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# Project based on IOT based Energy Meter Monitoring and Electricity Theft Detection with Dynamic Billing

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**ABSTRACT:** India faces the issue of energy theft at a very large scale. This project introduces a system that removes human intervention in meter readings and bill generation thereby reducing the error that usually causes chaos and energy related corruption. The energy consumption on time requirement basis consumption basis. Some of the issues of the existing systems are Every time we cannot check the meter and figure out the energy consumption manually. No alarming features if they consume excess energy than threshold limit. No transparency on unit charge while billing. In digital meters only the amount of energy consumed is displayed there is no past energy consumption history. In our project consumption of electricity can be monitored remotely. It could generate more accurate bills. We can also control the load (on/off) by sending a message also the bill will be generated after load is turned off. SMS can be sending to both the customer and the authorized electricity board, so that they can update the bill in online and we can pay via cashless transfer which will be useful in this hard times (lockdown).The system includes a provision of sending an SMS to user for update on energy consumption along with final bill generation along with the freedom of load re-configuration via SMS.The disconnection of power supply on demand or due to pending dues was implemented using a relay. Hardware implementation results suggest that the accuracy of the proposed system is slightly greater than that of existing smart meters. The cost of system has been estimated to be less than the available smart meters, offering the same functionality. Bilateral communication between user and system sets it apart from the commonly available smart meters.

**KEYWORDS:** Energy Consumption, IOT (Internet of Things) and Bilateral communication.

## I.INTRODUCTION

Energy consumption measurement is a major yardstick of a nation's progress today. It keeps the injudicious exploitation of energy in check, thereby reducing the gap between the ordinary and the privileged. The existence and need of energy measurement precede the actual onset of electricity consumption. In early 1870s, the time when gas lamps were the most popular source of energy, there existed gas meters to compute the energy consumed. Since then, the energy calibration process has come a long way. Edison's electrochemical meter for measuring DC didn't gain much popularity as it was labor intensive to read.

The disconnection of power supply on demand or due to pending dues was implemented using a relay. Hardware implementation results suggest that the accuracy of the proposed system is slightly greater than that of existing smart meters. The cost of system has been estimated to be less than the available smart meters, offering the same functionality. Bilateral communication between user and system sets it apart from the commonly available smart meters.

The outcome and benefits of proposed energy consumption as follows.

We came know that most of the public perceive that there is a mistake from government side that they were charging heavily on electricity bill during lockdown Period. In digital meters only units consumed is displayed but there is no

display of the amount to be paid [5]. They received heavy current bill than what they usually receive every month , it is may be because of many reasons such as usage of more electricity due to work from home culture, more people present in home back from hostels, other country etc, Also if the usage exceeds 200 units there will be an extra charge and there is no alert system to intimate in traditional energy meters and also the wastage of current by some busy individuals by not switching off the lights and fans when not in use due to their busy schedules and work. In order to replace outdated traditional energy meters with smart meters capable of automatic bill production and electricity monitoring charge for electricity generation and consumer transparency. This, in turn, lessens interpersonal conflicts and Government taxes and additional costs for power bills families, in these difficult times whenever individuals can keep track of your energy usage and pay the appropriate amount based on an hourly basis. to set up a warning system in case the metre is under a heavy load and using a lot of energy. Consumption exceeds the fundamental cap, hence establishing a connection between a mobile phone and an energy meter GSM is used for the transmission and reception of SMS-formatted data.

## II. PROPOSED SYSTEM

The system brings smartness in terms of bilateral communication and controlling of load. In case the user wants any information regarding the energy or wants to deter the load from the supply in between the period, it can be communicated easily through GSM by simply sending a text message .User can also refer to the server for necessary information. Whereas for wireless, GSM, Wi-Fi, or Zigbee technology can be used, Once bill is generated user has 15 days to pay his bill or else his supply will be disconnected using relay .

