

## A SURVEY ON IOT BASED REAL TIME ENERGY CONSUMPTION

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### ABSTRACT

On the updation of technology, every field is moving towards making systems automated, portable and easy to use. Supporting the change in time, the project proposes a technique for real time monitoring of energy consumption using smart energy meters connected with each other in a smart network and for theft analysis using IOT. Here we present ingenious energy theft detection with the boon of predicting consumer's ungenerous consumption pattern. To bring awareness among the people, we alert the consumers by a notification. IOT operation is performed by Wi-Fi device, which sends the meter data to the web page through the IP address. This is used for Electricity board to

continuously monitor the consumption of power and billing information that is calculated using microcontroller.

**Key Words:** Energy Meter, Electric board, Microcontroller, IoT, Sensor, Wi-Fi, webpage.

### INTRODUCTION

In the updating generation every one moving towards the portable and easy method of using every technologies, but not concentrating on the daily consumption of energy used by them, so the invention were takes place as energy management and monitoring which helps in effectively controlling of energy and avoiding energy wastage. The authorized person from the Tamil Nadu Electricity Board (TNEB) was being preceded by human operators at

consumer's service location to note down the consumed energy units and calculates the usage charge. In this even a single digit change while noting down the energy consumed readings may totally changes the calculation of the cost for the consumed units. This process of traditional meter reading which is time consuming and increase in the labour expenses. Therefore to new technology can be used (i.e.), the IOT based real time monitoring of energy. As per the TNEB tariff, if the usage of units goes beyond certain threshold units such as 100,200 and 500 units, base tariff amount changes to new tariff, so this causes consumer to pay extra money than the normal payment. Moreover, many people are not aware of this type of calculation in Electricity billing. Therefore, to bring awareness in the energy consumption for the consumer here we brought a system of IOT based

real time monitoring for the consumer. In the current situation, electricity theft has created a major impact and severe problems in the developing countries. To avoid such illegal consumption digital meters were implemented. Therefore, the following mode of operation using smart meters can identify the power theft by locating the area. Smart meters, together with the communication network and data management system, constitute the Automatic Metering Infrastructure (AMI), which plays a vital role in power delivery systems by recording the load profiles and facilitating bi-directional information flow.

### **OBJECTIVE**

Contemporary electric power systems face a significant challenge of both protecting their own infrastructure and ensuring the continuity of their services. Moreover, especially a big problem for the Electricity board

involves financial losses caused by electric energy. This system would provide a simple way to detect an electrical power theft without any human interface. It would provide a digital record in case of any judicial dispute. Energy management and monitoring has a significant role for the proper utilization and better energy management. Therefore, we design an IOT framework where a consumer can screen the energy utilization continuously and for monitoring the energy theft by Electricity board.

### **EXISTING SYSTEM**

In the traditional billing system, a person from Electricity board has to go each house and take the reading from each house's meter which is time consuming and also need lot of manpower. As in our state the electricity energy billing duration is at end of two months. Thus during the mid of month

the consumer is not having the awareness of how much the power is consumed, they can only know at the end of one or two months when the bill is issued. Where the consumer cannot track the usage of the power on the real time. Thus users face trouble in managing power consumption. Another disadvantage of this system is theft and such practices which is one of the major causes of power crises.

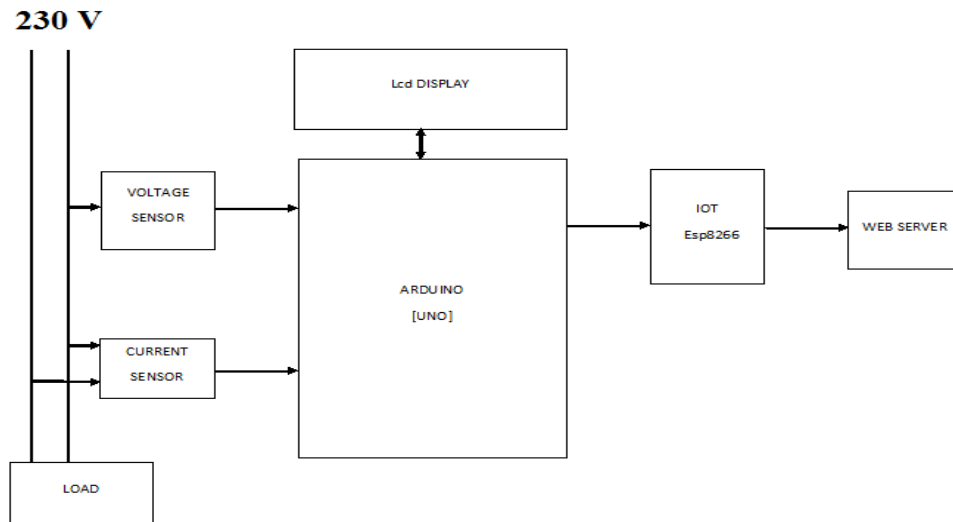
### **PROPOSED SYSTEM**

In the proposed system to eliminate the manual work and the human involvement in the meter reading we are using the concept of Internet of Things (IoT). This system which makes it possible for Electricity Boards to collect unit readings without using the manual involvement. The data, the unit consumed by the consumer which is collected at the consumer premises is loaded to the separate TNEB official

web server. A database at the server, that stores all the details including the consumer number, units consumed which will be only accessible to the authority. This is achieved by connecting the Arduino microcontroller with energy meter. In this paper we also suggests a method for effective energy management , to bring a awareness to consumer on billing pattern of TNEB and enables them to monitor the daily electricity consumption by using an android application and a website. The android application can monitor the power usage and can warn the users when power usage is getting close to the prescribed threshold energy level and alerts the consumer by notification if it exceeds. If the user fails to pay the electricity bill or if the is consumer is against of the rules and regulation of TNEB, then the server will automatically cut the power supply to the consumer. Electricity theft is a

social evil and which is increasing day by day , so a method for power theft detection and disconnection using the Automatic Metering Infrastructure (AMI). If there is any illegal connection it can be detected. The main advantage is that the power theft detected with the consumers number, which will be easy for the TNEB officials to take immediate actions on the consumer. If the power theft is identified in a locality the server automatically disconnect the illegal connection without human involvement.

