Energy Management System Using Breaker Circuits

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ABSTRACT: With the advancing technology, every field is shifting towards making systems automated, portable and easy to use. Supporting the change in time, the project proposes a technique for real time monitoring of energy consumption using mobile application. Here we present ingenious energy management system using IOT and circuit breakers. Here we separate the overall load consumption into two as essential and miscellaneous. To bring awareness among the people, we alert the consumers by a notification. IOT operation is performed by Wi-Fi device which sends the meter data by using meter module to the web page through the IP address. This is used for Electricity board to continuously monitor the consumption of power and billing information that is calculated using microcontroller.

KEYWORDS: IOT, Monitoring, Energy Metering, Wifi, Blynk Application, NodeMcu Esp 8266.

I.INTRODUCTION

The data collection of energy consumed by the consumer and monitoring of the distribution of energy are very necessary need in the energy visualization and analysis. Electricity has become one of many necessities of our everyday life. The right use of electric is very important to provide this valuable resource to as many people as possible. The efficient use of electric energy is highly dependent on energy metering. This paper presents an idea or a concept for smart home. Smart home or home can be said as the residential extension, it also involves the automation and controlling of both necessary and un nessccary load, which uses Wi-Fi for monitoring. Also with the help of Wi-Fi module nodemcu ESP8266, the consumer can monitor his consumed reading as a daily report and can set the threshold value through the Application. This system also can be used to disconnect the power supply of the house or industry when needed. Date is collected with help of nodemcu ESP8266 and Firebase (On Daily report). Whenever there is an increase in the consumption of power by any of the home appliance, the system will keep a check of it. The main aim of the project is to replace the existing manual reading of electricity meters and unknown facts of monthly usage and fare. The proposed project is designed for reading electrical energy in mobile application as a daily report and circuit breakers to maintain the consumption and fare.

Electricity is the heart of today's world and now due to digitalization it became key aspect to be taken care, which will enhance the way of living of people and economic development of our country. For the past decades, there is a lack of technological advancement for the basic structure of power grid which involves lack of knowledge in power usage and also tedious billing system through a dedicated worker need to take out the bill from meter and gives to the particular consumer area by area, in addition to mistakes like extra billing amount notifications from the electricity production board even bills are paid by the consumer, are quite common. In some areas cameras also used to take the reading but it is not so user friendly. All the above mentioned problems can be solved by using Internet of Things based power management system which keeps track of consumer loads in order to accurate billing, awareness about the power consumption and a way to save the wastage of power by using some threshold values which will turn off the required load through relay as per the requirement. This paper mainly focuses on power management system which utilizes Internet of Things (IoT) in order to improve the power management levels and smart billing system with the help of smart meters and smart grids. Thus the hardware implemented and results are taken and here we represented the total working system report with the obtained result and reports. We had the Blynk Application for providing the required data and It gives the clarity about the results. These server saves the daily calculated data obtained from the microcontroller. And these helps to have the clean report for a months and years.

II.SYSTEM MODEL AND ASSUMPTIONS

As in our state the electricity energy billing duration is at end of two months. Thus during the mid of months the consumer is not having the awareness of how much the power is consumed, they can only know at the end of one or two months when the bill is issued. Where the consumer cannot track the usage of the power on the real time. Thus

users face trouble in managing power consumption. We are not aware the fare till the end of the month, which cause problem in budget in every families. In case of any theft or short circuited or overload problems are not spotted and thus cause a huge amount of fare unnecessarily. Another disadvantage of this system is we don't have any limits and no caution when over use of power consumption. We don't have wireless communication which control the energy of total house. And there is no separate application Separate Application developed to embed the system with it using the Internet and It is done with wifi modules. And it is operated at anyplace and anytime. All statically date can be analyzed in the application and here limits can be set and which knew about the monthly bail at advance and limit the tariff. Here we embed with motion sensing device to control the wastage of the load by analyzing the presence of the people at a particular area. All energy management is connected and comes under a single application and which makes so easier to control. Energy is calculated by voltage, current, and time , and they are sent to the app and mark a limit for the energy usage per day and maintain the every load by authorizing the app. Once the app authorities by user, then the information received and using relay the high voltage device are shutdown. These system is properly monitored and maintain the fare as you decide. It stops the unnecessary fare and helps to know the fare on before. By additional motion sensing for monitoring the load for a particular area Control them, thus power efficiency increases.

