

# A SURVEY ON VARIOUS SMART ELECTRICITY METER AND BILLING SYSTEM

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## ABSTRACT

*A major and a very crucial part of government funds gets stuck with the people who have not cleared their bills on time and hence become due in forms of electricity bills, water bills, etc. But most of this amount is in the form of electricity bills whose dues are pending belongs to companies and other citizens who haven't cleared their electricity bills within the given time periods. There have been many approaches and solutions proposed by the researchers to address this problem hence to avoid the delayed collection of amount for the government. Some systems require barcodes while some require RFIDs and many other different requirements for different types of systems. This paper encloses the survey and study of various systems proposed for smart electricity billing mechanism using wide range of technologies. Post the survey, after analysis of drawbacks of the previously proposed systems, the proposed system has been given in short to overcome the existing systems drawbacks.*

**Keywords**— *Arduino, IOT (Internet of Things), android, Wi-Fi module, Bluetooth module.*

## I. INTRODUCTION

The world is changing towards a rapid growth of wireless and automation technologies, which not only try to reduce our extra efforts but also helps in the making of automation systems more and more efficient. A gadget is said to be sensible while it may decide what to do without any training and may paintings routinely. An electric powered or strength meter measures the overall electrical electricity in gadgets utilized by the home equipment which devour electrical electricity from the principle electricity supply. Electromechanical and electronic meter are two sorts of meter available inside the marketplace to measure the unit intake. Electromechanical meters are commonly used in village regions, where the makes use of of current era aren't as excessive as it is far in towns. Electromechanical meters have emerge as obsolete in recent times. Digital meters replace electromechanical meters. This meter includes lcd/caused show the studying. Calibration Led is used at the meter which indicates the gadgets consumed. Manpower is needed to read the meter and word down the studying. The studying on the meter is growing that is used to generate the electricity invoice. An IOT Based Smart Electricity Meter and billing System does the same task without human efforts. An IOT Based structure system is controlled using Arduino Mega, which is a microcontroller board. The purpose behind choosing this board is its efficiency and memory. It is more efficient in terms of memory and GPIO.

The facts acquired is then sent to the cloud thru the internet. Records obtained may be easily despatched wirelessly over lengthy distance with none noise disturbance the usage of the internet. As the information is directly sent to the cloud there may

be no prevalence of range and distance problem and is highly correct and efficient because of no human interference. Other wireless technology consisting of ZigBee, Bluetooth etc. have a very limited range hence cannot be used for long distance efficient data transfers. This project foresees the usage of the internet and the concept of IOT by which the base station, in addition to customers, remain up to date with the cutting-edge consumed units, converting the existing troubles faced through the power board and the person.

## HISTORY OF ELECTRICITY METER

The first correct recording strength intake meter turned into DC meter by means of Dr. Hermann Aron, who patented it in 1883. Hugo Hirst of the British well-known electric organisation introduces it commercially into Great Britain from 1888. An electricity meter, electric powered meter, electrical meter or energy meter is a tool that measures the quantity of electric power consumed by means of a local, agronomy, an industry, or an electrically powered device.

## II. LITERATURE SURVEY

[1] This research develops an idea of calculating a smart electricity bill using the ARM-7 controller. Due to this idea, it presents a well-planned value control of electricity billing. The existing electricity billing systems are discrete, erroneous, luxurious and time-consuming. They also are time and labour ingesting. This machine measures the strength intake through the IR sensor unit. After getting the energy intake the ARM processor will hit upon the unit pulse and the unit may be transformed as in line with our currency based totally on authority's tariff values and displayed on the LCD display for a particular person. Smart energy billing gadget also reduces the error made via humans while taking readings to a massive extent and there may be no want to take the studying in it. According to the strength consumption, the amount could be displayed at the LCD screen. A relay device has been used which shut down or disconnect the energy meter and load via supply mains whilst the client doesn't pay his invoice in the given time. Buzzer and LED's are used for indicating the charge of the bill by using the consumer.

