Dual meter technology equipped with MSPT

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Abstract- *since human evolution, mankind has exploited naturally available resources such as Wind, Water & Solar energy. Available conventional resources are like coal, oil etc depleting day by day and can play only minor role in power system. So dependency on renewable energy sources like wind solar water has to increase. But sun is available from since the birth of solar system, and freely available renewable energy source. So we can use it at any extend. And it becomes one of the most important and emerging energy source in 21st century. Present interest of human beings is on solar increased lot. Most of the works on solar are already done. And so many projects on solar cells are already completed in all over world.*
Keywords: Keil Compiler uVision 3, Embedded

Introduction

Most of the energy we get from the greatest reservoir, such as coal, hydro, natural gas etc. but the sun remains unused, since we can convert sun energy into electrical energy and use it. Then using electrical signal can store it in battery that is, the energy will be store in the form of chemical energy. In our project we are using solar panel which consists of solar cell. Dual meter technology is very helpful for public and even government. Using solar cell or solar panel on roof top or any other places we can generate power. That power use for domestic purpose and use to store power in battery also. If our generation is more than our load then, excess amount of energy we can send to electricity. This project is not yet implemented perfectly using dual meter. Our project main object is that generate maximum amount of energy and use it for domestic purpose or industry. And remaining or excess amount power will be send to EB. First let's store that power in battery. When the battery is full then, send it to EB. In our project we also used sun tracking system. By using sun tracking system we can generate maximum amount of energy. This one will be more advantage to our project.

I. METHODOLOGY

This project implements a new feature which is not yet been implemented in the present market. As now we know how the solar inverter or solar charger works, when solar light falls on to the solar panels then it induces electricity which is in the form of DC and the energy is stored in the battery, later that energy is being utilized for running the home appliances, industry.

In our project there are mainly three conditions will come. First one is if solar generation not there or it is not sufficient then supply will from electricity board this will done using separate switch. If switch is on then we will get supply from EB. If switch is off then will take supply from solar or battery.

This condition we have shown in our project is using battery condition. If battery is full then supply will switch to EB or grid without wasting power which is generated from solar. If battery is half charge then supply will switch to home appliances.

This half charge and full charge battery will be compared by using comparator section. That is op amp 741 IC. This will compare the voltage level of battery. If battery is fully charged supply will switch to EB. If half charge then supply will switch to home appliances. This will be done by setting voltage level to comparator.
Sun tracking system is used to generate maximum amount generation. If generation is more then we can earn money.

By delivering the power to the EB we can save maximum power and we can have mini power generation plant in the local station. And even every individual can earn by lending the power to the EB, this will be motivation for each individuals to adopt this technology and serve the country for a new future. This project monitors how many number of units we are transferred to the EB and what is the total amount the EB has to pay.

I. Hardware Technology consists of:
- Arduino. ATMEGA328
- Microcontroller AT89S52
- LCD.
- Solar panel.
- Battery
- Relay Driver.
- Resistors & Capacitors.
- LED'S &Crystals.
- Transformer.
- Comparator.
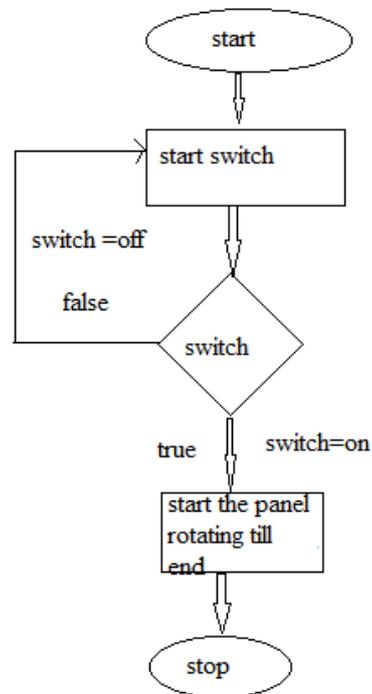- Voltage Regulators & Push Buttons.
- Stepper motor
- Crystal oscillator

Software Technology consists of:
- Keil Compiler uVision 3
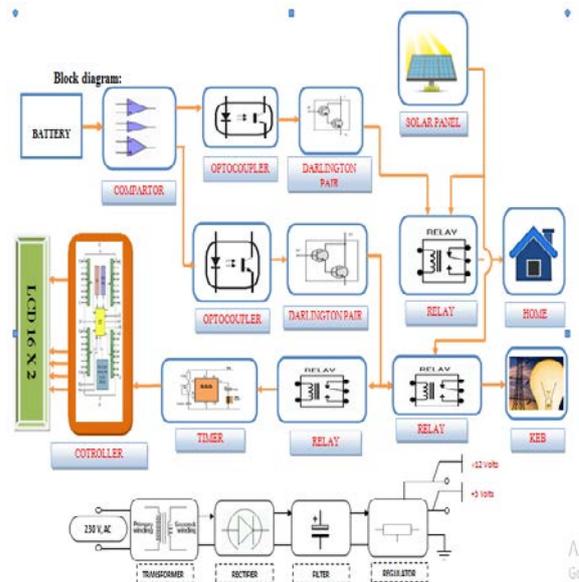- Language: Embedded C or Assembly

