IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 11, Issue 7, July 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.18

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

|DOI:10.15662/IJAREEIE.2022.1107024 |

The Channelization of Solar Energy in the Proper Way with Help of a Bi-Directional Meter

Prof. R.S Desai, Prof. Amit Kukker, Kumar Unnayan, Shantanu Shukla, Udbhav Singh

Associate Professor, Department of Electrical Engineering, BV(DU)COE, Pune, Maharashtra, India

Associate Professor, Department of Electrical Engineering, BV(DU)COE, Pune, Maharashtra, India

UG Student, Department of Electrical Engineering, BV(DU)COE, Pune, Maharashtra, India

UG Student, Department of Electrical Engineering, BV(DU)COE, Pune, Maharashtra, India

UG Student, Department of Electrical Engineering, BV(DU)COE, Pune, Maharashtra, India

ABSTRACT: The world today is moving towards development at a high pace. In order to facilitate this development the energy requirements need to be met while also keeping in mind environmental factors which include deterioration of climate standards due to heacy reliance on fossil fuels. Solar Energy has come out to be one of the major contenders for bridging this energy gap , while also addressing concerns regarding overuse of fossil fuels thus causing pollution. The objective of our system is to make sure that the energy obtained from solar sources via use of solar panels fitted in domestic settings are available for domestic use as well as surplus is stored in batteries which can be sent back to the grid in return of monetary compensations that can be availed during billing. The distributed generation & storage of elecricity using renewable resources is aimed to facilitate goals of sustainable development.

I. INTRODUCTION

Net metering can be termed as one of the best methods for implementation of Distributed Renewable Energy.
The worlds first net metering connection was established in 1979 in Massachusetts , USA , when an architect name Steven Strong put PV cells in his 2 building projects. He added a 5 kWp system alongwith a department of energy funded solar house. In this system , the system would draw power from the grid if needed , but when the solar cells produced more power than required by the house , then this excess power was fed back to the utilities. The meter worked as in , when the power was drawn from the grid , the meter ran forward but when the excess power from the PV cell was supplied back into the grid the meter ran backward. This was the first example of a working BDEM. Strong was conferred numerous awards for his achievement. Solar & wind pioneers inn the US followed suite & started connecting their systems to the grid. By 1998 , 22 states had adopted the net metering set up. This also led to the formulation of energy policies regarding net metering. USA after noticing the success of Distributed Generation & Net Metering decided to formulate policies to regulate it. The corporate energy market although supported the project in order to gain positive publicity , were in reality slightly against the idea , the main reason was because it led to a negative change in demand ie. Less energy would directly be consumed from the grid & this led to decreased monetary benefits for the large energy markets. Shifting of a large number of people from centralized grid systems to distributed generation could spell doom for the private energy sector.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

|DOI:10.15662/IJAREEIE.2022.1107024 |

BDEM helps in implementation of distributed generation. Under this form of setup power is produced near the equipment which is consuming this power. BDEM as the name suggests helps in providinng monetary benefit to the user , it helps send excess power produced back to the grid in order to decrease the cost incurred by the user. Further Distributed Generation when coupled with BDEM can be used as a method to overcome decrease in power in system or during emergency situations thus mitigating power supply interruption.

The difference between the total energy produced and total energy consumed is what the owner is billed for. While the excess energy is supplied to the grid , shortage of energy is compensated by the grid.

Energy shortage in renewable energy based setup occurs due to multiple reasons ranging from poor maintenance all the way upto climatic conditions. For example – In cloudy or rainy weather it becomes difficult for PV cells to gain energy & store it in batteries , in such circumstances the structure that uses PV cells as an energy source faces shortage of energy. In such a scenario , we can either supply the stored energy back into the system & mitigate the interruption or we can consume electricity from the grid to fulfill our needs.

This system can further be used for grid protection by large corporate consumers too. Net metering in general creates a smoother demand curve & helps the grid in better energy management during the peak electricity loads. [1]

