



SMART ELECTRICITY METER AND MONITORING USING IOT

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Abstract: In the most of the developing countries, the effort of collecting electricity utility meter reading and detecting illegal usage of electricity is a very difficult and time consuming task which requires a lot of human resources. Energy meter reading and monitoring system using Internet of Things (IoT) presents an efficient and cost-effective way to transfer the information of energy consumed by the consumer as well as it provides facilities to detect the illegal usage of the electricity with the help of wireless communication.

Aim of this study is to measure electricity consumption in the household and generate its bill automatically using IoT and telemetric communication techniques. Also this study aims to detect and control the energy theft. The Arduino microcontroller is employed to coordinate the activities with digital energy meter system and to connect the system to a WiFi network and subsequently to the Internet and Server. It has the facility to disconnect and reconnect the electricity supply automatically. The proposed system is capable of continuously monitor and being notified about the number of units consumed to the energy provider and consumer. The energy consumptions are calculated automatically and the bill is updated on the internet by using a network of Internet of Things. This automation can reduce the needs of the manual labours.

Keywords - ATMEGA328P Microcontroller, ESP8266 Wi-Fi Module, Energy Metre, Blynk, IoT, Energy Monitoring

I. INTRODUCTION

To measure the amount of energy consumed by domestic, commercial and industrial user, energy meter is being used. As the population of energy consumers are gradually increasing the smart energy meter helps to ease the energy management system. The paper depicts the solution for reducing human involvement in energy management for the domestic and industrial consumers. All the data monitoring is done via a web based portal provided with a dedicated internet connection. The system has to be made in such a way that the power consumption is analysed properly. Currently the system we use required human involvement which leads to the time consumption also, it has always been a necessity that a particular individual or person from the energy department should visit the consumer house and note down the readings and therefore errors can get introduced. So in order to overcome the stress, smart energy meter is introduced. In this work, the system uses Atmega328p microcontroller because it is energy efficient hence it consumes less power.

The system will combine with the energy meter which is already installed in place of residence. The consumer can easily access the figures of energy meter through a Blynk Application. The distribution companies are unable to keep track of the changing maximum demand of consumers due to this consumer is facing problems like receiving due bills for the bills that have already been paid. So to overcome these problems the remedy

is to keep track of the consumers load on timely basis, which will help to assure accurate billing. By considering the present scenario it is important to build an efficient energy meter.

The present project “Smart Energy Meter and Monitoring Using IoT” addresses the problem faced by both the consumers and the distribution companies. This system make it easier for the electricity department to read the meter readings monthly without a labour work. This can be achieved by the use of Atmega328p unit that continuously monitor and records the energy meter reading in its memory location. The consumers can continuously record the reading and the live meter reading can be access to the consumer on request.

II. LITERATURE SURVEY

Nazia Sulthana et al.,[1]Proposed “Smart Energy Meter and Monitoring System Using IoT” The energy meter shows the amount of units consumed and transfers the data to both the consumer and to the electrical board using NodeMCU for data communication.

Prathik et al.,[2]Proposed “Smart Energy Meter Surveillance Using IoT” The proposed system gives information about energy consumption on daily basis, billing and payment through IoT, pre-intimation of shut down details and alert system. Manisha Tejwani et al.,[3]Proposed “IoT Based Smart Energy Meter Monitoring and Billing System”. This system access the energy consumed by the consumer from customer ID also consumer monitor the energy consumed per day and bill get generated on ThingSpeak App. The proposed model used to calculate energy consumption of household.

D. Sai Sowmika et al.,[4]Proposed “IoT Based Energy Monitoring System” Smart energy meter using IoT is designed based on to use the electricity in an optimised manner and reduce the power wastage.

Sr. No.	Paper Name	Technology/Methodology	Hardware Devices	Results
1.	“Smart Energy Meter and Monitoring System Using IoT”	NodeMCU	Power Supply, Meter, Relay.	This system provides human automation through an app developed and power management done, also it can receive monthly energy consumption from a remote location directly to centralized office.
2.	“Smart Energy Meter Surveillance Using IoT”	Alert system	LCD Display, ESP8266, Flash ADC.	By using Arduino ESP8266 MC, it overcomes the disadvantages in traditional meters also all the details send to the customers mobile through IoT and GSM module.
3.	“IoT Based Smart Energy Meter Monitoring and Billing System”	ThingSpeak App	NodeMCU, LCD, ATmega328, Transformer.	This system keep track of unit consumption and accordingly generates bill which can be access by consumer by webpage and consumer can monitor date and bill in the graph on ThingSpeak app.
4.	“IoT Based Energy	AC3712 Current Sensor	Arduino, SMPS Board, PIR	The load automatically shut off and message is send to mobile

	Monitoring System”		Sensor, ESP8266 WiFi Module, GSM ThingSpeak.	number that we put the code here voltage an current values are constantly uploaded in the ThingSpeak app regardless of weather results an overload occurs.
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III. SYSTEM DESIGN

The design of the system includes power supply, Atemga328p Micro-controller, Esp8266 Wi-Fi module, Relay, Switch, LCD display. The load is driven by the relay which is connected to the Atemga328p and an Energy Meter, Wi-Fi modems to introduce ‘Smart’ concept.