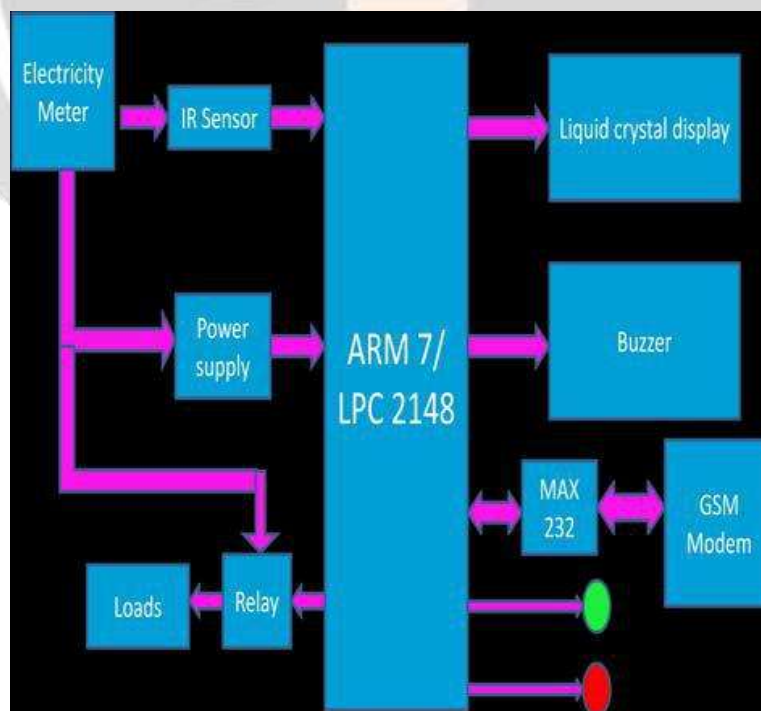
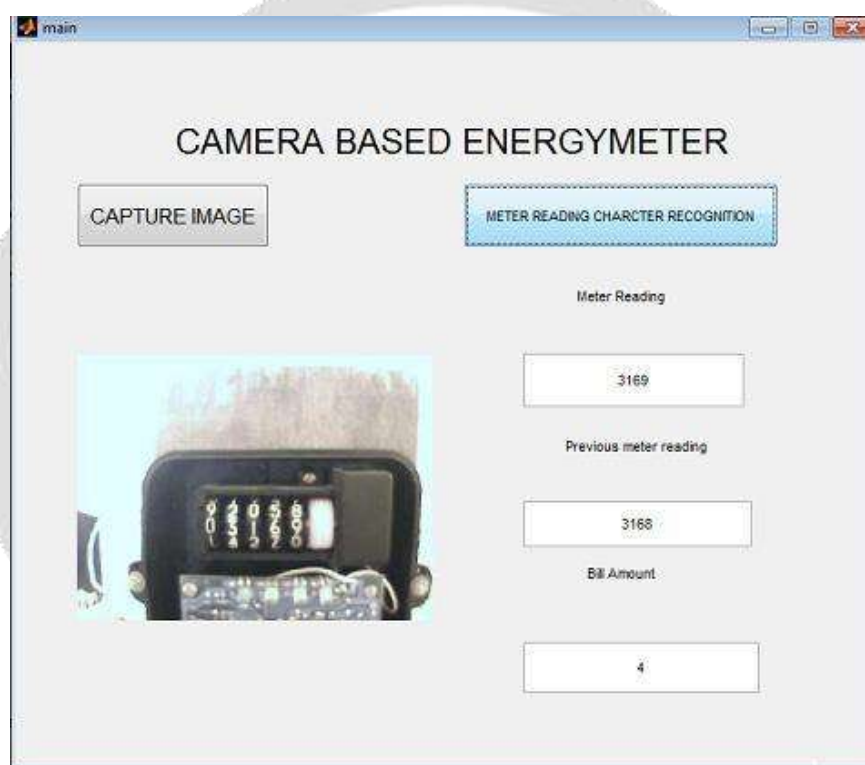


Fig.1. Block Diagram

**Advantage:** It can reduce problems associated with billing for the consumers living in inaccessible areas and reduce the deployment of manual efforts for taking meter readings.

