



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 5, May 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

ijrset@gmail.com

www.ijrset.com

IOT Based Smart Energy Meter for Domestic Use

Dr. Sanjay Warkad¹, Devanshugayki², Nikita Mungane³, Pallavi Manne⁴, Moresh Sambare⁵,

Srushti Isokar⁶

Assistant Professor, Department of Electrical Engineering, P R Pote college of Engineering and Management,
Amravati, India¹

Department of Electrical Engineering, P R Pote college of Engineering and Management, Amravati, India²³⁴⁵⁶

ABSTRACT: Internet of Things (IoT) has opened a myriad of applications in many areas, including medical and healthcare networks, smart home control, and environmental surveillance. IoT is supposed to bring about a large amount of progress within the ubiquitous computing sector. IoT-based energy management programs may allow a big contribution to energy conservation. Therefore, this paper focuses on the planning and implementation of an online of Things based household electricity energy monitoring and electric bulb remote for the reduction of electrical wastage using ESP 32-bit microcontroller. The ESP 32 microcontroller was used as the brain of the whole system which processes the energy consumption. The ESP32 microcontroller also handles the web connectivity via its inbuilt WIFI module so as to transmit the real-time energy consumption, and electric bulb remote control over the internet. A UBIDOS app was designed to serve as user interface for monitoring the household electricity energy consumption and electric bulb remote via UBIDOS cloud server from Math Works and also monitors the electricity consumed by the pressing iron and therefore the hand blower. Whenever, the electricity consumption exceeds the set threshold on the UBIDOS app, a notification is sent to the user's Email. The system might be used for reducing the wastage of electricity within the house by proper scheduling and monitoring of the appliances.

KEYWORDS: ESP 32 microcontroller, IOT, UBIDOS Application, UBIDOS server WIFI module.

I. INTRODUCTION

Energy meters are combination of analog and digital components working together to offer the output within the sort of digital readings that's what the entire power consumed by any industrial or residential building. Because the use of electricity round the world progressed, the worth for electricity has become competitive. The necessity for accurate measurement of the electricity consumed has become vital issue both for the consumers also because the electricity board. Utility companies started feeling the pressure for better instruments. Utility companies are being forced to seek out solutions which will demand more sophisticated energy measurement methods, providing greater amount of data on the consumer's power consumption. The Smart Energy Meter is that the best solution to face the present-day scenario of urgent need of accurate and user friendly electrical consumption measuring instrument. The energy consumption are often monitored by using an Electric device called energy meter. The value and therefore the regular Usage of Power consumption are informed to the user to Overcome high bill usage. The Energy meter shows the quantity hi of units consumed and transfers the info to both the customer and to the electrical board so this helps in reducing man-power. The user can check their Power usage from anywhere and at any interval. The IoT is employed to show on/off the household Appliances using relay and Arduino interfacing. The target of this technique is to watch the quantity of electricity consumed. The distributor and therefore the consumer both are going to be benefitted by eventually reducing the entire Power consumption

II. LITERATURE REVIEW

A new concept of energy meter are getting to be discussed, where maximum demand of energy of a consumer are getting to be indicated within the meter employed by the customer. After exceeding the utmost demand, the meter and hence the connection will automatically be disconnected by an embedded system inserted within the meter itself. Wi-Fi module ESP32 for controlling devices over the web. It can work with a micro-controller just like the Arduino with the assistance of this we will communicate between load circuit and utility side. The system consists of the electricity meter which measures the electricity bill and informs the buyer about the amount of units consumed and associated

costs with it with the utilization of Wi-Fi module (ESP32). The microcontroller ATMEGA328 (Arduino) coordinates the entire system with the assistance of its different components connected to it.