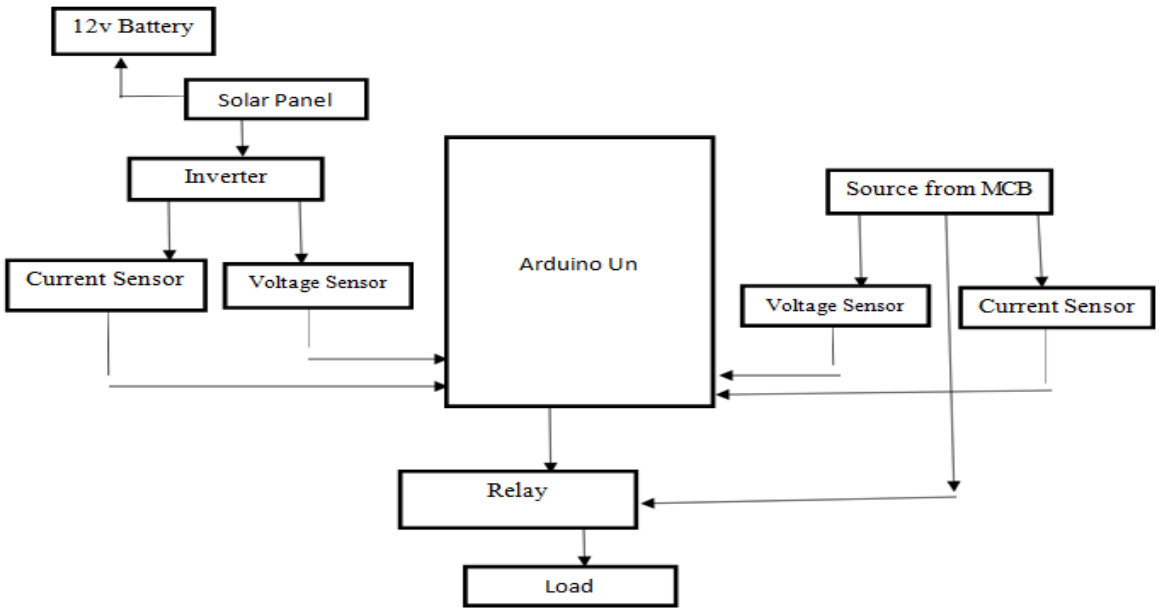
Further generation of energy near consumption sources has 2 main benefits : 1. Monetary benefit is gained as there are less cables & wirers required for supplying electricicty to the consumers. This means that the number of wires required to supply electricity over long distances from the source to the consumer would be decreased. 2. Further the losses incurred by the system due to long distance transmission is also decreased. This implies that losses due to heat , faults , etc are largely decreased. Also, the requirement of maintenance for these systems will decrease substantially.

An Arduino is used as the main controlling apparatus & the program regarding the working of the system is written in C language. Arduino consumes realtively less power & is therefore efficient & perfect fit for our system.

Further we use a battery in order to store excess energy to be used later by the utility or to be sent back to the grid in case its not consumed. Current sensors are used to sense presence of current. These sensors work on the principle of Hall Effect.

We further use breadbord for assembling the entire components. [1]

II. BLOCK DIAGRAM



| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

|DOI:10.15662/IJAREEIE.2022.1107024 |

III. COMPONENTS USED

The following components have been used in the designing of Bidirectional Energy Meter -

- PV Solar Panel.
- Arduino.
- 16x2 LCD.
- 12V DC Battery.
- Relay Module.
- Current Sensor (ACS 712).
- 12v DC adaptor.
- 6” x 4” Zero PCB

