MONTHLY ELECTRICITY BILLING WITH BILL SMS USING PIC

NISANTH M
Dept of Electrical and Electronics Engineering
Bannari Amman Institute of Technology
Sathyamangalam, Erode
nisanth.ee19@bitsathy.ac.in

SOWMIYA M
Dept of Electrical and Electronics Engineering
Bannari Amman Institute of Technology
Sathyamangalam, Erode
sowmiya.ee19@bitsathy.ac.in

AJMAL BASHA A
Dept of Electrical and Electronics Engineering
Bannari Amman Institute of Technology
Sathyamangalam, Erode
ajmalbasha.ee19@bitsathy.ac.in

I.ABSTRACT

Automated and smart metres are tools that can track the power users' energy usage in real-time. They are regarded as important technological enablers of the smart grid because the real-time consumption data they can gather allows for the creation of novel, complex charging systems. It could enable more effective operation of the power distribution system and might result in a number of value-added services. Utilizing power monitoring techniques enables power monitoring systems to receive information remotely, in relation to coordinates, and at certain times. This project's major goal is to alert consumers to electricity theft. Through embedded technology, it persists. This system is able to measure both the power transmitted over the load and the power used by the load over time. IOT is used to monitor parameters. This method will notify the user of the payment via the user. if the customer fails to pay the invoice. Automated and smart meters are tools that can track the power users' energy usage in real-time. They are regarded as important technological enablers of the smart grid because the real-time consumption data they can gather allows for the creation of novel, complex charging systems. It could enable more effective operation of the power distribution system and might result in a number of value-added services. Customers may examine their monthly power bill on an LCD display and by mobile SMS. IOT allows for the graphical display of daily consumption. The user may be informed to pay the cost of the power. Utilizing power monitoring techniques enables power monitoring systems to receive information remotely, in relation to coordinates, and at certain times.

Keywords:--Transformer,ATMEGA328p, ESP8266(IOT), CurrentSensor.

II.INTRODUCTION

In recent years, the usage of microcontrollers and the Internet of Things (IoT) in power billing systems has grown in popularity. The ATmega microcontroller is one such device and is a well-liked option for usage in power billing systems because to its low cost, adaptability, and simplicity. Using IoT and Atmega, the idea of monthly power billing entails collecting and processing data from electricity metres using sensors and microcontrollers. The information is then analysed and utilised to create billing information for clients after being transferred through the internet to a central server. Real-time monitoring and billing, increased accuracy, and a decrease in billing mistakes are all benefits of implementing IoT and Atmega in power billing systems. With the use of this technology, utilities may also give consumers more thorough billing details, such as usage trends, peak usage periods, and other information that can be used to assist customers better control their energy usage. The effective and correct administration of power billing is crucial to the efficiency of the whole electricity supply chain. Electricity bills are still often mailed out, and clients must visit a payment location to make their payments. This takes a lot of time and may lead to missing or late payments. In this study, we suggest a PIC microcontroller-based system for sending SMS alerts of monthly power bills. Customers receive real-time billing information from the system, which decreases the need for manual bill payment and boosts the efficiency and accuracy of invoicing. The project offers a system that enables readings of the amount of power spent in units and the maximum amount of current a user may use to prevent electricity theft. Our device displays power readings on an LCD panel and may SMS the user with this data and the cost. This eliminates any possibility of bill manipulation by providing the user with information about his precise power units utilized and cost directly from his meter. The project enables a bidirectional reading. One is on

International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

an LCD screen, while the second is by SMS. The ATMEGA328p family of PICs is connected to IOT as part of our project. The technology determines the unit usage while continually tracking electrical pulses.

