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IOT Based Multipurpose Smart Power Monitoring System

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Abstract: Our present paper discusses about the Smart Power Monitoring System using IoT concept. In this method, we can recharge the amount by using prepaid billing method. It can give the accurate list of charges. By using this smart technique, we can avoid the problems like thefting of power and human errors like extra bills. It can also control the voltage drops. The final result is we can control the consumption of power and reduce the usage of power.
Keywords: Prepaid billing, extra bills, power theft.

I. INTRODUCTION

Actually a smart meter is an electronic device that records the consumption of electrical energy in each interval of time and communicates that information and daily back to the utility for monitoring and billing. By using these smart meters we can avoid non technical loss due to transmission of electrical energy. It had been very difficult for the utility companies to detect and fight the people responsible for theft. By using this technique when the power theft will happen, then the meter sends the notification to the consumer and the power supply will be stops automatically. In this way we can save the power. We can also control the voltage up and downs. A key advantage of smart metering is the visibility afforded the consumer to observe his energy usage. At homes, we can arrange the front panel LED indicators these are used to represent consumed energy it means a series of LEDs running from green to red it can provides a simple of indicating how much electricity is consumed. The consumption of electricity can also checked through our mobile phones at anywhere. It means the consumption of power will be displayed in the form of amount. The prepaid amount is stored in controller. Sensors sensed the power the sensing values are given to the microcontroller. Whenever the utilization cost values is equal to the prepaid amount, then the controller will turn off the power supply. We can also monitor the consumption of power through our mobile phones.

II. PROBLEM STATEMENT

Traditional energy meters' having the disadvantage is the consumer using this normal energy meters would not be able to get real value of their consumption usage and the another disadvantage is security and privacy, this system can be easily theft by consumer, such as by doing unethical tricks like by using magnet and other connection changes user can stop the meter while also getting energy, user will not be billed for this energy consumption. Hence, this system has moving characteristics, accuracy would be less. The solution to this challenge is described in this paper.

III. LITERATURE REVIEW

In this paper we are discussing about the smart energy meters uses and its applications. By using these smart meters the different applications are:

A. Household purposes
B. Industrial purposes
C. Agricultural purposes
D. Hospitals

The overview of this project is by using this smart meters technique we have lot of benefits compared to the normal energy meters. Those are:

E. Clear and accurate billin
F. Better and faster customer service
G. Human errors can be avoide
H. Daily monitoring basis
I. Time saving
J. Labour work can be avoided.

IV. COMPONENTS USED

A. The description of each component is as follows:

1) *Arduino At Mega 2560:* Smart energy meters are mainly based on Mega 2560 microcontroller. The experimental board is mainly based on the At Mega 2560.

Fig: Arduino At Mega 2560

The featues of Arduino At Mega 2560 are:
a) Operating voltage : 5v
b) Digital I/O pins : 54 (out of which 6 PWM outputs)
c) Analog input pins : 16
d) Input voltage (limits) : 6-20v
e) Clock speed : 16 MHz
f) Flash memory : 256 KB

2) *Arduino Uno:* It is the basic controller used in wireless colour indication system.

Fig: Arduino Uno

The features of this controller are:
a) Operating voltage : 5v
b) Digital I/O pins : 14
c) Analog input pins : 6
d) Input voltage : 6-20v
e) Clock speed : 16MHz
f) Flash memory : 32 KB

3) *Wi-Fi module ESP8266:* The ESP8266 Wi-Fi module is a self contained SOC (System On Chip) with integrated TCP protocal that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all networking functions from another application processor. Wi-Fi module is also used to send notifications for our mobile phones.