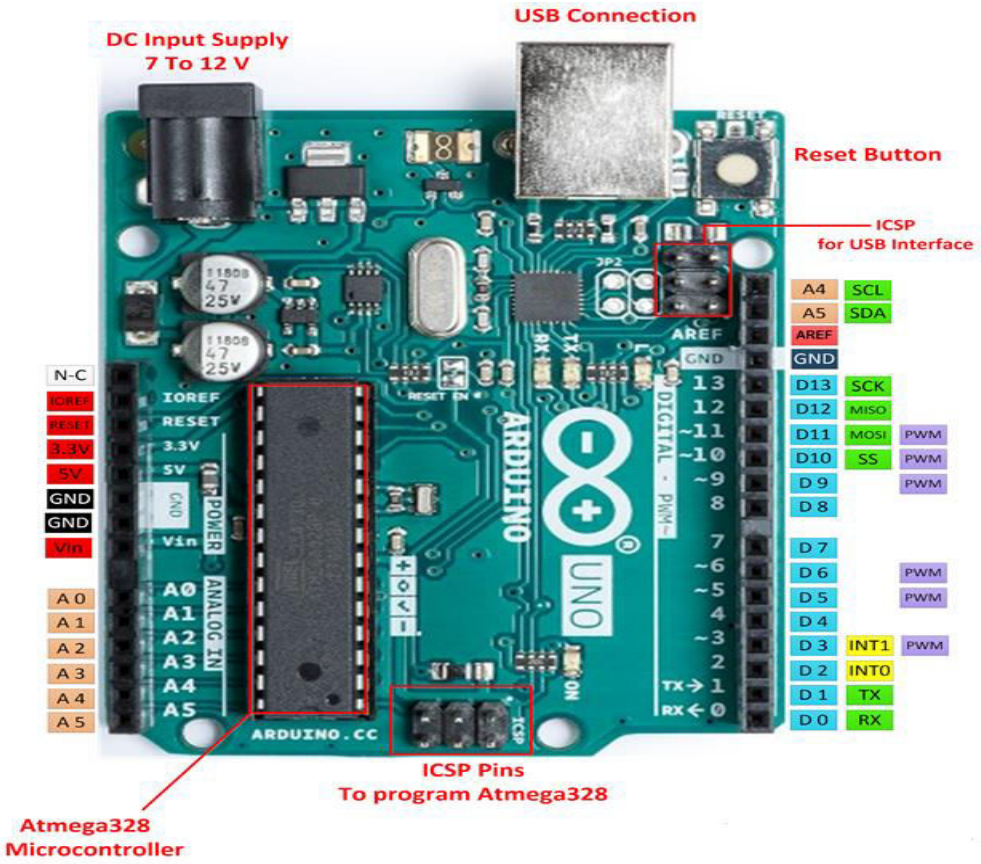
3. Arduino

The Arduino/Genuino Uno microcontroller board is based on the ATmega328P microcontroller (datasheet). There are 14 digital input/output pins (six of which can be used as PWM outputs), six analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button on the board. Arduino UNO is a low-cost, flexible, and easy-to-use open-source programmable microcontroller board that may be used in a wide range of electronic applications. This board can operate relays, LEDs, servos, and motors as output and can be interfaced with other Arduino boards, Arduino shields, and Raspberry Pi boards.This board has a USB interface, which means it can be connected to a computer through a USB cable, and it can be programmed using the Arduino IDE (Integrated Development Environment) software.[2]

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

|DOI:10.15662/IJAREEIE.2022.1107024 |



Pin Diagram of Arduino UNO

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
66LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