Flow chart of dual meter
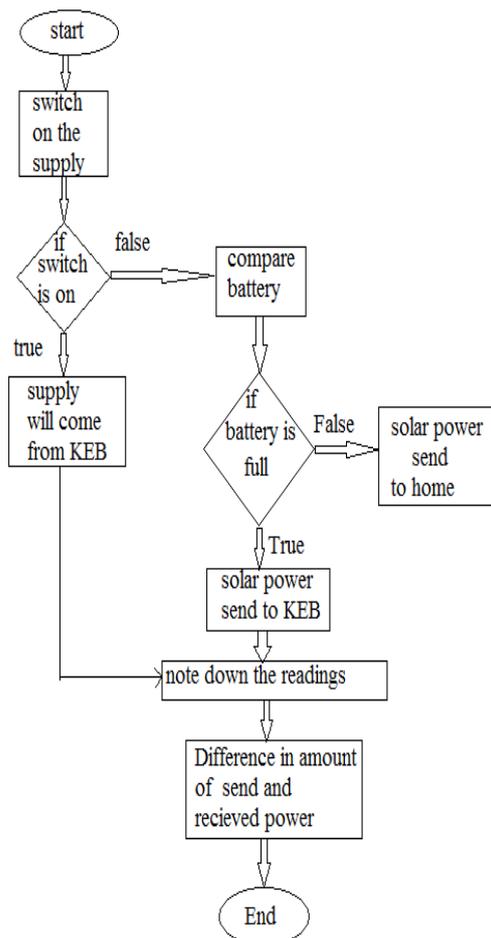
Flowchart of sun tracking

III. Block Diagram

1. Dual meter
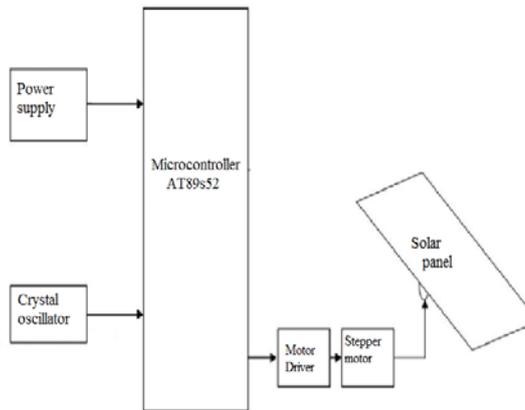
1. **Sun tracking**

Fig 2 sun tracking system

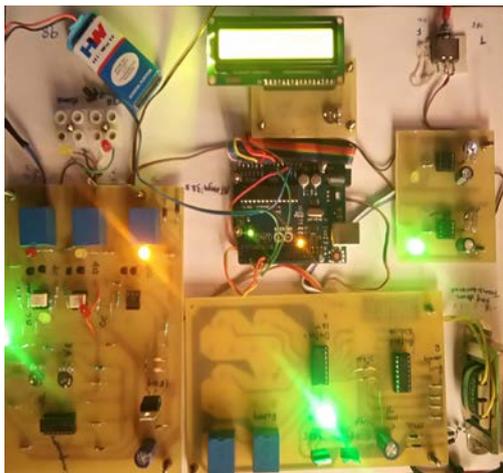2. **Project kit**

Fig 3 project kit
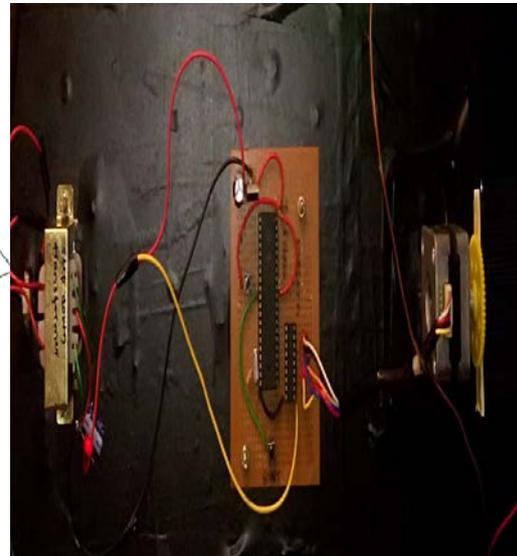

4. Sun tracking

Fig 4 sun tracking system

IV Block diagram explanation:

- **Power supply unit**

This section needs two voltages viz., +12 V & +5 V, as working voltages. Hence specially designed power supply is constructed to get regulated power supplies.