Fig: Wi-Fi module ESP8266

4) **Step Down Transformer:** Step down transformers are used to convert 120v to 5v and send it to the controller; why because of the controller requires 5v of voltage.
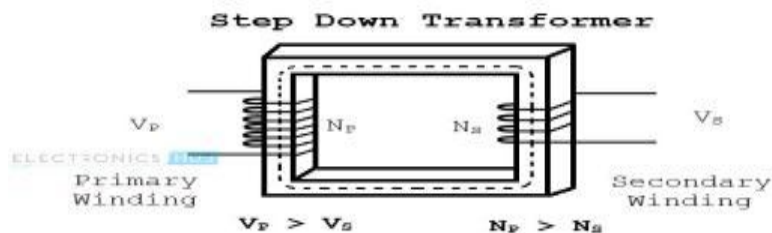

Fig: Step Down Transformer

5) **Smart Meter:** It is a new kind of electricity meter that can digitally sends the meter readings to the consumer for more accurate list of charges.

Fig: Smart Meter

6) **LCD Display:** A Liquid Crystal Display (LCD) is a flat panel display or other electronically modulated optical device that uses the light modulating properties of liquid crystal. Liquid crystals does not emits light directly, images in colour or monochrome. Here we are using the 16*2 LCD display.
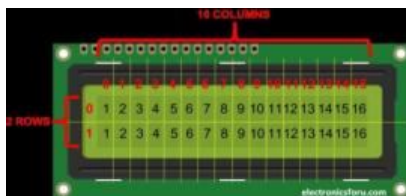

Fig: 16*2 LCD Display

7) **Front Panel LEDs:** An LED (Light Emitting Diode) is a flat panel display; it displays the capable of providing general illumination in addition to visual display. These are commonly used in destination signs on transport vehicles.

Fig: Front Panel LEDs

8) **Current Sensors:** A current sensor is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal can be used to display the measured current can be used for purpose of control.

Fig: Current Sensors

9) *Relay Drivers:* Relays are the components that permits a low power circuits to control signals or to switch high current ON and OFF which should be electrically isolated from controlling circuit.

Fig: Relay Drivers

10) *Zig-Bee:* The technology defined by the Zig-Bee specification is intended to be simpler and less expensive than other Wireless Personal Area Network (WPAN).

Fig: Zig-Bee

V. METHODOLOGY

Smart power meter is a future technology electronic device. The key feature of this meter is we can recharge the amount in meter through our mobile phones. By using network of internet of things the cost of energy consumed by the different devices in the house can be checked by the consumer at anywhere. We can control the loads like fan, light etc through our mobile phones only. The power supply will be given either through a battery or external supply. This method is known as prepaid billing method. In this technique, meter does not display the power consumption in the form of units; it will display the consumption of power in the form of list of charges. In this method, we can see the consumption of power by using different loads that was displays in LCD and also in our mobile phones. In that way we can easily save the consumption of power. In households, we can arrange the wireless colour indication system i.e. green to red. When the amount is zero then the lights will off. The total power supply will be stops. In this way we can reduce the consumption of power and saves the electricity. It will controls the voltage drops. The consumer can pay the electricity bill for the consumer power. If in case consumer fails to pay the bill then the electricity transmission will be automatically turns off. The main advantage of this method is that we can avoid the thefting problems, it means if any tampering happens in the power supply then the Wi-Fi module will sends a notification to our mobile phones. It is mostly happens in agriculture areas. By using normal energy meters the thefting was easily possible but there is no schemes for detecting the person who is the responsible for thefting. So by using this smart technique we can totally avoid the thefting problems and reduce the usage of power. By using this advanced meters we can also reduce the working of labours and also there is no chance of interference of third party between the energy provider and consumer. We can avoid some major problems like extra billing, human errors. We can control the power consumption by using our mobile phones only. So by using this smart idea we can monitor the consumption of power at anywhere in the earth.

VI. CONCLUSION

The complete working model of a smart energy meter was built which uses Arduino controllers. Automatic meter reading and individual device billing can be explained well using the system. Economical losses of electricity board can be minimized. Labour charges and efforts can be reduced. The error, time delay that occurs due to manual metering can be avoided to a greater extent. Electrical line fault detection has been made easy for the electricity board. Finally but not the least this type of meter supports remote metering which is the future of energy meter.

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