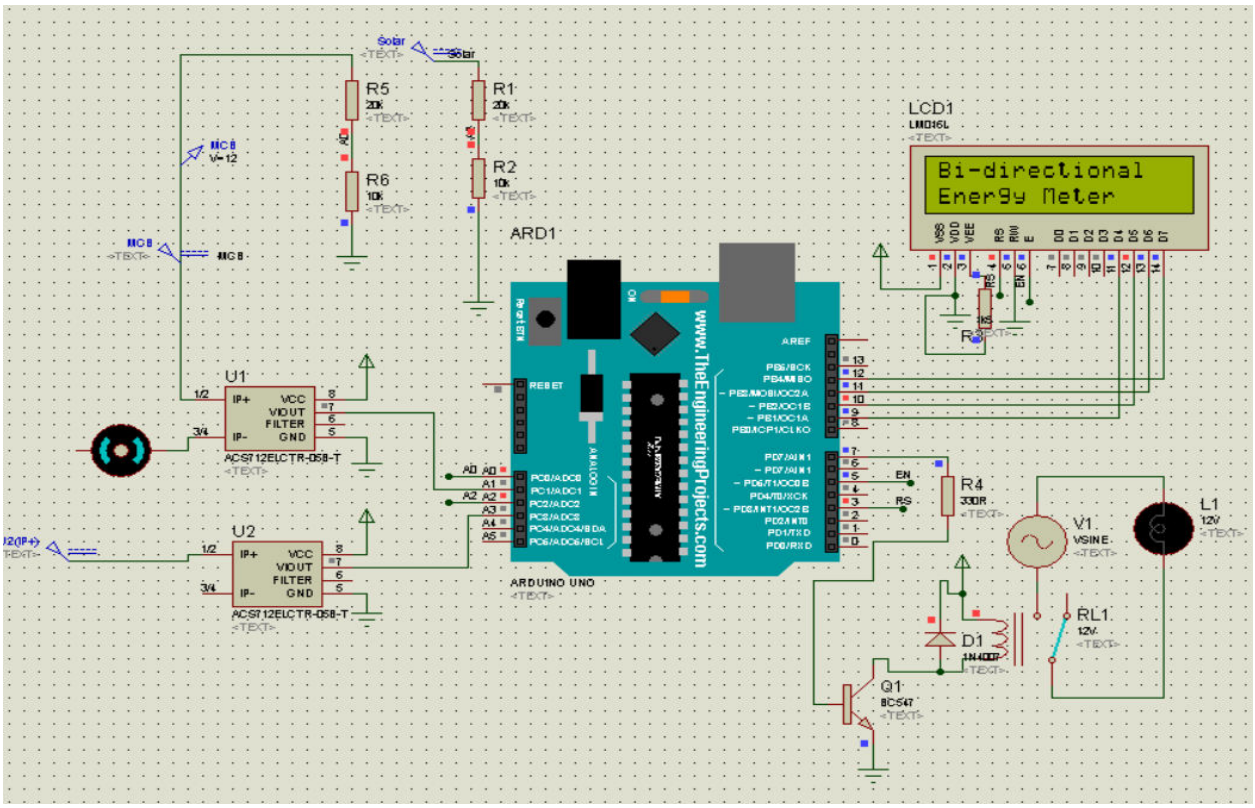
Technical Specification of Arduino UNO

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

|DOI:10.15662/IJAREEIE.2022.1107024 |

IV. WORKING



V. BASIC WORKING & REQUIRED PARAMETERS

Priority is given to the solar, Solar power is used for load and DC battery is charged at the same time. In the absence of solar power relay will activate to switch source pin from solar to MCB. While using the power from, Current and voltage is measured and stored the form of Consumed power and energy. In the absence of load on solar source, inverter will switch on and DC power is converted to the AC to feed to the grid.at the time of giving power to the grid power and energy is calculated with the help of another set of Voltage and current sensor. By calculating the difference between consumption power and grid power, can finalize the actual consumption of power and energy. [2]

Power :

Power is product of voltage (volt) and current (Amp)

P=VxI

Unit of power is Watt or KW

Energy:

Energy is product of power (watt) and time (Hour)

E= Pxt

Unit of Energy is Watt Hour or Kilowatt Hour (kWh)

- Voltage
- Current
- Time

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.18|

||Volume 11, Issue 7, July 2022||

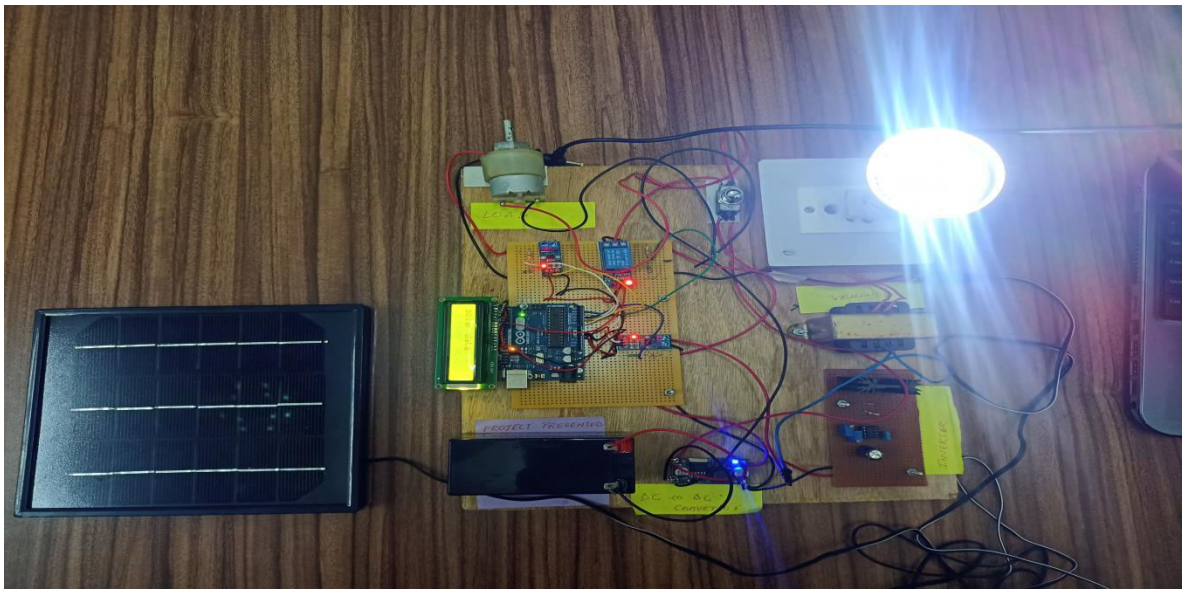
|DOI:10.15662/IJAREEIE.2022.1107024 |

From the above formula it is clear that to measure Energy we need three parameters

VI. RESULTS AND DISCUSSION

We can say that BDEM is currently only device that can use to channelize two sources of power in proper way. But there is some portion that we have to work on BDEM to make more fast,more efficient, more accurate, some cases are there where we have to work on like an incorrect and false mechanical orientation or electrical polarity of the current transformer may lead to the negatives KW readings after supplying the power. We can work on the life span of BDEM it can be exceed to maximum 60 years. Storage of the energy is currently on working stage, because many users use BDEM for billing adjustments and Government of India is also working on it. Industrial area is doing good with BDEM but for domestic loads it is very new concept and we have to improve in many areas.