III. LITERATURE SURVEY

In this paper, the system consists of the electricity meter which measures the electricity bill and informs the buyer about the amount of units consumed and associated costs with it. The microcontroller coordinates the entire system with the assistance of its different components connected. Authors described in their findings [1] a low-cost real-time ARM-based energy management system. It's conceived as a part of a distributed system that measures the most power grid quantities and provides the likelihood to manage the entire power station. An integrated Web Server allow to gather the statistics of power consumptions, power quality and is in a position to interface devices for load displacement. The device is characterized by quick access to the knowledge and therefore the combination of a sensible meter and digital communication [12] capability allow local and remote access. During this way it's possible to manage the facility consumption of the facility system resulting in an overall reduction in consumption and In [2] authors suggested WIFI technology application for energy meter and develop for Apple and BlackBerry 10 OS, thus providing multiple platform users support. In [3] describes PIC18F46k22 Microcontroller based design and implementation of energy meter using IoT concept. The proposed system design eliminates the human involvement in Electricity maintenance. The customer must buy the usage of electricity on schedule, just in case that he couldn't pay, the electricity transmission are often turned off autonomously from the distant server. The user can monitor the energy consumption in units from an internet page by providing device IP address. [9] Theft detection unit connected to energy meter will notify company side when meter tampering occurs in energy meter and it'll send theft detect information through PLC modem and theft detected are going to be displayed on the terminal window of the corporate. In [4], smart energy meter is meant to urge telemetering, tampering detection and supplier can disconnect service to the buyer within the event of meter tampering or unauthorized use of energy. It makes the relation between utility and user more transparent and reliable. Power saving is feasible which contributes towards the minimization of the matter of energy crisis. In IoT [5] technology an IoT device was created for measuring the voltage, current, power and energy of a three-phase four-line power cable during a laboratory building. Wi-Fi unit performs the IoT operation by sending energy meter data to website which may be accessed through IP address. The Hardware interface circuit consists of PIC18F46k22 Microcontroller, MAX232, LCD display, theft detection unit, TRIAC switch circuit. In [6] authors suggested DB18B20 temperature sensor, PIR sensor, PLC modem, and ESP8266 Wi-Fi module. Wi-Fi unit performs the IoT operation by sending energy meter data to website which may be accessed through IP address. In [7] authors presented need for measuring the consumed electricity. It's accomplished by the wattmeter, but an individual from TNEB has got to visit each house for measuring the facility consumption and for calculating the bill amount. So it requires much of manual work and consumes time. So as to avoid of these drawbacks we've intended to construct an IoT based energy meter. Therefore the proposed energy meter measures the quantity of power consumed and uploads it to cloud, from which the concerned person can view the reading. The facility reading is shipped to cloud using ESP 8266, a Wi-Fi module. The facility reading from digital wattmeter is read using the Opto-coupler and transmitted digitally to the Arduino. it automates the method of measuring the facility consumption at homes using IoT and thereby enabling remote access and digitalization. In [8] authors implemented Prepaid Billing which might go a extended way in making consumers aware of the energy they use and be more economical. This device uses ATMEGA 328P Micro Controller for computational purposes and Wi-Fi module for data transfer and updates. The prototype model of this proposed energy meter was developed and was validated with various loads in our laboratory during 19-1-2016 to 25-1- 2016(Scale down period as 2 months). It proves, this device is user friendly, make consumers conscious about the quantity of energy they spend and help to conserve the already depleting resources. The automation of billing system eliminates labour resources involvement, hence is more accurate [13]. So obviously there is a requirement for measuring the consumed electricity. It's accomplished by the wattmeter, but a personal from TNEB possesses to travel to every house for measuring the facility consumption and for calculating the bill amount. it requires much of manual work and consumes time. So as to avoid of those drawbacks we've intended to construct an IoT based energy meter. Therefore the proposed energy meter measures the number of power consumed and uploads it to cloud, from which the concerned person can view the reading. The facility reading is shipped to cloud using ESP 8266, a Wi-Fi module. The facility reading from digital wattmeter is read using the Opto-coupler and transmitted digitally to the Arduino. So it automates the method of measuring the facility consumption at homes using IoT and thereby enabling remote access and digitalization. [11] Wi-Fi unit performs the IoT operation by sending energy meter data to website which can be accessed through IP address. The Hardware interface circuit consists of PIC18F46k22 Microcontroller, MAX232, LCD display, theft

detection unit, TRIAC switch circuit, DB18B20 temperature sensor, PIR sensor, PLC modem, and ESP8266 Wi-Fi module. Wi-Fi unit performs the IoT operation [10] by sending energy meter data to website which may be accessed through IP address.