III. LITERATURE REVIEW

[01] Through the IR sensor unit, this device gauges power usage. The ARM processor will detect the unit pulse after obtaining the power consumption. The unit will then be translated to our currency using government tariff values and displayed on the LCD screen for a specific user. It is a time-consuming and complex system. It does not save the data. To overcome this, we using IOT to save data in the Cloud and response of data is faster. [02] This technology established the idea of automated meter reading (AMR), which transfers the automatically gathered data to a central database for invoicing. Zigbee is used in the system so there is a limitation of range. Also faces the problem of image processing. We overcome this problem using IOT. [03] This paper presents a smart energy meter for an automatic metering and billing system. In this meter energy utilized and the corresponding amount will be displayed on the LCD continuously and communicated to the controlling base station. Its limitation its work for the limited time. [04] The main idea of the project is to modernize our billing system using GSM. The GSM is a technique works on the principle of TDMA – time division multiple access and operates at the frequency off 900MHZ. The details of power displaced in the energy meter are transferred to the mobile. Less efficient more data are not Displayed. [05] In this paper, a wireless method is proposed which puts emphasis on Intelligent Energy meter (IEM) reading and bill generation using Arduino Mega and Ethernet Shield. The monthly generated bill will be sent to the consumer through SMS. Complex system, Data based handling is difficult. To overcome this type of problem Save the data using IOT and indicate the costumer via sms. [06] According to one study, PIC microcontrollers are suitable for use in power billing systems because they are affordable, simple to use, and flexible. The study employed a GSM modem to deliver SMS alerts to clients with their bill amount and due date and a PIC microcontroller to communicate with a power metre. The findings demonstrated that the system could compute bills with accuracy and deliver SMS alerts in real-time, making it a practical option for small- to medium-sized utilities. [07] According to the study, utilising a PIC microcontroller to calculate bills and deliver SMS alerts greatly cut down on the time and labour needed for human billing operations. The outcomes also shown that the use of a PIC microcontroller increased bill computation precision and decreased billing mistakes.

IV. METHODOLOGY

This system for displaying monthly electricity bills includes bill SMS functionality and is powered by a Pic ATMEGA328p chip. The message can be sent via WhatsApp in addition to mobile. Current Sensor is used to determine current use. Additionally, it sends through the server to the ATMega the values that were saved and sent to the ESP8266p WiFi Module. For demonstrational reasons, we will attach a lightbulb to the system to test it. We regulate the load current by means of a relay. However, we would examine the IoT and its Server to make sure they were functioning correctly before turning on the output load. To save electricity, the usage is stored on an IOT server and daily comparisons are made. The current device also has theft detection integrated, which is shown on the LCD. Following the creation of the monthly power bill, the microcontroller (PIC) transmits the electricity bill notification signal to the customer's mobile phone through IOT and, if necessary, generates a bill as well. Additionally, the microcontroller shows this bill and its units on the system LCD display.

A. Block Diagram:

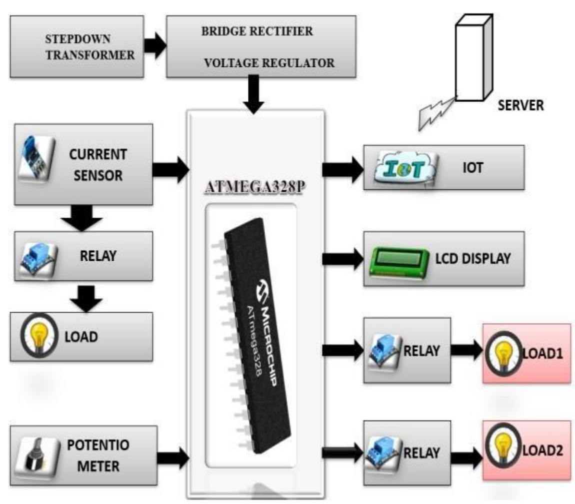

Fig:1.0 Block Diagram of the Project

B. Proposed System:

The following elements make up the suggested system for monthly power billing utilising IoT and an Atmega microcontroller based on Fig:1.0:

Current Sensor: The system has a sensor that measures and records each customer's power use. the sensors that provide the microcontroller with use statistics.

Microcontroller: The system's main processing component is the Atmega microcontroller. It gathers information from the electrical metres, processes it, and then transmits it through the internet to the main server. Data is transmitted from the microcontroller to the main server over the internet by the system using a communication module, such as a (MSP) Wi-Fi module. This makes it possible to track and charge for power use in real time. Data from the microcontroller is received and processed by the central server. Based on each customer's power use, it creates billing information for them and communicates it to them by SMS or email.

Database: The system includes a database that houses information on each customer's power use. The database is utilised to provide billing data and give clients access to their usage history.

The Current Sensor will track the user's energy use and relay that information to the controller. The controller will continuously track energy use and update the IOT with the measured use value. The utilisation in a certain IOT website might be seen by the user or the official. Through IOT, this system will notify the user of the payment. This system has a power theft detecting feature. This system is able to measure both the power transmitted over the load and the power used by the load over time. This power theft is discovered as a result. The IOT is updated together with the LCD display of the monitored parameters.

The suggested IoT and Atmega microcontroller-based monthly power billing system has a number of benefits over conventional billing methods. Electricity use is tracked and billed in real-time, with increased precision and fewer billing mistakes. Additionally, it makes it possible for utilities to give consumers more thorough billing details, including as consumption trends, peak usage periods, and other information that may be used to assist customers better control their energy usage.

