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# IOT BASED CONTROLLING AND MONITERING OF ENERGY METER USING ARM

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**Abstract:** In this present scenario IOT based applications are becoming more popular and provide effective solutions for many real time problems. We can see a person from electricity board standing in front of our house whose duty is to read the energy meter reading and handover the bills to the owner of that houses every month. According to the reading we must pay the bills. The main drawback of this system is that person has to go area by area and he has to read the meter of every house and handover the bills to TNEB. Many times, errors are occurred like extra bill amount due to human error. The proposed system eliminates human error in electricity billing. IoT-based applications are becoming more popular and provide effective solutions for many real time problems. In this paper, real-time monitoring and controlling system for residential energy meter is proposed. The presented system provides ubiquitous and continuous access to energy consumption to the consumer by the advancement of IoT technology The system consists of a digital energy meter, ESP8266 Wi-Fi module and web applications. The ESP8266 Wi-Fi module will be embedded into the meter and implement the TCP/IP protocol for the communications between the meter and web application. The experimental results show that the proposed system works very well with efficiency, and it is feasible to implement in practical applications, in a cost-effective manner.

**Keywords— energymeter,WI-FI module ESP8266, iot, UARTS, Electric board,** ***ARM controller, LCD diplay***

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## 1. INTRODUCTION

In the present billing system, the consumers are facing problems like receiving monthly electricity bills for poor quality electric supply. Moreover, when it comes to power theft India losses billions of rupees because of unbilled consumption and unlawful usage of electricity. To overcome the problems to keep track of consumers load on timely basis. which will have held to assume accurate billing, track maximum demand and detect threshold value. This are features to be considered of designing an efficient billing system. This paper deals with continuous automatic communication between consumer of energy meter and utility via internet. Which utilizes the features of embedded systems i.e. combination of hardware and software to implement desired functionality. The paper

discusses comparison of Arm and other controllers, and the application of Wi-Fi modems

to introduce 'Smart' concept. With the use of WI-FI module the consumer as well as service provider will get the used energy reading with the respective amount, Consumers will get to know the help of Wi-Fi modem the consumer can monitor his consumed reading and can set the threshold value through webpage.

This system enables the electricity department to read the meter readings monthly without a person visiting each house. This can be achieved by the use of ARM CORTEX unit that continuously monitor and records the energy meter reading in its permanent (non-volatile) memory location. This system continuously records the reading and the live meter reading can be displayed on webpage to the consumer on request. This system also can be used to disconnect the power supply of the house when needed. Theft in electricity produce non-technical losses. To reduce or control theft one can save his economic resources. IOT energy meter can be the best option to minimize electricity theft, because of its high security, best efficiency, and excellent resistance towards many of theft ideas in electromechanical meters. So, in this paper we have concentrated on both issues.

## 2. LITRETURE REVIEW

1. In this article fully based on controlling the various devices and monitoring energy consumption with the help of IOT present in [1]
2. This paper provide a real time-residential of energy monitoring system present in [2]
3. In this automatic meter reading system consist a GSM module. Automatically the readings are send to the GSM present in [3]
4. Design and implementation of wireless sensor network and protocol for smart energy meter present in [4]
5. GSM enabled smart energy meter and automation of home appliances present in [5]
6. An Energy Meter Reader with Load Control Capacity and Secure Switching Using a Password Based Relay Circuit, present in [6]

## 3. EXISTING SYSYTEM

In this project - IOT based controlling and monitoring of energy meter is implemented in two parts.

1. Hardware Implementation
2. Software Implementation

In this implemented system the hardware parts consist of LPC824 Microcontroller, Energy meter, LCD Display and ESP8266 Wi-Fi module. An electricity meter or energy meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device. In this project DLMS energy meter we are using. So, the proposed controlling and monitoring of energy meter measures the amount of power consumed by the consumer and it will be automatically upload in the cloud, from which the concerned person can view the reading. The power reading which is uploaded in the cloud using ESP 8266-Wi-Fi module. The power reading from

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energy meter is read through the IR probe and transmitted to the microcontroller. In software parts we are using the keil software , Flash magic tool and program where architected by EMBEDDED C.

