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Design and Development of Iot Based Wireless Green Grid Monitoring and Load Distribution System

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Abstract: Green energy grid power distribution and monitoring using smart android application and blue tooth technology.

Index Term – Arduino, Grid Control, Smart Grids, Smart Metering, Wind Energy, Solar Energy.

I. INTRODUCTION

In this project we give an idea of non-conventional energy generation and control the grid automation system using android. From this, we measure the voltage level from energy source. If we occur the over voltage and system automatically operate the load according the voltage capacity, if any source is not available the system automatically shift on ac source supply. System operate the load and all resource signal send using wireless technology on android app.

In this project we generate the electrical energy from different energy source such as

- Solar energy.
- Wind energy.

This energy stored in battery. And this energy is applicable in industry automation and load shading according to supply source,

MODE OF PROJECT

- **To check the voltage**: In this mode we use LM-339 IC, this is comparator by which we check the voltage generation and system operate the load according to incoming source of supply.
- **Protection and control mode**: In this mode we check the all condition in case of under voltage and after grid protect by reach in off mode. And for alerting system and indicate on led indication.

SOLAR ENERGY

When Light Hits the Cell

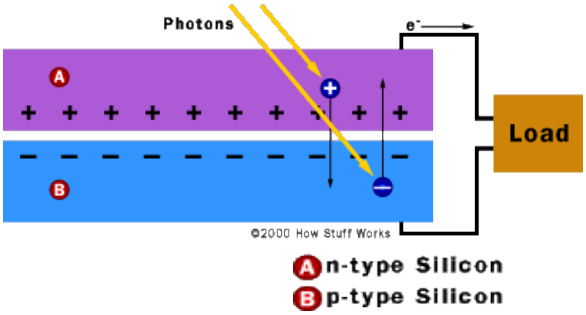
When light hits to our solar panel, the light is having the photons in it. Photon has some energy in it and can free one electron.

Photon gives some energy to electron and holes to get free as well. If the above process happens in result this will create electric field. This field will move the electron to the N side and hole will move to the P side. We also provide the circuit path through which electron will travel to the P side and gets combines with holes. The flow of electrons provides the current in opposite direction and electric field provides the voltage. Then with the both

Current and voltage we can calculate power.

P = I X V

Power is the product of Current and Voltage.



WIND ENERGY

Wind Turbine made up of strong aluminum and steel to stand in hardest weather conditions. This Turbine have the strong 3D blade that is designed to assemble the same easily.

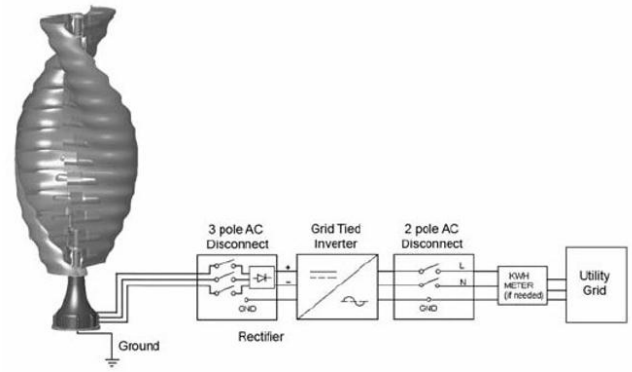
The shape of the wind turbine gets the stable production of power. The RPM of the blade depends upon the speed of the wind.

In Traditional time, we were having the horizontal axis wind turbine which generally produce the electricity based on direction of wind.

In Modern days, we have constructed vertical axis based wind turbine which can generate electricity based on any direction of the wind, also it does not create any noise and more stable than horizontal axis wind turbine.

In VAWT, It is having generator at the bottom end that connects with the turbine and makes the arrangement easier. The blades are connected perpendicular to the ground in a parabolic shape so that it can get the air from any direction. It does have the lower cost and more lighter than HAWT.

It can start itself or self-starting, it can also work for the low wind speeds & can produce power with the same.



Rated power and rated wind speed - The rated power is usually defined as the maximum power output and the rated wind speed is the wind speed at which the turbine reaches the rated power output. A combination of high rated power and low rated wind speed (it is advantage for wind turbines to reach their rated power at the lowest wind speed possible) is favorable.

Cut-in & cut-out wind speed - The cut-in speed is the lowest speed at which a turbine will start to generate electricity.

Practically the speed is around 3 to 4 m/s. Lower start up speed has the advantage in terms of total energy production. The cut out speed is the speed at which a wind turbine will stop producing electricity. Many

VAWTs can withstand extremely high wind speeds and are designed in such a way that they do not shut down at any wind speed.

Why should choose VAWT?