The Wi-Fi modems assist the consumer to monitor the consumed readings. This system continuously monitors the energy meter and calculate the amount of units consumed and according to the consumed units the bill gets generated which can be accessed by the consumers on Blynk App. The units in the energy meter can also be shown by the Liquid Crystal Display i.e LCD.

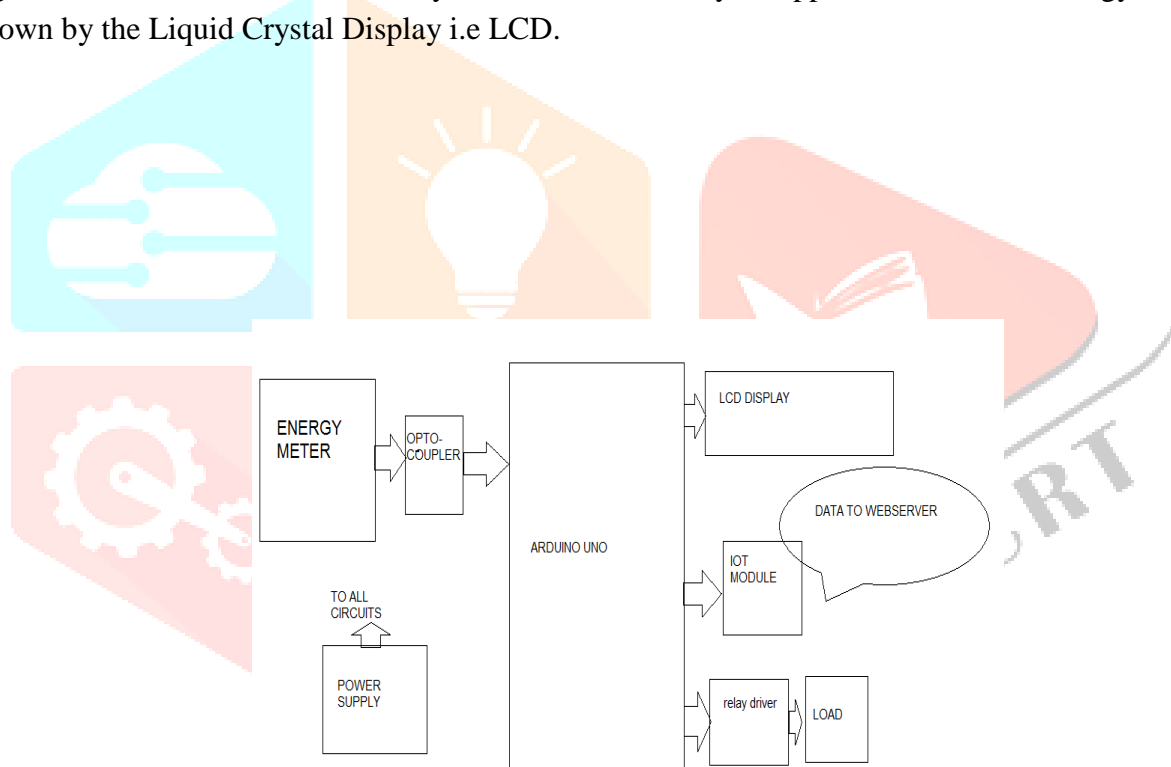


Fig 1 Block Diagram of Smart Electricity Meter

IV. METHODOLOGY

Designing a smart electricity meter and monitoring system using IoT involves a systematic methodology. Initially, you need to plan the project, gather specific requirements, and determine your target audience. Hardware selection is crucial, including microcontrollers, current and voltage sensors, and communication modules. These components must be integrated to collect real-time data on electricity usage accurately. The microcontroller is programmed to process and transmit this data to a central server or IoT platform via various connectivity options. Data storage and management are essential, ensuring data security and redundancy. Building a user-friendly realtime monitoring dashboard is pivotal for user engagement, while data analytics can provide insights into consumption patterns. Robust user authentication and security measures are crucial for data protection, and energy billing can help users manage their usage effectively. Scalability, regulatory compliance, and thorough testing are vital aspects, and once the system is ready, deployment and ongoing

maintenance ensure its reliability. User training and support complete the methodology for a successful smart electricity meter and monitoring system using IoT.

V. DESCRIPTION

The technology is getting upgraded every time. As the existing system uses more time consumption every user who is experienced in the existing system thinks of the system which consumes less time and added more flexibility. The proposed system uses Atmega328p microcontroller that can process the impulses taken from the Energy Meter. The consumer's energy meter is monitoring continuously and the number of pulses/units is displayed on the LCD. In the traditional energy meter there is LED which blinks 3200 times I.e 3200 pulses gives 1 unit of power consumption. But for this system 10 pulses gives 1 unit of power consumption, As per this knowledge the microcontroller IC counts the number of blinks and according to the number of units consumed the bill get generated also the real time analysis can be accessed by the Blynk App. It will increase the awareness about the daily consumption of energy.

VI. CONCLUSION

An electric meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customer's premises for billing purposes at the end of the month a person from the electricity department has to visit the consumer premises and note down the reading. This system makes trouble-free for electricity department to access the energy consumed by the consumer from the customer Id also the consumer monitor the energy consumed per day and every day bill get generated on the webpage. The system reads the data from the energy meter without tampering it, the proposed model is used to calculate the energy consumption of the household. Hence the wastage of energy is less and it also bring awareness among all.

VII. REFERENCES

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