C. Parts and Its Uses:

1. ATMEGA328p: A popular microcontroller integrated circuit used in many different electronics applications is the ATMEGA328P. It is an 8-bit microcontroller with great performance and low power consumption built on the AVR architecture. Its essential characteristics include:

Flexibility: The ATMEGA328P is appropriate for a variety of applications, including robotics, smart home systems, automotive, and consumer electronics.

Low voltage operation and low power consumption make the microcontroller perfect for battery-powered applications.

Simple to use: A wide range of software development tools and libraries support the ATMEGA328P, making it simple for programmers to create new applications and projects.

Cost-effective: The ATMEGA328P is a popular choice for DIY and hobby applications since it is reasonably cheap.

High performance: The microcontroller is well suited for applications that need real-time data processing and control because it offers quick processing and effective data storing.

2. Stepdown Transformer: An example of a power supply equipment that transforms high-voltage AC power into low-voltage DC power is a 230V to 12V transformer. Lighting, motors, and security systems are just a few of the applications that frequently employ this kind of transformer.

A transformer's primary operation is to employ magnetic induction to change a high-voltage AC power source into a low-voltage AC signal. The result of rectifying this signal is a DC voltage. The primary coil, secondary coil, and core, which is commonly constructed of iron, are the key parts of a 230V to 12V transformer.

3. Bridge Rectifier: An electrical circuit known as a bridge rectifier transforms an alternating current (AC) input into a direct current (DC) output. A typical power supply circuit converts the AC input voltage into a DC voltage that may be utilised to power a variety of electronic devices. Four diodes are stacked in a bridge arrangement to make up a bridge rectifier. The way the diodes are linked prevents them from conducting electricity in any other direction except from the positive terminal to the negative terminal. The diodes only let current to flow during the positive half-cycle of the input voltage when the bridge rectifier is subjected to the AC input voltage. The diodes stop current flow during the negative half-cycle. A DC output voltage that is proportionate to the input voltage's absolute value is the outcome.

4. Current Sensor: An electronic device that gauges the flow of electrical current in a circuit is called a current sensor. In many kinds of electrical systems, such as power supplies, motor drives, and power distribution systems, it is used to observe and manage the flow of current. Current sensors come in a variety of forms, including linear Hall effect sensors, Rogowski coils,

International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

and Hall effect sensors with Hall effects. Hall effect sensors provide a voltage proportionate to the current using the magnetic field produced by the current flow. Wire coils called Rogowski coils provide a voltage proportionate to the rate at which the current in a conductor changes. One variety of Hall effect sensor that produces a linear output proportional to the current flow is the linear Hall effect sensor.

5.IOT: Data capture, data transmission, and data storage are all processes in the sending and storing of data in an IoT (Internet of Things) system. Here is a general description of what happens:

Data gathering: Gathering data from the different sensors and devices that make up an IoT system is the first stage in transferring and storing data from the system. This information can contain status details, such as whether a device is on or off, as well as physical factors like temperature, humidity, and pressure.

Data transmission: Using a communication protocol like MQTT (Message Queuing Telemetry Transport), HTTP (Hypertext Transfer Protocol), or CoAP, the obtained data is subsequently sent to a central server or cloud platform (Constrained Application Protocol). How the data is packed and sent to the server is decided by the communication protocol.

Storage of data: After being transferred, the data is kept on the server or cloud platform. A database management system like MySQL, MongoDB, or Cassandra can be used for this. The information might be kept in semi-structured formats like JSON or XML or in a structured format like a table or document.

Data analysis and visualisation: Using different tools, including spreadsheets, charts, and dashboards, the stored data may then be examined and displayed. This enables the data to be monitored and analysed in real-time, allowing the system to recognise and react to abnormalities and patterns.

V. TESTING AND RESULT

Depending on the precise implementation, the outcome of a monthly power billing system employing IoT and the ATmega328P microcontroller might vary, but some basic advantages include:

Enhanced accuracy: The monthly electricity billing system may be created to correctly measure and record the amount of electricity utilised over a specific time period utilising IoT devices and the ATmega328P. By improving billing accuracy, this may result in fewer disagreements between power companies and their customers.