In this system, smart energy meter is supposed to urge telemetering, tampering detection and supplier can disconnect service to the customer within the event of meter tampering or unauthorized use of energy. It makes the relation between utility and user more transparent and reliable. Power saving is feasible which contributes towards the minimization of the matter of energy crisis.

IV. BLOCK DIAGRAM & METHODOLOGY

The phase current and voltage will be monitor by using microcontroller that is ESP32. It maintains 8bit data size, operating range are going to be 3.3v to 5v. Wi-Fi module (ESP32) works under six AT commands. First is to set the Wi-Fi module. Second is to make enable multiple connections. The third is to get an IP address from the router. Fourth is to set up the server. Last is to set date length which could send. The last one is to plus access point which requires SSID and password to join the access point. This diagram consists of all comments used in our project. Components such as voltage sensor, Current sensor, ESP32 module, LCD display, RTC etc.

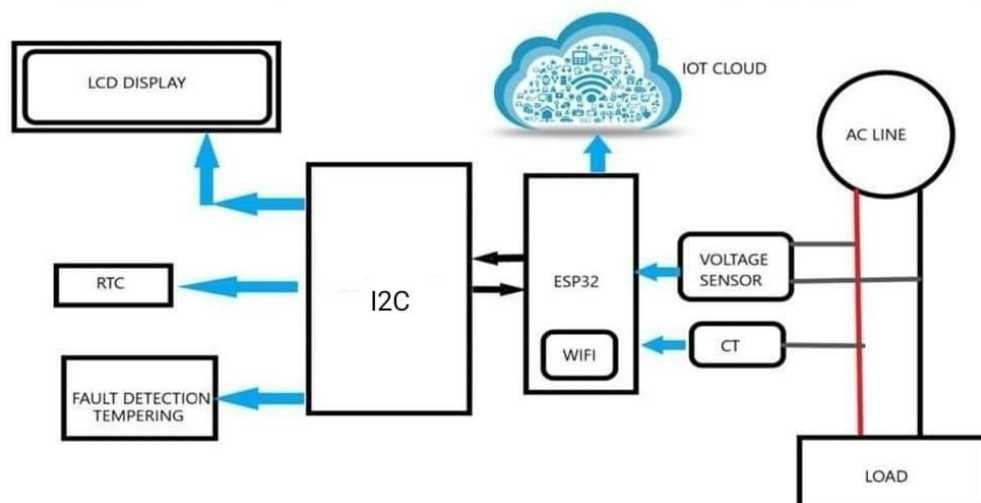


Figure1: Block diagram of smart energy meter

V. CALCULATION AND REASULT

To calculate the amount for consumed power is:

$$Wh = \text{watts} * \text{time}$$

$$KWh = \text{watts} * \text{time} / 1000$$

For example 5000 W power consumed in 3 hrs time

$$KWh = 5000 * 3 / 1000 = 15KWh \text{ [unit]}$$

BILLING:

Unit calculated * 4.1 + additional charges.

HERE 4.1 is value of rupees / unit is considered.

In figure 3 indicate the UBIDOS dashboard showing various parameters such as electrical parameters and bill for consumer analysis through IOT.

