Smart energy meter driven via IOT

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ABSTRACT

The suggested solution aims to make the electricity grid completely automated. The Internet of Things (IOT) is a network of physical objects that do have connectivity, sensors, and electronics software to allow objects to gather and share data. IOT-based automatic meter reading is a method that employs energy meters to automatically gather data, upload it to a server for invoicing, and then detect any tampering. The data is collected via a meter connected to the internet and display information on the LCD so that we can comprehend and read what is happening with the system. The LCD will display the current drawn as computed by the current transformer connected in with the load. This server data transfers a part of MSEB. The name of the power distribution board, "Maharashtra State Electricity Panel," is MSEB, which is not a technical term. The data is gathered by the internet, and when a key is pressed, the microcontroller sends an SMS to the transmitter via the internet in order to obtain the meter reading. Constantly reading and calculating each customer's bill is challenging. This will facilitate accurate and proper billing process reading. By ensuring that all of the features that an IOT-based smart energy meter can easily do.

***Keywords**: LCD, Smart Energy Meter, Current Transformer, Wi-Fi Module, max232, Optocoupler, Power Theft, Automatic billing.*

1.INTRODUCTION:

Energy distribution includes an important element called energy meter billing. Every time a meter reading and bill for the consumer are required, a representative from the authority is necessary. However, this caused a dilemma because manual reading requires effort, takes time, and may be inaccurate. Therefore, smart energy meters come with the ability to automatically read the meter and also have the ability to detect meter tempering by sending a message with the aid of IOT. When an electric system is overworked, it can also identify the fault and alert the user via message if excessive electricity is being used.

The issue of electricity theft exists today's energy meters, when there is no evidence of meter tampering are less reliable since they are less accurate. The IOT-based energy meter, on the other hand, has more features and protects consumers from overloading and unauthorized electricity theft. Passing a code, such as a password, from the board depending on customer bill payment via IOT can be used to automatically connect and disengage. By interacting with the distribution system and consumer energy meter, a malfunction in the distribution system can be located. There is a problem between the consumer and the distribution transformer if there is a supply in the circuit but none at the consumer's end. The electricity department can now read monthly meter readings without having to visit each residence thanks to this transformer. This can be done by using an Arduino device, which stores energy meter readings in nonvolatile memory and constantly records them. When necessary, this device also has the ability to cut off the home's power supply. This paper primarily discusses smart energy meters, which use hardware and software features of embedded systems. The paper describes the functions of an IOT-based smart energy meter. Additionally, a Wi-Fi modem allows the user to define threshold values via a webpage and track reading usage. Consumers can increase the threshold value and have the meter switch on automatically if they are aware of the threshold notification; otherwise, the meter turns off automatically.

Finally, on the first day of each month, a text service provider and the customer will both receive the whole monthly bill with the amount.

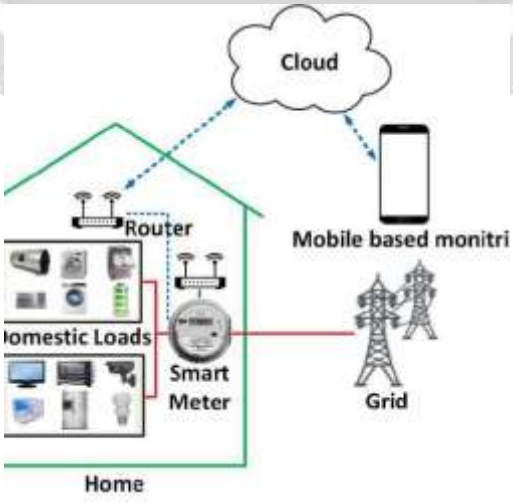
2.Working:

The LCD, sensors, current sensor, and voltage sensor are all present in this microcontroller unit. In the proposed system, we swap out the conventional meter for a metering module composed of a metering IC and a microcontroller that automatically reads the energy meter every month, transmits the information to customers, and suggests a service provider system. When any other events occur in the proposed system, such as tempering, overloading, or faults, this data is stored and sent via SMS to the customer with information about the billing amount.

IOT is only the Web Server, which serves as the conduit for communication between the customer and the service provider. The Internet of Things (IOT) is the global network that allows for constant online connectivity between stationary locations and mobile devices. Compared to SMS, data transfers are far less expensive. Through the use of RS-232, the 8051 microcontroller is connected to an energy meter and the primary controller, the PICF877A.