## 4. PROPOSED SYSTEM

According to our proposal the IOT based controlling and monitoring of energy meter system IOT act like a heart. Since, IOT is the cost-effective method compared to other controlling and monitoring system. So, from this implementation in our TNEB department can easily monitor daily power consumption consumed by the consumer and, TNEB can control it from anywhere at any time. They can view the electric power reading through the internet. In this power reading upload in to the cloud at instantly similarly the consumer can also see the accurate readings of their own energy meter. This could be main advantage of this project. The power consumption data are always available in the cloud server. After succeeding this project, it will reduce the human errors and save cost along with time**.**

## 5. BLOCK DIAGRAM OF IOT BASED CONTROLLING AND MONITERING OF ENERGY METER.

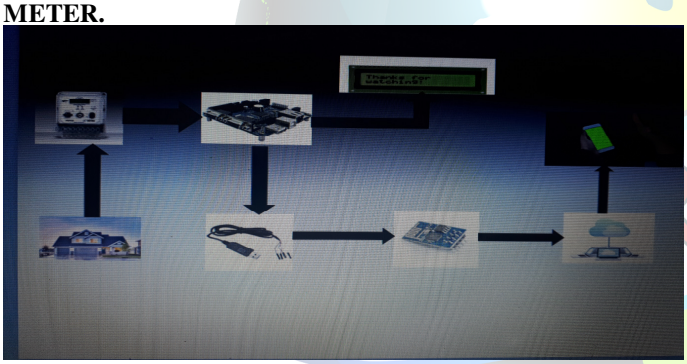

**Figure: 1**

This article proposes and analysis the system which is used for energy meter to control and monitoring with the help of IOT. Beyond this innovative work we are taking DLMS energy meter. From this energy meter we are getting the values with the help of IR probe from energy meter to microcontroller. This microcontroller takes the readings which send it to cloud using ESP8266 Wi-Fi module and Wi-Fi module provide a network facility for microcontroller. Then the values are show in the LCD display. From this LCD display we will see the consumed energy unit (Kwh). All these data are displayed in the LCD display

## 6. *INTERNET OF THINGS (IOT)*

In this modern world Internet of Things (IoT) is an important tool for automation. which means the network of physical object that are connected to the internet protocol which allow them to send, receive and exchange data. Integration of sensing and actuation systems, connected to the Internet, is likely to optimize energy consumption. It is expected that IoT devices will be integrated into all forms of energy consuming devices (switches, power outlets, bulbs, televisions, etc.) and be able to communicate with the utility supply company in order to effectively balance power generation and energy usage. Such devices would also offer the opportunity for users to remotely control their devices, or centrally manage them via a cloud-based interface, and enable advanced functions like scheduling (e.g., remotely powering on or off heating systems, controlling ovens, changing lighting conditions etc.).

## 7. ENERGY METER (DLMS)

The energy meter is an instrument which is used to measure the power consumed by the consumer. The DLMS (Device Language Massage Specification) energy meter used. Is Electromechanical meter consists of an aluminium disc positioned between two electromagnets, one of whose coil is connected to the load and is the current coil and the coil of another electromagnet is connected to the supply voltage. The interaction of the flux between the two coils is responsible for providing a torque to the disc, which starts rotating, with the revolutions proportional to the load current. The counter records the number of revolutions and displays them, which indicates the energy consumed.


**Figure 2**

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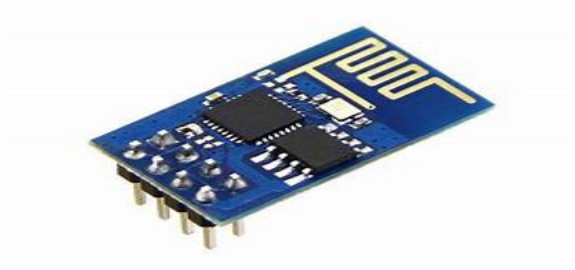
8.LPC824 MICROCONTROLLER

LPC824 microcontroller used in this project. It is a 32bit ARM cortex MO+ family. The LPC 824 microcontroller support up to 32 kb flash memory and 8 kb of RAM. In this microcontroller has four I2C, two SPI and three USARTS peripherals. The memory up to 32bit on chip flash memory with 64 byte writes and erase.

8.1 ESP8266 Wi-Fi MODULE

Wi-Fi ESP8266 is a low-cost chip with TCP/IP stack and microcontroller. In our project main importance of wi-fi is it performs IOT operation. The simple device is connected from microcontroller to send the information.