They are more stable in turbulent conditions (e.g. wind generated from passing vehicles)

•They can have the wind from all directions.

• They are very easy to build than the more traditional horizontal axis wind turbines

• The Generators and gearbox are placed on the ground which makes the service or maintenance process more easier and also cheaper.

• The one rotation axis in practice reduces vibration and stress to their nominal levels.

• There generally does not have the cut out speed that makes the turbine to generate electricity in each and every condition.

• They does not make any noise because the blades does not make any noise rather than HAWT that makes so much noise because of blades that pass close with each revolution.

Batteries to Store Electricity Generated By Above Sources

Deep-cycle Batteries

There is always a question in our mind, that what kind of batteries we should have in PV systems?

There are lots of different kinds of batteries that are commonly used, the only one characteristic they should be deep cycle batteries.

Unlike the other batteries like shallow batteries which is used in cars.

Deep cycle batteries are having the ability to discharge more of their stored energy and having long life. the shallow cycle batteries discharge large amount of current for the short time to start the car and then recharged when drive.

PV Batteries generally have the ability to discharge small amount of current for the longer time such as all night and gets charged in the day time.

The Lead acid and nickel cadmium batteries are most commonly used batteries. nickel one is more expensive and having long life, can discharged completely without any fault. Lead acid batteries are having one demerit that it can't get charged 100 percent that gives shorten life.

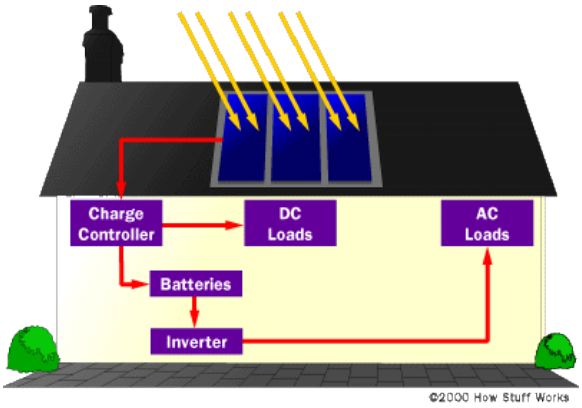
Generally, we require lead acid batteries that are designed to discharge not more than 40 percent or 50 percent.

DC to AC

Now there is point that we are getting electricity generated by the PV modules and getting extracted from the batteries. they all are the Direct current.

At the other end, we need to have the Alternating current to supply in the houses. So we need an inverter, which will convert DC current to AC current.

Most of the inverters allows you to control how system works for you. There are also AC modules which have an inverter already in build. This removes the need of large and central inverter and gives no wiring issues.



Distribution of Electricity Generated by sources

In this project, we are proposing the model of how electricity is being generated through Solar Energy and Wind Energy.

After getting electricity stored in the battery, the controller will distribute the electricity in the houses. When the voltage of solar energy will get depleted, the controller will transfer all the load to the wind energy generation and vice versa.

If both the sources would not able to generate appropriate amount of voltage to distribute to the houses then an A.C supply is used to distribute electricity to all the houses.

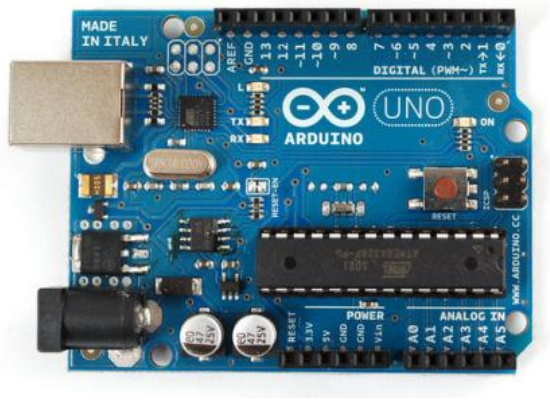
ARDUINO

In this project, we have used Arduino controller to control or to convert the inputs to the outputs.

Arduino is an open source platform, that is very easy to use for hardware and software also.

The Arduino is basically used to read inputs from the finger, light sensor and gives the output by activating the fan ,turning on/off the led.

You can simply program your board to what to do with inputs when sending set of instructions to the controller.



Advantages of Arduino boards.

- Inexpensive
- Cross-platform
- Simple, clear programming environment
- Open source and extensible software
- Open source and extensible hardware

In this project, we can see the results or readings of voltages in the android mobile using Bluetooth device.

CONCLUSION:

We have discussed the growth of electricity environment and gives essential results from those changes. It is having a lot number of initiatives that need to take place in the electricity industry to deal with it. This is the new technology that should come in technology and can approach the houses and electrical power systems.

The 'smart grid' is the wide term that can refer lots of numbers of these.

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