The energy meter is supplied with power in this setup. A GSM device demonstrates the microcontroller's interface. Using user MODEM, data is transferred to the office MODEM. Every single consumer has a unique number that is given to them by the authority.

3. ARCHITECTURAL MODEL:



Efficient Energy Meter:

An electronic device called a smart energy meter records electrical energy consumption at intervals of no more than an hour and transmits that data to the utility at least once per day for monitoring and invoicing. Two-way communication is made possible by smart meters.

Communication between the central system and the meter. To assess the amount of electricity consumed by loads like lights, fans, refrigerators, and other appliances, utilities, one of the electric departments, installs these gadgets everywhere, including residences, businesses, factories, and public buildings.Energy meters calculate the product of the voltage and current measurements and provide immediate power. The energy used over that time period is calculated by integrating this power over that time.

WLAN MODULE (ESP8266):

Wireless Fidelity is what Wi-Fi stands for. We are utilizing Wi-Fi, which is crucial in the IOT space. The consumer can adjust different threshold values via Wi-Fi in accordance with their needs and turn on or off the energy meter. The cost and unit readings are always shown on the website on the final day of the month. Additionally, Wi-Fi enables the Consumer to access the Arduino board and meter.

ADUNO NUO (ATMEGA 328):

The necessary system's brain is the Arduino board. The system's entire functioning and operations depend on this board. The optocoupler's 5V supply triggers an action from Arduino, which continues to count the supply before calculating the price and the amount of power used. The website continuously maintains this data so that users can access it whenever they want and verify their use. It even responds appropriately, as planned, to circumstances such as message forwarding or sending while threshold values are met, etc.

PIC 16 F877P microcontroller:

The PIC16f877A microcontroller is the one in use. The core controller is a mid-range family since it has an integrated SPI master. I/O lines in 16F877A are sufficient for the needs of the moment. It is equipped to start all intersystem connections and communications. Each system function must be controlled by the master controller using a supported device. The PIC16F877A comes equipped with 256 bytes of EEPROM data memory, an ICD, two comparators, eight channels of 10-bit Analog-to-Digital (A/D) converter, self-programming, two capture/compare/PWM functions, and a synchronous serial port that can be set up as either a 2-wire Inter Integrated Circuit (IC) bus or a 3-wire Serial (USART). It is perfect for higher level A/D applications in the automotive, industrial, appliance, and various consumer applications because to all of these advantages.

Module GSM:

A GSM modem is a specific type of modem that works with a SIM card and requires a mobile operator subscription, much like a cell phone or mobile phone. A GSM modem resembles a mobile phone from the viewpoint of a mobile operator. A mobile phone with GSM modem capability can also serve as a separate modem device using a serial, USB, or Bluetooth connection. A GSM modem is one that makes available a modem interface for numerous applications, including message sending and receiving. The mobile operator charges as if the sending and receiving of messages were done directly through with a mobile phone for this reason and process. in action A GSM modem must be able to send and receive SMS messages using an "extended AT command set" in order to perform these functions. With the proper cable and software driver, a normal GSM mobile phone might also function as a GSM modem when connected to a computer's serial port or USB port. The SMS/MMS Gateway can handle any phone that can send and receive SMS messages using the "expanded AT command set." Keep in mind that not all mobile phones are functional with this style of modem interface.