**Limitations:** It is a time-consuming and complex system. It does not keep the information.

[2] Nowadays, power strength customers have extended in every region like rural, urban, residential, commercial and in an commercial vicinity. Thus it's miles very crucial to take care of the proper use of strength to generate accurate bills, invoices and try and reduce the frauds. Electromagnetic watt meter reading is performed manually and it calls for a massive variety of manpower. It is difficult to get admission to the meters at rural location, indoor meters and meters with obstacles. To conquer this here we are going to introduce automatic meter reading concepts (AMR) which automatically gather the intake of strength after which the device transfer that collected data to a primary database for billing. Because of those charges are reduced at the meter reader, his periodic trips to each house to examine a meter within the case when in the first trip analyzing isn't available. Here transistor-transistor logic (TTL) serial camera is used to take the picture and wirelessly send this to server Personal Computer (PC) in which it undergoes processing to extract digits and almost about a preceding month database new bill is generated with tariff consideration.



**Fig.2.Camera Meter Reading**

**Advantage:** This system overcome human work. This gadget additionally takes an automatic reading and create a database.

**Limitation:** ZigBee is used in the system so there is a limitation of range. Also faces the problem of image processing.

[3] Electricity is one of the fundamental requirements of human beings, which is generally used for domestic, commercial and agricultural purposes. Power robbery is the biggest trouble in recent days which causes a number of loss to power boards. In international locations like India, those situations. Are more often. If we are able to save you these thefts we can store quite a few energy. This is carried out using Smart Energy Meter (SEM). SEM is an electric device having electricity meter chip for measuring the electric power fed on and a Wi-Fi protocol for data communication. This paper affords a smart power meter for an automated metering and billing machine. In this meter electricity applied and the corresponding quantity may be displayed at the LCD constantly and communicated to the controlling base station. The feedback from the person facilitates in figuring out the usages between legal and unauthorized customers which facilitates in controlling the electricity robbery. Communication among consumer/household and substation is done the use of ZigBee. GSM community is used for sending SMS to the

local authorities concerning the robbery instances. This meter can paintings as either prepaid or post-paid meter. The proposed machine replaces traditional meter studying strategies and allows remote get entry to of existing energy meter by the power provider. Also, they can reveal the meter readings often without the man or woman visiting each residence.

**Advantage:** This paper is beneficial for overall improvement of the traffic waft and safety conditions.

**Limitation:** Its trouble is the limited time work.

[4] One can't imagine lifestyles with out power, as it's miles one's top requirement. Thus, there's a high want not handiest an green generation and transmission of power however the way it's getting used and measured at the time of billing. As per the modern scenario, manpower is required to collect information from meter studying and accordingly, the bill is being generated. As there's an involvement of human, it can be erroneous. Likewise, a human is worried in cutting the strength line if the invoice is due or unpaid by means of the purchaser which will be unsafe and risky. Not most effective this, a quite good quantity is paid for such undertaking every month that is a waste of money. Thus, the present methodology needs to be converted into an wise and green mechanism which would benefit both the ends i.e. the base station and the patron. In this paper, a wi-fi approach is proposed which places emphasis on Intelligent Energy meter (IEM) analyzing and invoice generation using Arduino Mega and Ethernet Shield. The monthly generated invoice may be despatched to the consumer thru SMS using GSM900 and electricity of unpaid consumers could be disconnected using a relay which might be controlled wirelessly the usage of the concept of the Internet of things (IoT).

**Advantage:** This system uses Arduino and GSM system for fast processing of data and also the customer gets notified through text message.