**BLOCK DIAGRAMME**



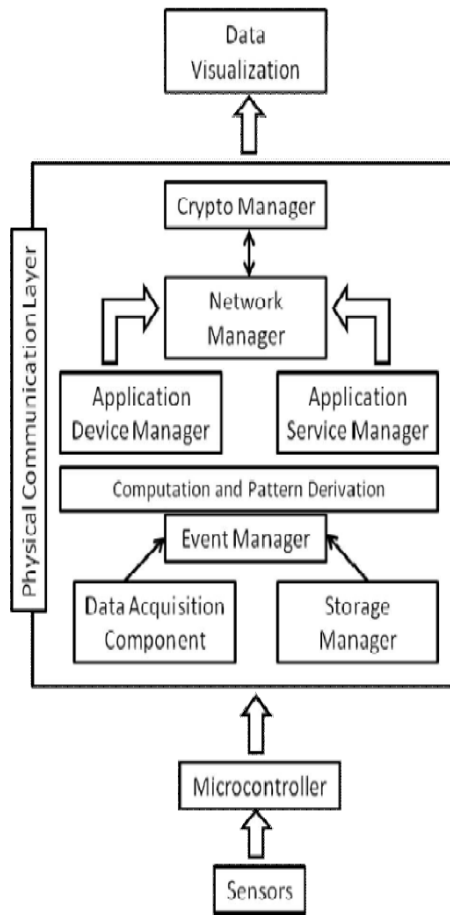
**SYSTEM ARCHITECTURE:**

**HARDWARE SPECIFICATION :**

- MICRO CONTROLLER
- RELAY
- CT
- PT
- LCD

**SOFTWARE SPECIFICATION :**

- WEBSERVER
- ARDUINO MICROCONTROLLER
- EMBEDDED COMPILER



## COMPONENTS USED:

### 1. ARDUINO UNO

Arduino UNO is ATmega328P-8 bit AVR family microcontroller. Its operating voltage is 5volts. It has six analog input pins i.e., A0 to A5. There are fourteen input or output pins, which

includes serial pins, external interrupt pins, PWM pins, SPI pins and in- built LED pin. Analog pin 4 is SDA and pin 5 is SCA, both are used for TWI communication using wire library. Generally, microcontroller consists of RESET, VCC, GND, clock signal pins.

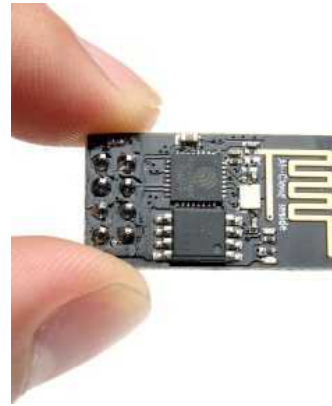
### 2. CURRENT SENSOR ACS712

The current sensor ACS712 is a device that works on the principle of Hall Effect phenomenon and detects the current in the designed path and transfers the reading to Arduino board. It operates from the range of 5V and gives an analog voltage as output which is proportional to the current sensed on the terminals. Both positive and negative poles of the sensor are connected respectively to the required path. Here the poles are connected to the phase and neutral of the single phase line

### 3. ESP8266 WIFI MODULE

The ESP8266 is a low cost wifi module which is interfaced with microcontrollers such as Arduino UNO. ESP8266 contains a built-in 32-bit low-power CPU, ROM and RAM. It is a complete and self-contained Wi-Fi network solution that can carry software applications as a stand-alone device or connected with a microcontroller

(MCU). The module has built-in AT Command firmware to be used with any MCU via COM port.



### 4. ENERGY METER

Energy meter is a device used to measure the amount of electrical load consumed by the users. They are calibrated by Kilowatt hour. Digital energy meters are mostly used for reading power consumption. The product of instantaneous current and voltage gives the instantaneous power. By integrating instantaneous power against time, the energy usage of the consumers is obtained.



## METHODOLOGY

**REAL TIME MONITORING OF ENERGY USING SMART ENERGY METER:** This system will provide the smart and secure infrastructure, where there is a provision for the supplier that they can monitor the power consumed by consumer. The electricity board maintains a server where each consumer is provided a smart meter. Smart energy meter is concerned with the automation of the electric billing system and provides a awareness of consumption of energy to the consumers. ESP8266 module and local network which are used by the server where the energy

meter is interfaced with the Arduino microcontroller using an interfacing device, Opto-coupler. The pulses from the energy meter using the calibration LED is detected by an Opto-coupler and it converts the pulses to electrical signals acting as counting pulses for the microcontroller. Based on these pulses, Arduino will automatically generate consumed unit and cost. The generated data is automatically updated to a central data base.

## CONCLUSION:

An attempt has been made to make a practical model of 'IoT Based Real Time Energy Monitoring Meter.' The propagated model is used to calculate the energy consumption of the household, and even make the energy unit reading to be handy. So the consumer can get awareness among the daily consumption of energy. Hence it reduces the wastage



of energy and Even it will deduct the manual interventions.

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