- **Comparator:**

In electronics, a **comparator** is a device that compares two voltages or currents and outputs a digital signal indicating which is larger. It has two analog input terminals V_+ and V_- and one binary digital output V_o. The output is ideally

$$V_o = \begin{cases} 1, & \text{if } V_+ > V_- \\ 0, & \text{if } V_+ < V_- \end{cases}$$

A comparator consists of a specialized high-gain differential amplifier. They are commonly used in devices that measure and digitize analog signals, such as analog-to-digital converters (ADCs), as well as relaxation oscillators

- **Buffers**

Buffers do not affect the logical state of a digital signal (i.e. a logic 1 input results in a logic 1 output whereas logic 0 input results in a logic 0 output). Buffers are normally used to provide extra current drive at the output but can also be used to regularize the logic present at an interface

- **Drivers**

This section is used to drive the relay where the output is complement of input which is applied to the drive but current will be amplified

- **Relays**

It is a electromagnetic device which is used to drive the load connected across the relay and the o/p of further processing.

V. SOLAR CELLS

The name "solar cell" means that it is a cell or a plate which converts solar energy into the useful electrical energy. The energy which we get from sun is enormous and it is a great source of energy. Its energy will never finish so this is also known as the main source of renewable energy. With the scarcity of non-renewable energy it is of utmost importance to find a way out to solve the energy problem by some means within a very short period of time. So there is a way out which is now developing. That is we are now able to convert the sun energy to electrical by some means and that is why the importance of solar cell comes into play. Though it is developing but if it is developed completely, then every household may produce the energy of its own.

1 Construction of Solar Cell

The junction diode is made of SI OR GaAs . A thin layer of p-type is grown on the n-type semiconductor. Top of the p-layer is provided with a few finer electrodes which leaves open space for the light to reach the thin p-layer and it under lays p-n junction. Bottom of the n-layer is provided with a current collecting electrode.

2 Working Principle of Solar Cell

Solar (or photovoltaic) cells convert the sun's energy into electricity. Whether they're adorning your calculator or orbiting our planet on satellites, they rely on the photoelectric effect: the ability of matter to emit electrons when a light is shone on it. Silicon is what is known as a semi-conductor, meaning that it shares some of the properties of metals and some of those of an electrical insulator, making it a key ingredient in solar cells. Let's take a closer look at what happens when the sun shines onto a solar cell. Sunlight is composed of miniscule particles called photons, which radiate from the sun. As these hit the silicon atoms of the solar cell, they transfer their energy to loose electrons, knocking them clean off the atoms. The photons could be compared to the white ball in a game of pool, which passes on its energy to the coloured balls it strikes.

Freeing up electrons is however only half the work of a solar cell: it then needs to herd these stray electrons into an electric current. This involves creating an electrical imbalance within the cell, which acts a bit like a slope down which the electrons will flow in the same direction. Creating this imbalance is made possible by the internal organisation of silicon. Silicon atoms are arranged together in a tightly bound structure. By squeezing small quantities of other elements into this structure, two different types of silicon are created: n-type, which has spare electrons, and p-type, which is missing electrons, leaving 'holes' in their place.

When these two materials are placed side by side inside a solar cell, the n-type silicon's spare electrons jump over to fill the gaps in the p-type silicon. This means that the n-type silicon becomes positively charged, and the p-type silicon is negatively charged, creating an electric field across the cell. Because silicon is a semi-conductor, it can act like an insulator, maintaining this imbalance. As the photons smash the electrons off the silicon atoms, this field drives them along in an orderly manner, providing the electric current to power calculators, satellites and everything in between.
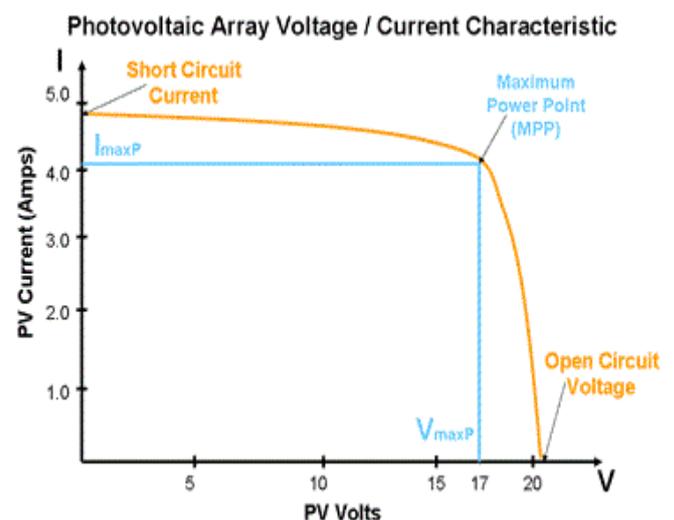