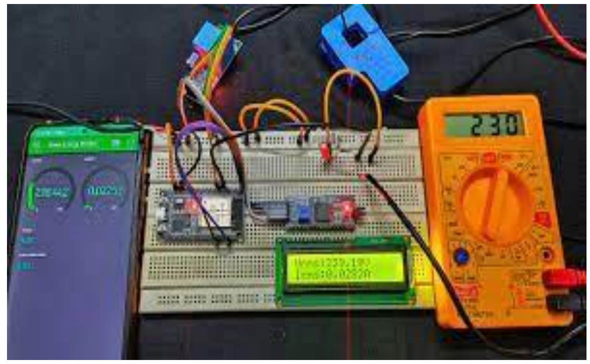

Fig: 2.0 Output can be verified manually using Multimeter

Efficiency gain: Automating many of the manual steps involved in power billing with the ATmega328P can save time and effort by generating invoices more quickly. Fig:2.0This may lead to quicker and more effective billing procedures, which will increase client satisfaction.

Fig: 2.1 Output can be viewed using mobile in Graphical format.

Real-time monitoring: By using IoT devices and the ATmega328P, it is possible to monitor power use in real-time and identify patterns and abnormalities early on Fig:2.1. This can lead to greater dependability and cost-effectiveness by identifying possible problems with the equipment or billing procedures.

Increased automation: The combination of IoT devices and the ATmega328P can result in an increase in automation for the power billing process, decreasing the need for manual intervention and lowering the possibility of mistakes Fig:2.0.

- Data would be gathered by the IoT system from numerous sensors put in a customer's house, including power meters.
- The IoT network would then be used to send the data to a central server.
- The data may be processed and the power bill depending on the customer's use determined using the ATMEGA328P microprocessor.
- An interface, such as a web page or mobile app, might then show the computed amount.
- The consumer might then use the same interface to evaluate and pay the bill.

VI. CONCLUSION

In this research, a novel idea for monitoring daily energy usages and energy theft detection MONTHLY ELECTRICITY BILLING WITH BILL SMS USING PIC is put forth. A system like an Current sensor monitoring and computerised billing system would be able to do away with manual meter reading, reduce labor, increase accuracy, and stop power theft.

Finally, the protection against energy theft and usages can be monitor using the Internet of Things (IoT)-based smart home devices and can be further applied in commercial and industrial sectors. In comparison to conventional manual billing systems, monthly power billing utilising IoT and Atmega offers a more effective, economical, and precise way for electricity billing. Real-time data on power use may be gathered and sent to a central server utilising IoT and Atmega for processing and creating monthly bills. By doing away with human mistake, this method also cuts down on the time and resources needed for manual invoicing. Additionally, it gives customers more open and in-depth information about their electricity expenditures and use, empowering them to make better choices regarding their energy usage.

REFERENCES

[1] Andrzejozadowicz, jakubgrela, "Control application for an internet of things energy meter-a key part of an integrated building energy management system",2015 IEEE.

[2] P. Loganthurai, M. Veeralakshmi, A. Vanmathi, Professor, Department of EEE, K.L.N College of Engineering, "Smart Energy Meter Billing using GSM with Warning System",IEEE 2017

[3] OsmiJaiswal, Dilip Chaubisa, B.E, Student Department of ECEL.D College of Engineering,"Arduino Mega and IOT based Intelligent Energy Meter (IEM) to Increase Efficiency and Accuracy in Current Billing Methodology" ICE-CDS-2017

[4] Md. Masudur Rahman,OhidulIslam, Md. SerazusSalak in," Arduino and GSM Based Smart Energy Meter for Advanced Metering and Billing System," Pabna University of Science and Technology, Pabna, Bangladesh 2015 IEEE.

[5] Himshekar Das, L. C. Samika, GSM Enabled Smart Meter and Automation of Home Appliances, National Institute of Technology, Silchar, India 2015 IEEE.

[6] H.G.Rodney, Tan IEEE, C.H.Lee and V.H.Mok, 2007. Automatic Power Meter Reading System using GSM Network. The 8th International Power Engineering Conference, PP: 465-469

[7] T.Chandler, The Technology Development of automatic metering and monitoring systems, IEEE International Power Engineering Conference, Dec 2005.

[8] Nikhil V. Patil, Dnyaneshwar R. Bondar, Rohan S. Kanase Department of Electrical Engineering, Rajarambapu Institute of Technology, Islampur, India "Intelligent Energy Meter with Advanced Billing System and Electricity Theft Detection" ICDMAI,2017.

[9] Uzair Ahmed Rajput, Khalid Rafique, Abdul Sattar Sa and, Mujtaba Shaikh, Muhammad Tarique, Modeling of Arduino Based Prepaid Energy Meter using GSM Technology, International Journal of Advanced Computer Science and Applications, 9(5), 445-449, 2018.

[10] G. Vani, V. Usha Reddy, Application of Smart Energy Meter in Indian Energy Context, IOSR Journal of Electrical and Electronics Engineering, 10(3), 07 13, 2015.