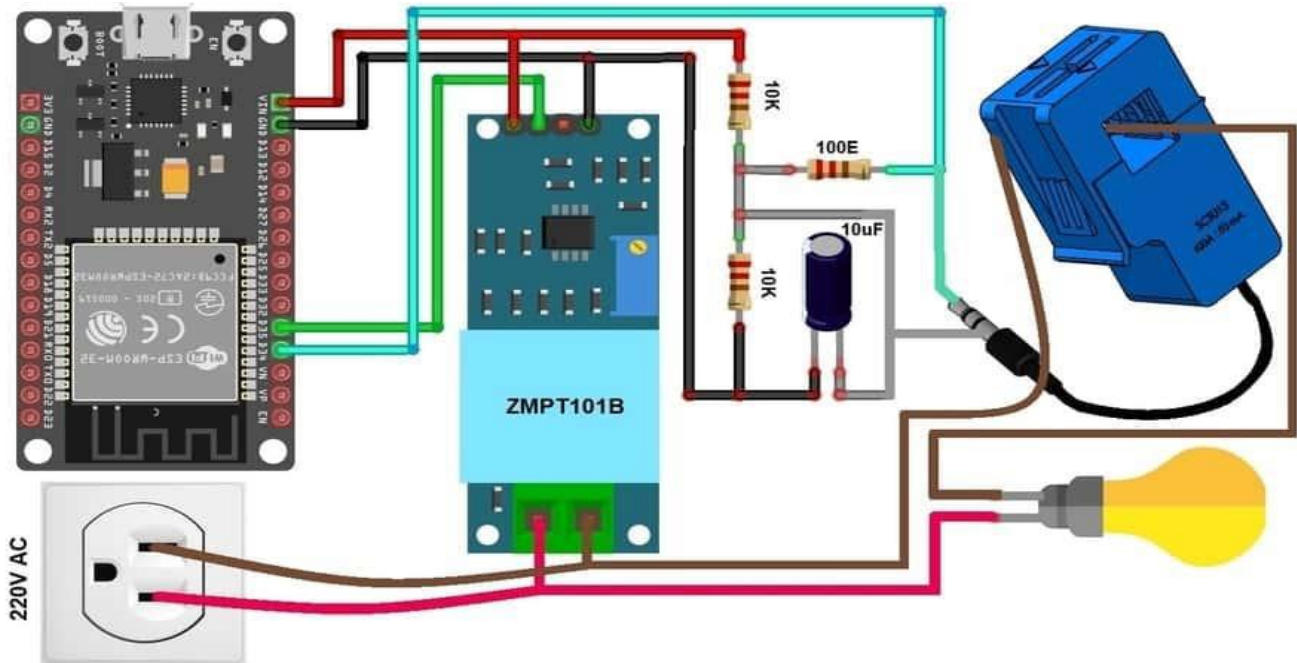


Figure 2: Smart energy meter connection diagram

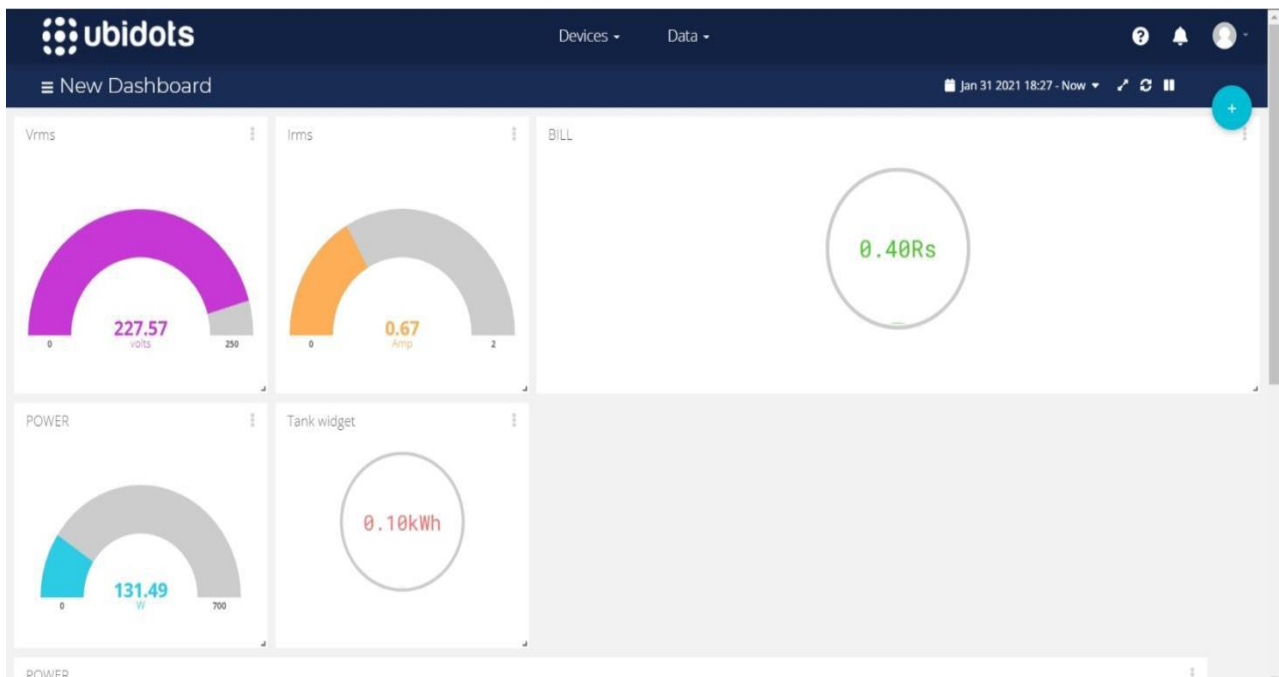


Figure 3 :UBIDOS dashboard

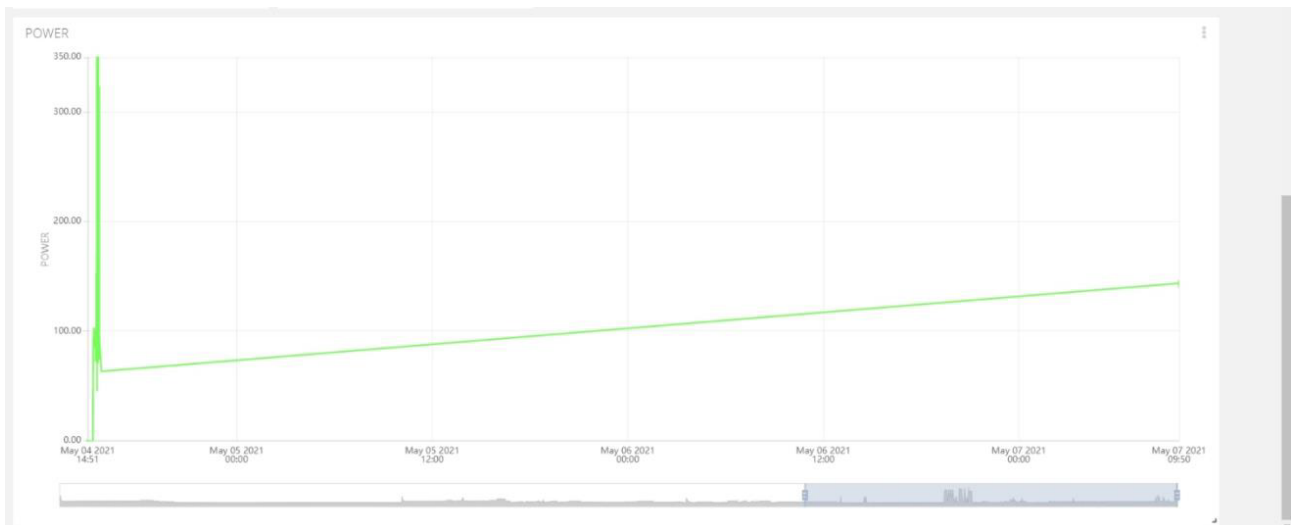


Figure 4: Graph between instantaneous Power and time

VI. CONCLUSION

The Smart energy monitoring system includes ESP32 WI-FI module.. The system automatically reads the energy meter And provides home automation through an app developed and Power management done through this application. The Proposed system consumes less energy and it will reduce Manual work. We can receive monthly energy consumption from a faraway location on to centralize office. During this manner we reduce Human effort needed to record the meter reading which are till Now recorded by visiting the house individually. The paper describes the planning and dealing of Smart Energy Meter and represents how Smart Energy Meter are often used for Automatic Meter Readings. It is most economical implementation to develop mankind during this era of technology. With this enhancement in the use of technology to facilitate mankind, it is an efficient and practical utilization of present network. This paper also shows that how customer can manage the load by using Smart Energy Meter. It provides ease in taking meter reading, accuracy, detection of fault conditions, power factor calculation, less operation cost and removal of possible corruption related to meter readings.