VII. FINAL IMAGE.

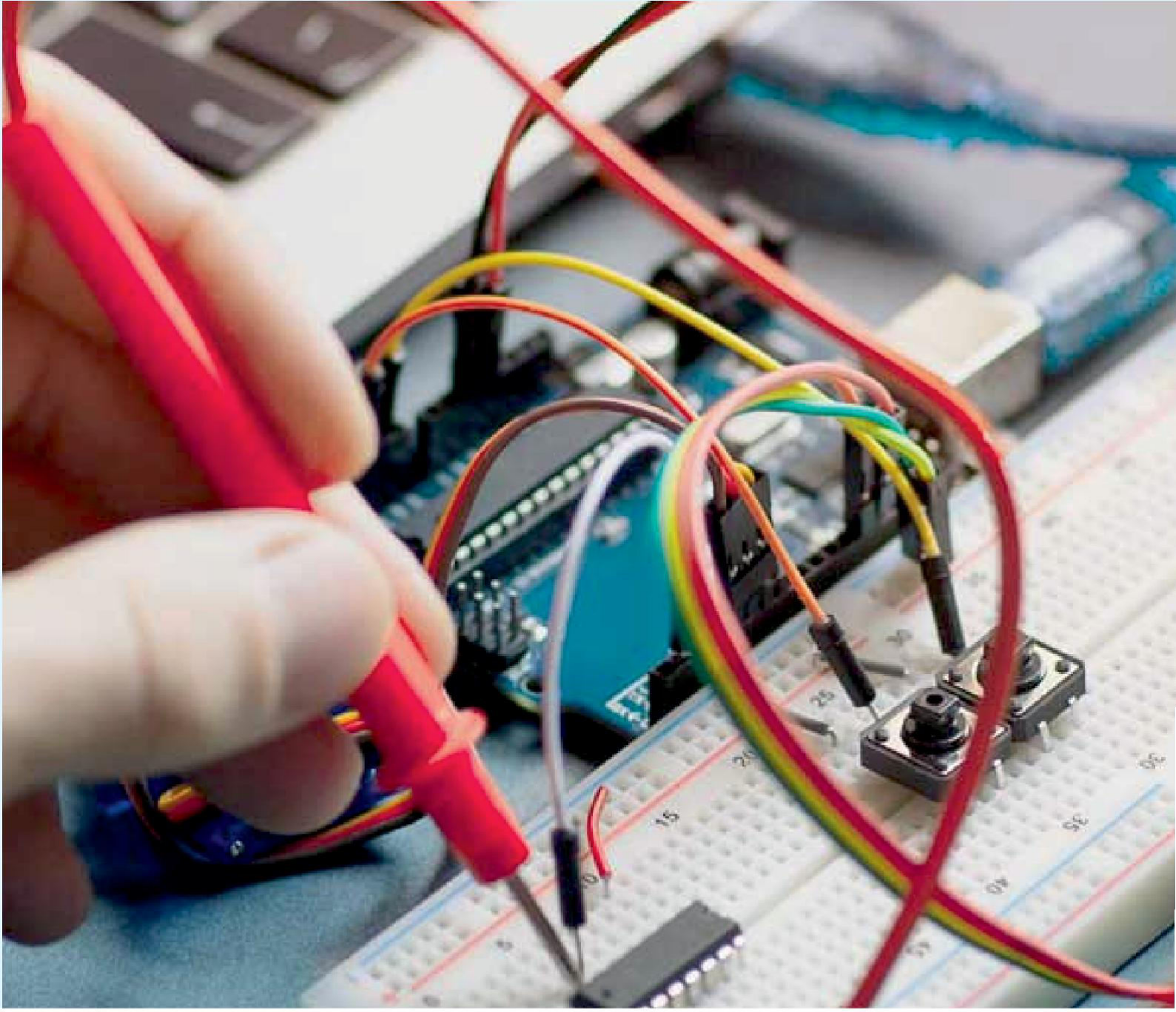


VIII.CONCLUSION

In our project we channelize the solar energy in a proper way with the help of Bi Directional Energy Meter. This method is also called as On-Grid Power System but in domestics loads it is used for billing adjustment process but we try to make a small solar power station or power grid at your place where you can generate energy and sell to government it can help government to give power supply in rural areas.[3]

REFRENCES

1. Fundamentals of Solar Energy by G.N Tiwary.
2. Future of Energy by Alex Boyels.
3. Energy Department of USA.



INNO SPACE
SJIF Scientific Journal Impact Factor

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

Impact Factor: 8.18

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

www.ijareeie.com

Scan to save the contact details