4. CIRCUIT DIAGRAM:

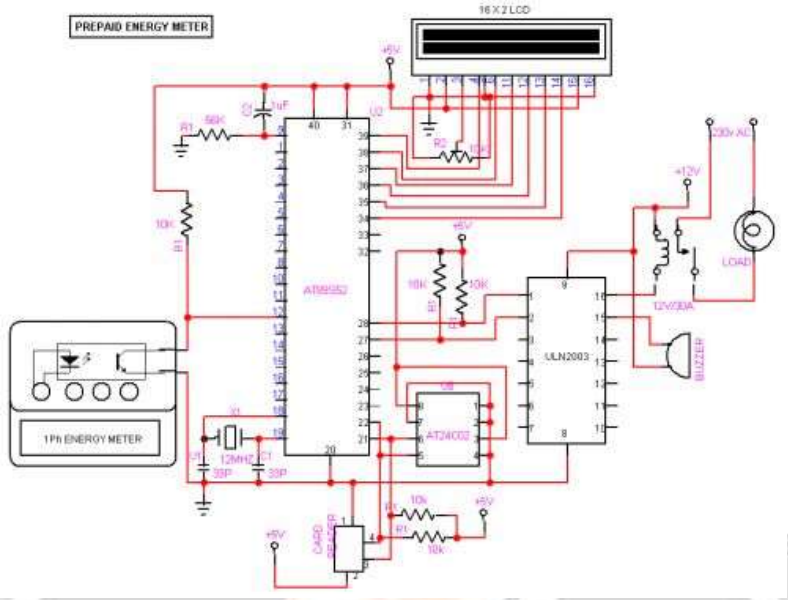


Fig 1: Circuit diagram of smart energy meter

1.Enabling the electricity user to cut costs by consuming more energy at off-peak chapter tariff times.
2.Allowing automatic control of electrical appliances.
3.Influence how often energy its consumers use.

5. Block diagram:

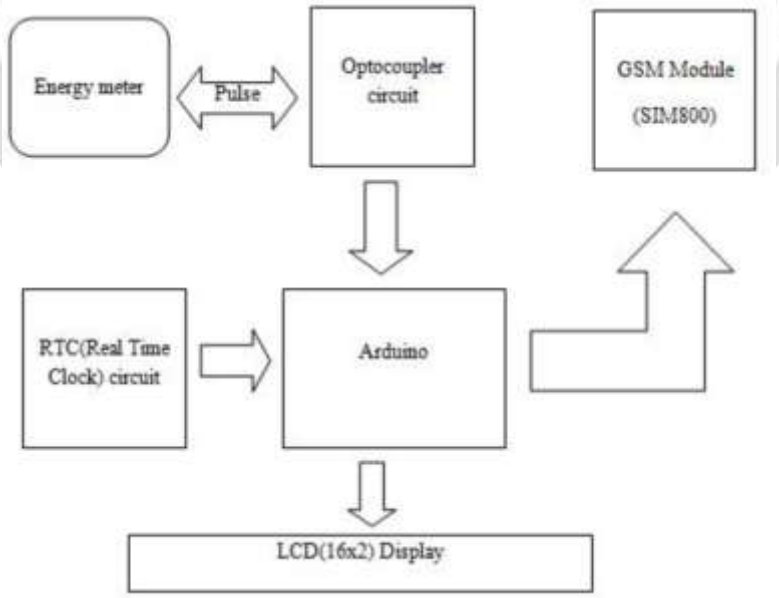


Fig 2: Block diagram of smart energy meter

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7. FEATURES OF SMART ENERGY METER:

1.We are able to remotely monitor a consumer's load usage.
2.The capacity to perceive anger.
3.We have remote control over the load.
4.Detecting theft is simple**.**

8. Conclusion:

A workable model of an "IoT Based Smart Energy Meter" has been attempted. The propagating model is used to estimate the household's energy usage and even makes it simple and precise to read energy units. As a result, it decreases energy waste and increases awareness among everyone. Even so, the manual intervention will be subtracted.

9. REFERENCES:

[1] http://www.mobilegpsonline.com/downloads/GM28-29%20Datasheet%20R1G.pdf
[2] http://www.mobilegpsonline.com/GSMJC01Spec.pdf
[3] http://www.visualgsm.com/wire_sms_index.htm
[4] http://en.wikipedia.org/wiki/Gsm
[5] Himshekhar Das, L.C.Saikia, “GSM Enabled Smart Energy Meter.
[6] Ofoegbu Osita Edward, “An Energy Meter Reader with Load Control Capacity.
[7] Yingying Cheng, Huaxiao Yang, Ji Xiao, Xingzhe Hou, “Running State Evaluation Of Electric Energy Meter”.
[8] Sahana M N, Anjana S, Ankith S,K Natarajan, K R Shobha, “Home energy management leveraging open IoT protocol stack, IEEE 2015.
[9] Luigi Martirano, Matteo Manganelli, Danilo Sbordone, ‘‘Design and classification, IEEE 2015.
[10] J. Widmer, Landis,” Billing metering using sampled values”, IEEE 2014.
[11] Cheng Pang,Valierry Vyatkin,Yinbai Deng, Majidi Sorouri, “Virtual smart meter IEEE 2013.
[12] Amit Bhimte, Rohit K. Mathew, Kumaravel S, “Development of smart energy meter, “IEEE INDICON 2015 1570186881”, 2015.