Figure V-I characteristics

Advantages of Solar Cell

- No pollution associated with it.
- It must last for a long time.
- No maintenance cost

Disadvantages of Solar Cell

- It has high cost of installation.
- It has low efficiency.
- During cloudy day, the energy cannot be produced and also at night we will not get solar energy.

Applications

- It may be used to charge batteries.
- Used in light meters.
- It is used to power calculators and wrist watches.
- It can be used in spacecraft to provide electrical energy.
- It can be used for street light

- It can be used in satellite.
- it can be used for home appliances.

VI Dual meter

It is an energy meter which records two types of readings. That is one which how much power we take from electricity board and how much power we send to electricity board. It is also called as net metering. It replaces 2 energy meters recording data from different sources of energy. Relay output option available for prepaid metering based on set value with individual load hours for both energy sources. Individual load hours for both energy sources. Net metering (or net energy metering, NEM) allows consumers which generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. This is particularly important with wind and solar, which are non-dispatchable. Monthly net metering allows consumers to use solar power generated during the day at night, or wind from a windy day later in the month. Annual net metering rolls over a net kilowatt credit to the following month, allowing solar power that was generated in July to be used in December, or wind power from March in August.

Net metering policies can vary significantly by country and by state or province: if net metering is available, if and how long you can keep your banked credits, and how much the credits are worth (retail/wholesale). Most net metering laws involve monthly roll over of kWh credits, a small monthly connection fee,[1] require monthly payment of deficits (i.e. normal electric bill), and annual settlement of any residual credit. Unlike a feed-in tariff (FIT), which requires two meters, net metering uses a single, bi-directional meter and can measure current flowing in two directions. Net metering can be implemented solely as an accounting procedure, and requires no special metering, or even any prior arrangement or notification.

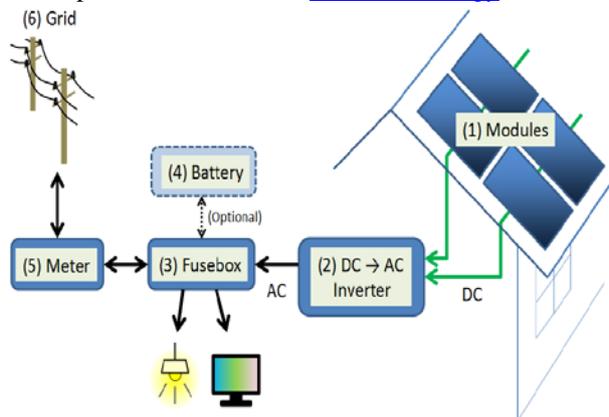Net metering is an enabling policy designed to foster private investment in renewable energy.

Figure 1.3 Dual meter

Advantages and Disadvantages
Advantages:

1. High reliability, due to the usage of power semiconductor devices.
2. System monitored without any difficulty (no need of full attention).
3. As this system uses both Solar Energy and Mains Supply to charge its Battery, chances of facing Black-out conditions is very less.
4. No wastage of power and effective in implementation.
5. System costs less with reliability and longer life.
6. Lower weight because of reduction in components. And expenditure on care & maintenance of the system is negligible.
7. It can be used as a decentralized energy system right at the place of use; hence there is no need of transmission line.

Disadvantages:

1. Low conversion efficiency.
2. High capital cost to install.
3. Can't generate more power during rainy season
4. We can generate power in day only

Application

- Use it for domestic purpose
- Water irrigation
- Industry

CONCLUSION

As this project is based on arduino. Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced ICs with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

And by sun tracking system is done by using microcontroller AT89S52. And this will be work on the basis of timer, which less cost than sensor. By combining this with Dual meter it will more effective. Generation of electricity by solar panel using sun will generate more than normal so it is more effective and we can more by this.

FUTURE ENHANCEMENT:

There is always chance to improve any system as research & development is an endless process. Our system is no exception to this phenomenon. The following developments can be

done in future for this project. In future we can use this project in several applications by adding additional components to it. A smart grid uses digital technology to improve the reliability, security, and efficiency of the electricity system. By adding GPS and GSM we make billing wirelessly via a message.

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Appendix A

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