REFERENCES

- [1] Landi, C.; Dipt. di Ing. dell'Inf., Seconda Univ. di Napoli, Aversa, Italy ; Merola, P. ; Ianniello, G, "ARM-based energy management system using smart meter and Web server", IEEE Instrumentation and Measurement Technology Conference Binjiang, pp. 1 – 5, May 2011
- [2] (2017 Jan. 31) ACS712 [Online] Available: <https://www.sparkfun.com/datasheets/BreakoutBoards/0712.pdf>
- [3] Birendra kumar Sahani, Tejashree Ravi, Akibjaved Tamboli and Ranjeet Pisal, "IoT Based Smart Energy Meter", International Research Journal of Engineering and Technology (IRJET), Vol. 4, No. 4
- [4] "Darshan Iyer N, Dr. KA Radhakrishna Rao M Tech. student, Dept. of ECE, PES College of Engineering, Mandya, Karnataka, India", "IoT Based Energy Meter Reading, Theft Detection and Disconnection using PLC. (2014 March 19) ESP8266 Wi-Fi Module [Online] Available: https://cdn-shop.adafruit.com/product-files/2471/0A-ESP8266__Datasheet__EN_v4.3.pdf
- [5] Win Adiyansyah Indra, Fatimah BtMorad, Norfadzlia Binti Mohd Yusof and Siti Asma Che Aziz, "GSM-Based Smart Energy Meter with Arduino Uno", International Journal of Applied Engineering Research, Vol. 13, No. 6, pp. 3948-3953, 2018.
- [6] M. Patel Umang and M. Modi Mitul, "A Review on Smart Meter System", International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, Vol. 3, No. 12, December 2015.
- [7] Samarth Pandit, Sneha Mandhre, Meghana Nichal, "Smart Energy Meter using internet of Things (IoT)", VJER-Vishwakarma Journal of Engineering Research, Vol. 1, No. 2, pp. 222-229, June 2017.
- [8] Win Hlaing, Somchai Thepphaeng, Varunyou Nontaboot, Natthanantangsunantham, Tanayoot Sangsuwan and Chaiyod Pira, "Implementation of Wi-Fi-Based Single Phase Smart. Meter for Internet of Things (IoT)", 5th



International Electrical Engineering Congress, Pattaya, Thailand, pp. 8-10, March 2017. Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, No. 7, pp. 6482-6491, July 2015.

[9] S. Imran and Dr. K. Pahlada, "IoT Based Electricity Energy Meter Reading Through Internet", International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES), Vol.3, No. 11, November-2017.

[10] N. Darshan Iyer and Dr. K. A. Radhakrishna Rao, "IoT Based Electricity Energy Meter Reading, Theft Detection and Disconnection using PLC modem and Power optimization", International Journal of Advanced

[11] Giri Prasad, Akesh, BalaPravin, Gokila Devi and Gowri Devi, "IoT Based Energy Meter", International Journal of Recent Trends in Engineering & Research (IJRTER) Conference on Electronics, Information and Communication Systems, 2017.

[12] Dr. Shreedhar A. Joshi, SriyayKolvekar, Y. Rahul Raj and Shashank Singh, "IoT Based Smart Energy Meter", Bonfring International Journal of Research in Communication Engineering, Vol. 6, Special Issue, pp. 89-91, November 2016.

[13] R. Bhavani and S.Alagammal, "Design and Implementation of GSM Based Smart Energy Meter for Home Applications", International Journal of Latest Trends in Engineering and Technology, Vol. 8 No. 1, pp. 431-439, 2015.



INNO SPACE
SJIF Scientific Journal Impact Factor

**Impact Factor:
7.512**

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details