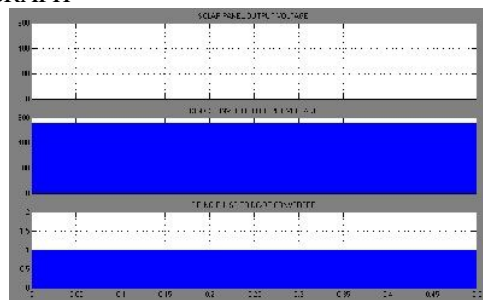3. SOLAR PANEL SIDE DC-DC CONVERTER MODEL INPUT,OUTPUT AND FIRING PULSE GRAPH



Fig-7

The Output current and Output voltage waveforms of Solar panel side dc-dc converter  is shown in Fig-5. While we are using the solar energy means we will get the dc with low level. Then again we are using step up chopper to increase the voltage level.

## IV. ADVANTAGES AND APPLICATIONS

❖ ADVANTAGES

- Low cost in power consumption
- Uninterrupted power supply
- Easy to handle and less manual work
- Non pollution

❖ APPLICATIONS

- It can be used in residential area
- It can be used in industrial area

## V. CONCLUSION

This paper presents the uses of renewable energy and how it is applied for power generation. After a thorough study of literatures of all the topics that include smart grid and smart metering management system. A simple system to improve the standards is developed. It is a real-time monitor able and developed with simple hardware which improves the capacity of generation in real time. This system can be easily implemented with maximum reliability and the high standard with low cost is a special enhancement of the project.

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