**ESP8266 WI-FI MODULE**

**Figure 3**

**8.2.LCD DISPLAY (2*16) SEGMENT**

In this project LCD 2*16 segment display we are using. A 16x2 LCD means it can display 16 characters per line and there are 2 LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. such lines.


**Figure 4**

**8.3 RELAY**

It is a relay which is electrically operated switch. Here JQC-(T73) DC 5V relay we are using. Two relays used in this

project for ON, OFF purpose**.**

**Figure 5**

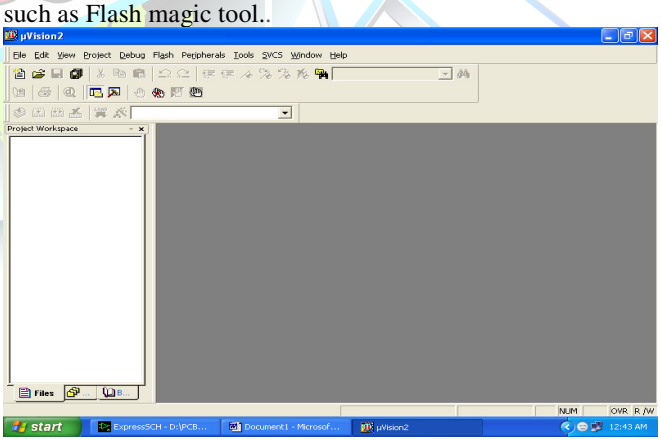
**9. SOFTWARE IMPLEMENTAION**

**9.1 Ubidots WEBSERVER**

It is a flat form of IOT. We can connect our hardware in ubidots device agnostic cloud and develop, store and can deliver our IOT.

**9.2 SOFTWARE IMPLEMENTATION**

In our project we are using Keli v5 IDE (Integrated Development Environment). Keli is a compiler that has 3 windows, project window, edit window, and build or command window. Keli compiler also supports the embedded c programing code. The compilation of the embedded c program converts it into machine language in hex file format. Keli Software provides a broad range of development tools for the embedded systems marketplace. The products also address about the various debugging tools such as Flash magic tool..




**PROJECT WINDOW 1**

**Figure 6**

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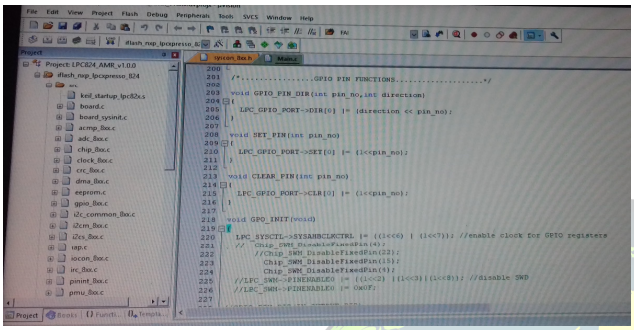
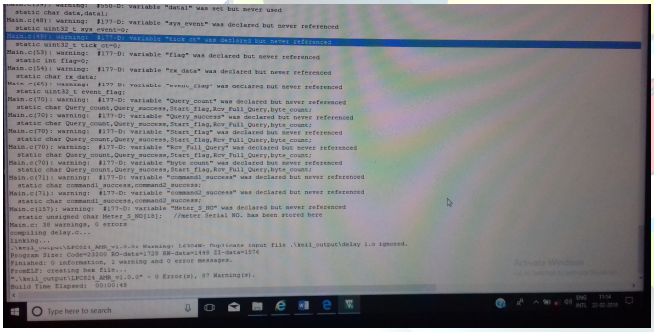
After initialisation the Keil IDE in our pc. Open the Keil icon. Then open the editor window. The editor window mainly used to edit the program. For this project we are using embedded C language. The editor window with the program shown in below figure.



**EDITING WINDOW 2**

**Figure 7**

After edit the program build the project using build option. The output of the program is available in output window. If there is any error occurred in the program, we can see an error in output window. The output window shows a result of the programme.

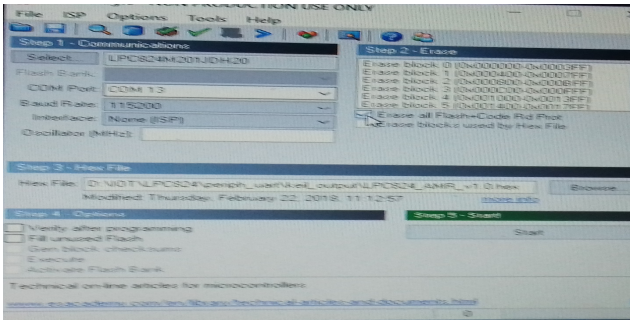


**BUILD or COMMAND WINDOW 3**

**Figure 8**

### 9.3 FLASH MAGIC

Flash Magic is a PC tool for programming flash-based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware.