**Limitation:** Complex machine, Data primarily based managing is tough.

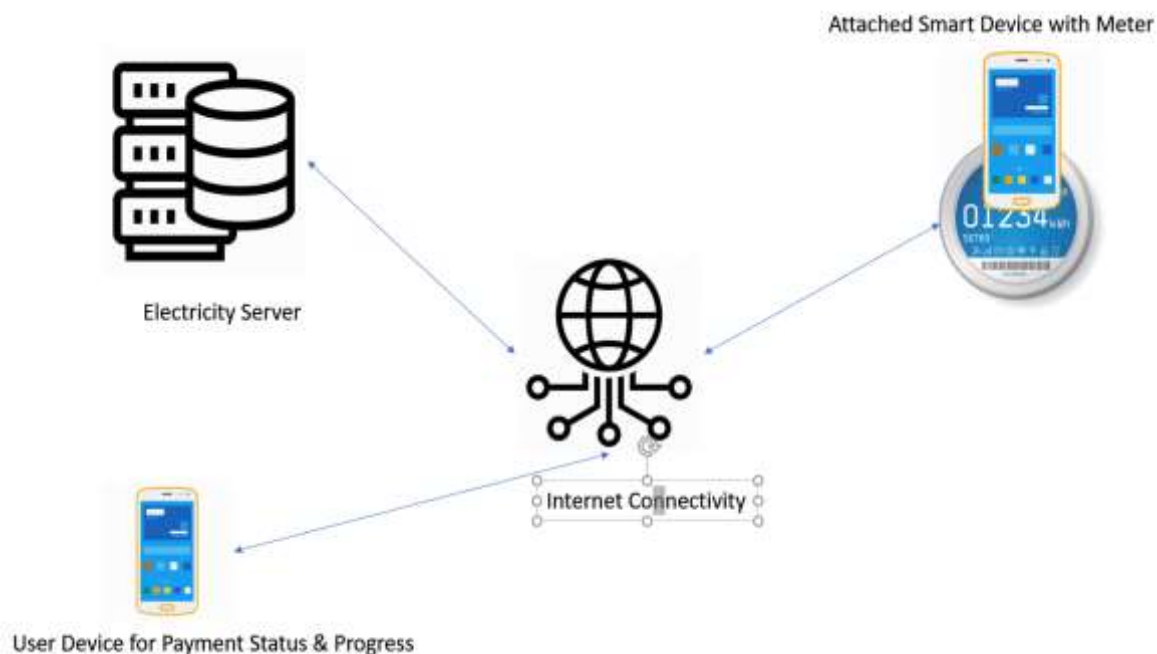
[5] The main concept of the task is to modernize our billing gadget the use of GSM. The GSM is a method works on the principle of TDMA "time division multiple get admission to and operates at the frequency off 900MHZ. The info of strength displaced inside the energy meter are transferred to the cellular the use of GSM and it also indicates the units fed on by means of the load. If the variety of units fed on by means of the total load exceeds certain restrict means it's going to give a warning based on tariff and additionally we're doing to show ON and flip OFF the load by way of setting a password to every load the usage of GSM technique. Thus, with the help of this project, we can reduce the energy bills.

**Advantage:** Uses TDMA technique.  
Better and enhanced load management..

**Limitation:** Uses GSM system.

### III. PROPOSED SYSTEM

There may be many disadvantages such as manual work, high rate of human error, fault meter readings for power consumption, whereas some systems use camera based image but still are not that much efficient and also face environment issues, theft, etc. To triumph over from these drawbacks in the proposed system with undue performance and heftiness the user who wishes to use electricity, needs to sign up first, and then the facts of consumer can be stored on the cloud. The admittance to the internet is through android which has specific MAC id so the exchange of meter can't be possible. The billing could be automated via the server-based unit. For defaulter, customer strength connection may be cut thru the relay on the electric meter. Thus, attendant work becomes avoided.



**Fig.2 System Architecture**

#### IV. ADVANTAGES

- [1] Zero Risk Of Power theft.
- [2] Human error rate tackled by eliminating human involvement.
- [3] Power intake and consumption devices control.
- [4] Cost efficient.
- [5] Easy and a non-corrupted connection.

#### V. LIMITATIONS

- [1] The electric units calculation of power consumption is time based.

#### VI. APPLICATIONS

- [1] The device may be used in the Domestic and Commercial vicinity for electric powered supply.
- [2] For Gas supply lines as well as Water supply.

#### VII. CONCLUSION

The existing system has a number of the troubles like guide work, human errors, misguided meter studying, corruption, Power theft. In the proposed system the electricity connection to each user may be given handiest to the registered person and the smart billing can be executed via IoT (Internet of Things).

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