The main objective of the project is to design a proper energy management system to control and monitoring the energy usage and prevention of fare. Energy is calculated by voltage, current, and time , and they are sent to the app and mark a limit for the energy usage per day. Once the app authorities by user, then the information received and using relay the high voltage device are shutdown .These system is properly monitored and maintain the fare as you decide. Energy management using the breakers are the one, which the total system is connected to the circuit breakers normally relay circuit. Our process is to monitoring the power system and here we separating the whole system into two parts namely Essential load and Normal load. And by the fixing of the monthly usage and rate, you can control the whole power system. Additional to that, we connected the system with motion sensing for the monitoring of load at particular area and controlling the unwanted load using the breakers . The total system is connected with the Nodemcu Esp 8266 Board and the system is created with separate app to personalize the needs you want.

IV.HARDWARE REQUIREMENT

The Components are connected and to form a EMS(Energy management system) and monitoring. Here we separate the total system is to two namely Monitoring and Switching loads. In which both input and output performance are done simultaneously. The overall measurement and controlled load are collected as data and they are maintained with the help of software and cloud server(Blynk). This Peacefair PZEM-004T Ac Multi-function Electric Energy Metering Power Monitor is very popular in electrical consumption measurement projects. It is capable of measuring four interrelated electrical variables as voltage, current, power, and energy. Simply power the board with a power supply (or you can use the AC source you are measuring) and connect the circular sensor to the board. Run the wire through the circular sensor and you`re ready to start measuring the voltage, current, and power. The circuit also comes with a TTL to USB adapter wire for easy connection to a computer or microcontroller.

This module features a TTL serial data communication interface, you can read and set the relevant parameters via the serial port; but if you want to communicate with a device which has USB or RS232 (such as computer), you need to be equipped with different TTL pinboard (USB communication needs to be equipped with TTL to USB pin board; RS232 communication needs to be equipped with TTL to RS232 pinboard). and display it on LCD and send the data to the Application through Blynk server.

V. RESULT AND DISCUSSION

The above figure shows the hardware implementation of the Energy management system using circuit breakers. Here we are using two SSR(Solid state relay) for controlling high capacity loads and 4 channel relay for low capacity loads. The data collected from the Pzem 004t sensor is saved and maintained in a cloud server named as Blynk server. Here the separate server is maintained and the daily report is calibrated in the Application. In our project the main motive is to control the electric bill and make as your own budget. These reduce a huge problems in the budget of the family and Industries. The main aim of the project is to replace the existing manual reading of electricity meters and unknown facts of monthly usage and fare. The proposed project is designed for reading electrical energy in mobile application as a daily report and circuit breakers to maintain the consumption and fare.

Applications:
- Energy consumption units is display on LCD.
- Accessing information is easy for customer from energy meter through IoT
- Fare is maintained and make it as prepaid recharging.

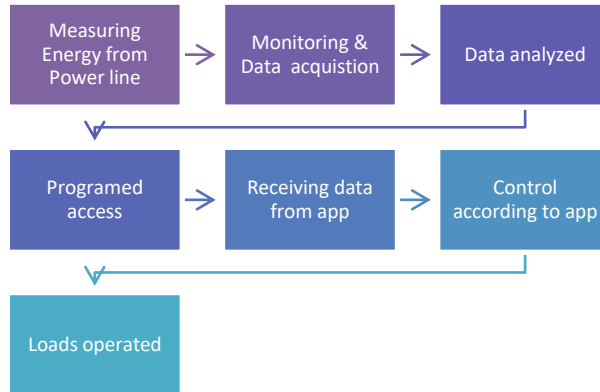- By using remote server disconnection of service.