**FLASH MAGIC WINDOW**

**Figure 9**

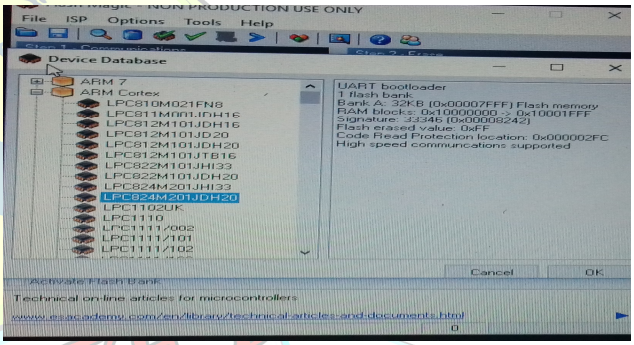


**Figure 10**

The flash magic window includes some options like select device, Baud rate Com Position etc… After setting these values in flash magic then we must to click the start option. After clicking this start option the program start to flash with the hardware. The hardware connected with pc.

## 10. RESULT

Finally , the project output shown in the ubidots web server. From this web server the officer able to view the meter readings. At the same time the TNEB officer can control the system in anywhere at any time. The output readings always available in graph format. In this ubidots server provide comprehensive meter reading like voltage, current values and total consumed unit in (kWh). These are the parameters we can able to see in ubidots webserver.

### 10.1 OUTPUT WINDOW FOR MONITERING

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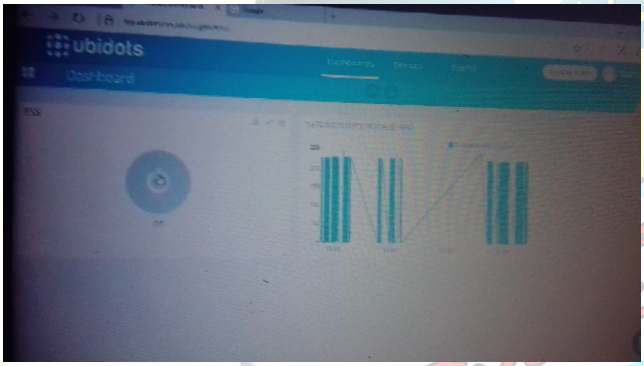
**Ubidots Webserver**

**MONITERING WINDOW**

**Figure11**

From this output of monitoring window show how much of power consumed by the consumer with the date and time.

### 10.2 OUTPUT WINDOW FOR CONTROLLING




**CONTROLLING WINDOW**

**Figure 12**

### 10.3 HARDWARE INTERFACE WITH PC

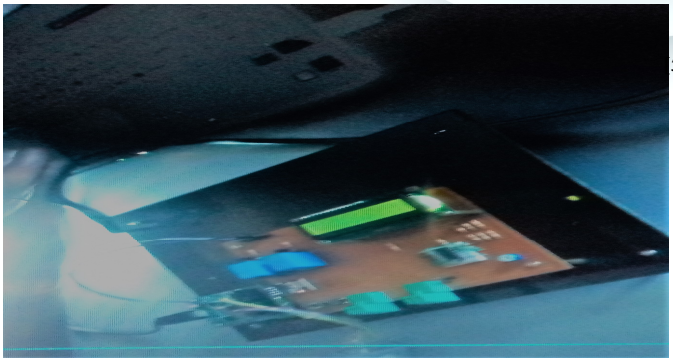


**Figure 13**

## CONCLUSION

The propagated model is used to control and monitor the energy meter through the internet. After completion this project our TNEB department can avoid lot of issues between the consumer and TNEB . And this project provides an accuracy in power consumption used by the consumer. From this implementation they can break the connection if user does not pay the bills after due time. There is no need for the electricity officials to visit the spot to disconnect the connections i.e., everything can be control over through the internet. Then users also can view the readings from the energy meter from the home. The energy meter displays the provided up to date information on electric power energy consumption.

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