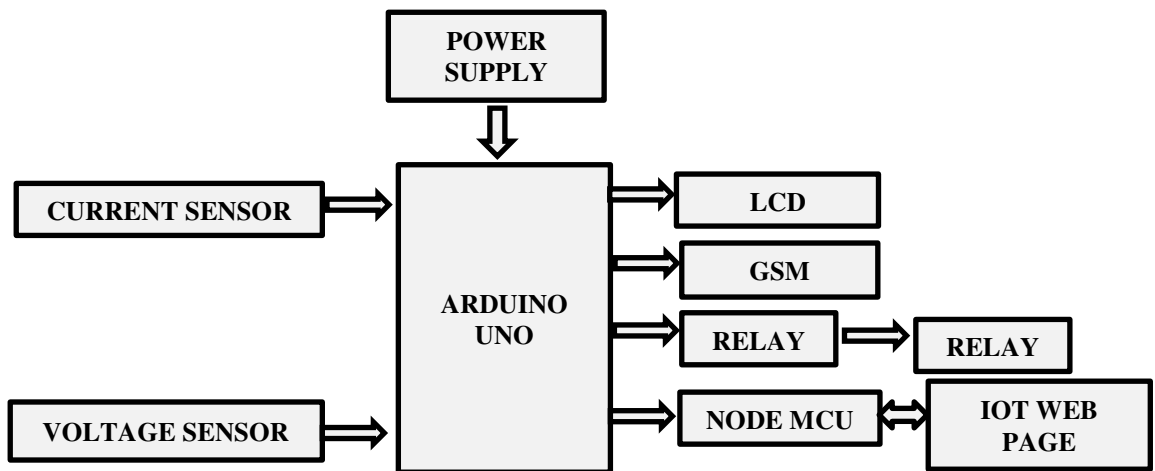


Fig. 1 Architecture of proposed system

Advantages:

- The security and the performance is high
- In this work, methodology to implement Monitoring system to get a details of the entire system parameters through to an IOT app.
- Low cost & High Efficiency
- Result can obtain and anywhere we can monitor the entire parameters.

## III. WORKING FLOW

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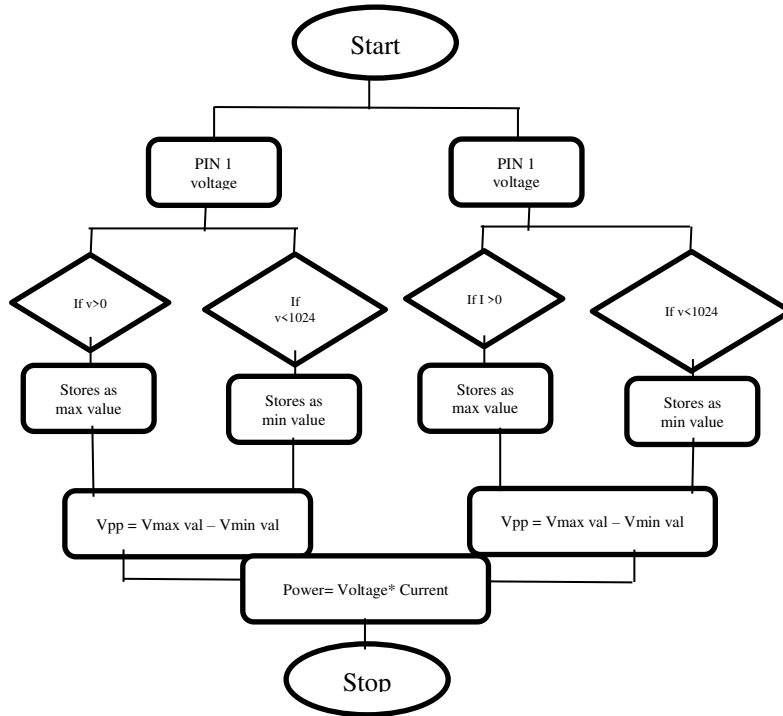