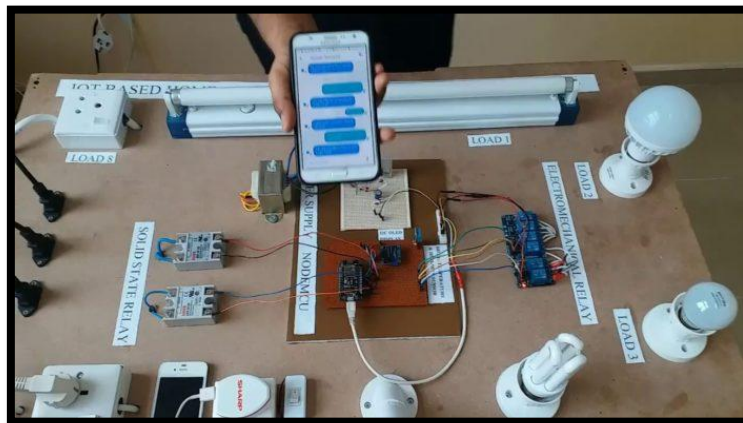

Fig 1.1 Functional Block Diagram
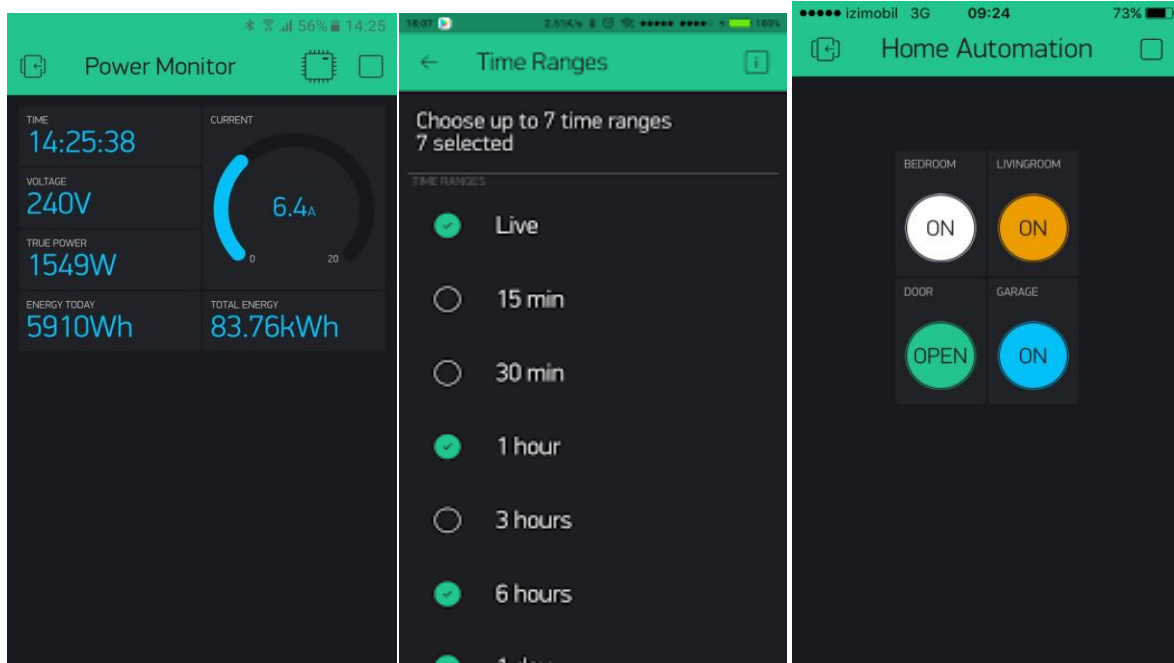

Fig 1.2 Hardware Implementation

Fig 1.3 Software Implementation(Blynk)

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering in less than 5 mints. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet of Your Things. Blynk Server is an Open-Source Netty based Java server, responsible for forwarding messages between Blynk mobile application and various microcontroller boards (i.e. Arduino, Raspberry Pi. Etc).Blynk Cloud is software written on Java using plain TCP/IP sockets and running on our server. Blynk iOS and Android apps connect to Blynk Cloud by default. Access is free for every Blynk user. To run Blynk Server, all we need is Java Runtime Environment. The below figure shows the notification on the mobile app using the Thing speak mobile application and Virtunio application. Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. There are three major components in the platform:

Blynk App: – It allows you to create amazing interfaces for your projects using various widgets which are provided.
Blynk Server: – It is responsible for all the communications between the smartphone and hardware. You can use the Blynk Cloud or run your private Blynk server locally. It's opensource, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
Blynk Libraries: – It enables communication, for all the popular hardware platforms, with the server and process all the incoming and outcoming commands.
Now imagine, every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.

VI.CONCLUSION

The integration of hardware and software in proposed system can switch on the user's power consumption for crossing the threshold of electricity usage through notification in consonance with TNEB tariff . All energy management is connected and comes under a single application and which makes so easier to control. Energy is calculated by voltage, current, and time , and they are sent to the app and mark a limit for the energy usage per day and maintain the every load by authorizing the app. The system can be operated from long distances irrespective of time and more efficiently by IoT technology. Improved security, Cost efficient and highly reliable, Helps in successfully controlling energy use, Wastage of energy is avoided, Meter reading can be accessed from anywhere on the globe at anytime, Offering more detailed feedback on energy used by the consumer enabling them to lower their consumption rate, This system discards the human involvement in energy management, As the real time monitoring which helps in comparing the energy bills of every previous month and years to get a prior knowledge about the consumption of energy, Through mobile applications we can convert the readings in a excel sheet for comparison.

REFERENCES

[1].   Jaanaa Rubavathy.S, P.Bavithra, M.Harsha Priya and R.Umamageshwari (2018), "Android Based Voice Controlled Smart Wheelchair", International Research Journal of Engineering and Technology(IRJET),p-ISSN: 2395-0072, Vol. 05 Issue: 01,Jan-2018,pp. 1446-1451.

[2].   Sagar Pattil and Gopal Pawaskar "Electrical power theft detection and wireless meter reading", international journel of innovative research in science and technology, Vol.2 issue 4, April 2013

[3].   Ministry of International Trade and Industry, "Fundamental Policies for Rational Use of Energy," July 1993

[4].   A.H. Nizar and Z.Y. Dong, "Identification and detection of electricity customer behaviour irregularities," in proceedings of IEEE Power Systems Conference and Exposition, pp. 1-10, Mar. 2009.

[5].   A.Pasdar and S.Mirzakuchaki, "A solution to remote detecting of illegalelectricity usage based on smart metering," proceedings of 2ndInternational Workshop on Soft Computing Applications, pp. 163-167, Aug. 2007.

[6].   S. De, R. Anand, A. Naveen, and S.Moinuddin, "E-metering solution for checking energy thefts and streamlining revenue collection in India," Proc. IEEE PES Transmission and Distribution Conference and Exposition, Dallas, TX, Sep. 2003, pp. 654–658.

[7].   Martini; Riyanto, I.; Adiyarta, K.; Suparmoko, M. An Effort to Lower Electricity Bill in University Building by Automatic Lighting Switches Application. Pertan. J. Soc. Sci. Human. 2018, 26, 11–19.

[8].   Md.Masudur Rahman and Noor-E-Jannat "Ardunio and GSM based energy meter for advanced metering and billing system," 2nd international conference on electrical engineering and information & Communication Technology, May 2015.

[9].   Ministry of Public Management, Home Affairs, Posts and Telecommunications,   Information and communication in Japan2002.

[10].   Jansson, G.; Schade, J.; Olofsson, T. Requirements management for the design of energy efficient buildings. J. Inform. Technology.