Fig. 2 Architecture of Workflow Chart

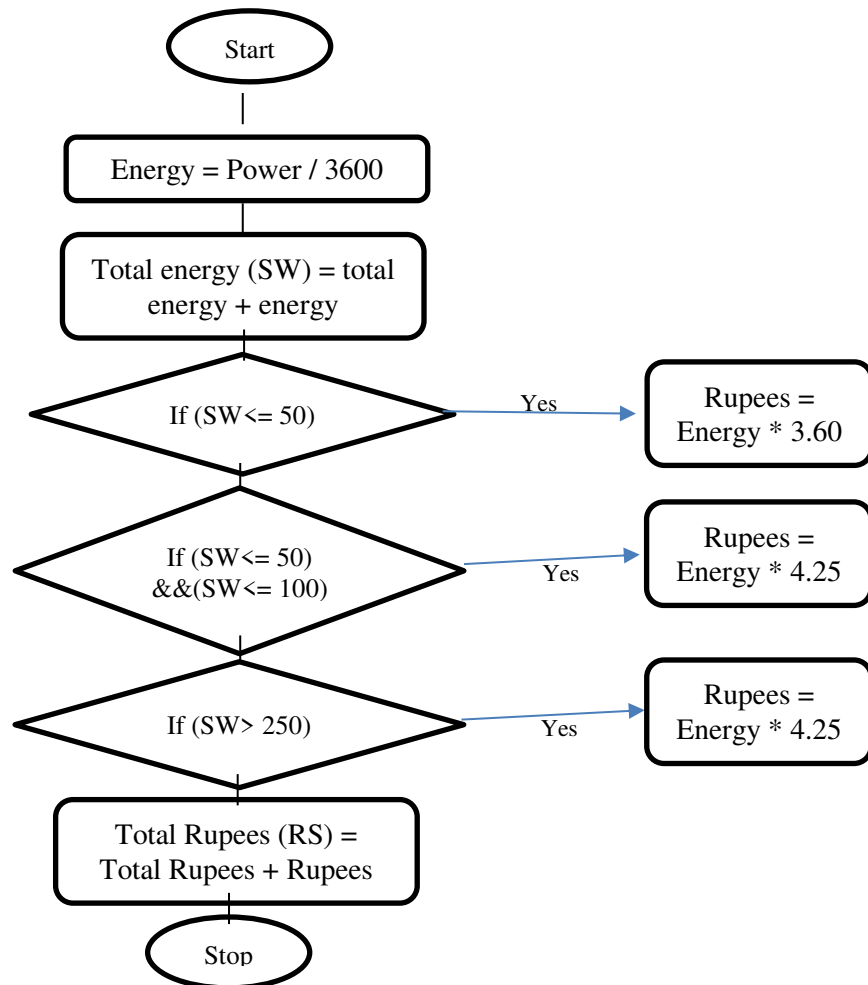


Fig. 3 Architecture of Cost for Electricity

### III. COMPONENTS DESCRIPTION

#### Arduino Microcontroller:

Arduino uno is the newest version of the normal Arduino USB board. We can connect this Arduino board with the computer using USB cable and then we need to program it and then we can use the board. It is a microcontroller having 14 pins based on ATmega328. In the fourteen digital input and output pins in which six pins are act as PWM outputs, another 6 acts as analog inputs, then a 16 MHz of ceramic resonator, a USB connector, an ICSP header, a power jack and a reset button. It exists everything that needed to hold up the microcontroller. We can easily attach it to a computer using a USB cable or we can use AC-to-DC adapter to the power or we can use a battery to get going. There are so many types of Arduino boards that can be maintained for different uses. For any type of Arduino board these components are common in them.

#### GSM Module:

GSM module is employed to send a message (SMS) to the registered user phone. When there is a detection of gas leakage by the gas sensor, microcontroller will send a signal to GSM module, during which one among the work is to deliver the text SMS. In the GSM module it will use SIM memory to save the data of the owner and the distributor or to whoever the messages got to be forwarded. It requires very less memory to send and receive messages and functions on simple 12 Volt supply.



### Energy Meter:

An electricity meter or an energy meter is an absolutely necessary device that goes with utilization of commercially issued energy. It authorizes systematic pricing of energy utilized by individual consumers and it quantifies. They are typically measured in billing units, the most commonly used one being the Kilowatts/ hour, that which is identical to the amount of total energy consumed by a load of 1 kilowatt over a period of 1 hour, or it can be written as 36,00,000 joules.

**Power Supply:** Power supply is termed as a device which is useful to supply the electric power to the required devices through it to the electrical load. The main function of the power supply is to change the electric current and then power the load.

We have three types of power supply:

1. Unregulated power supply
2. Simple regulated power supply
3. Regulated power supply

### Hardware Requirements:

- Power supply
- Arduino UNO board
- GSM Module
- Energy Meter
- Relay
- 16X2 LCD Display
- Bulbs – 4
- Mobile Phone and SIM cards.

### Software Requirements:

- Here we are using Arduino Software
- Messaging Application.
- EMBEDDED C
- Arduino Compiler

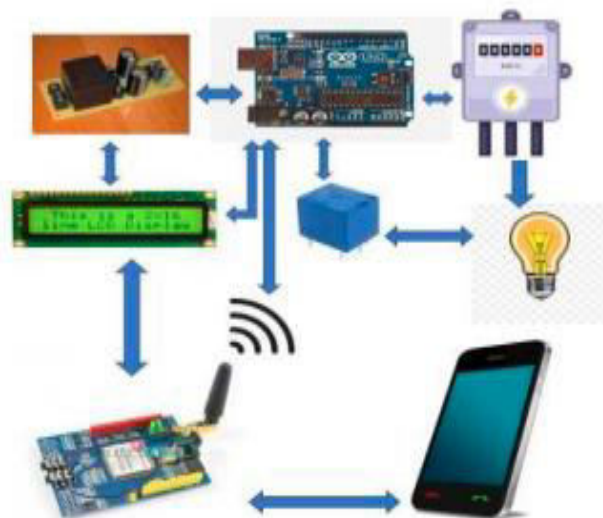


Fig. 4 Hardware Connection Setup



#### IV. METHODOLOGY

The components of this project—an Arduino board, a GSM module, a power supply, a relay, a 16X2 LCD display, and a load—are used to monitor electricity use and generate automatic bills. The Forwarding an SMS from a mobile device allows for load monitoring using an energy meter that is connected to a GSM module we may acquire the electricity bill because it is embedded in the system directly from the GSM Module to our cell phones indicating the quantity of units consumed. First, we pivot on the kit's power source and initialize it by pouring using a USB cord, connect an Arduino UNO board to the one can program software in the Arduino program and wait require the LCD to function before sending a message from a mobile device. Dial ON bulb 1, ON bulb 2, or ON ALL on your phone. GSM acquire the SMS and carries out the directives. Consequently, we can turn the load (bulb) ON or OFF.the energy meter in the system displays the reading, i.e., the number of units that have been used, as well as that sends the cost of electricity via GSM module for a mobile phone that shows the quantity of units along with the payment due, devoured.

#### V. RESULTS AND DISCUSSION

Hardware Connection: A microcontroller input is adequately interfaced to a computerized energy meter that takes the perusing from the energy meter and shows the equivalent on a LCD. The perusing of the energy meter is additionally shipped off the control room by a SMS by means of SIM stacked GSM modem. This GSM modem can likewise get orders from the phone to control the proprietor's electrical burdens. It utilizes a standard computerized energy meter that conveys yield heartbeats to the microcontroller to perform meaning important activity. On getting order it can turn ON/OFF the heaps.



Fig.5 Hardware photo of developed experimental



Fig.6 Mobile Messageof developed experimental



## VI. CONCLUSION

The aim is to create a user-friendly billing system with least human errors, by implementing modern technology that is compatible even with the old metering units. This device enables the users to easily monitor and track their energy usage. The system proves to be advantageous in such a way that the user receives updates on consumption through a message and can even disconnect the load from the supply when not required with a simple message. Based on survey we came to conclusion that most of the public wants to know the electricity consumption on daily, monthly and yearly basis. So they felt good if they can monitor their electric current usage their mobile phone and also they won't blame government anymore. The government transparency on unit current will increase so public will have good opinion on government. Till now we gathered the information which is required to implement the project we referred IEEE papers, searched on internet and you tube, referred some books, joined some online courses, analyzed the survey what the public felt, hardware design of the project and components required. In future we need to apply our design and implement it, along with that we will develop the mobile application where an individual can monitor the electricity usage, in order to develop an application we will do a course on android development and for data storage we use firebase. Firebase is a cloud platform which is provided by google for data storage. Thus, the entire system is a confluence of modern technology and existing electrical architecture that shall be user-friendly without affecting its simplicity in implementation.

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