"IOT BASED SMART ENERGY METER USING THEFT DETECTOIN"

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I. Abstract

In presence, India faces large scale of power crisis. Active power and reactive power monitoring system which works on Wi-Fi module is introduced in this project. Nowadays Energy data collection system is major part of research and development. Through this technique, if any consumer are consuming reactive power then their behaviour with energy uses can easily know and bill also get reduced. Wi-Fi based smart energy meter method is given in this paper to minimize electricity theft, absence of consumer can know reactive power consumption by connecting smart energy meter in office. There are many methods for assembly of energy detail uses. The main goal of the project is to start reducing reactive power consumption by IOT base, microcontroller and LDR sensors. Single phase induction motor are for reactive power consumption and Current Transformer (CT) which generates high amount of current. This all data, Sensors data are given to microcontroller and then it sends to Wi-Fi module according consumer know their power used. Then finally show all energy data, unit utilization, reactive power, penalty factor (power factor) on LCD.

The IoT based smart energy meter is based on Ardiuno. In this system we reduce the human participation in electrical energy maintenance. The theft of the electricity increases the costs paid by customer. Hence this system is used for the detection of theft. The Arduino checks the main meter and sub meter reading. If the difference between the main meter and sub meter is occurred then that theft has occurred message will be display on the LCD display and also display on the thingspeak.

Keywords-IoT, Arduino Uno, Energy meter, LCD Display, current sensor, Energy meter, IOT, WI-FI Module,

II. Introduction

Basically we know that energy meter. An energy meter is an electrical device that measure the electrical power being consumed. In the electricity energy meter shows only the unit of electricity. Energy meter is a measuring instrument to calculate the amount of electric energy consumed by electricity powdered devices. The energy metering which measure voltage, current & calculating active power can be used to increase usage efficiency of electricity. This projectpresents real time energy meter reading using current sensor, voltage sensors and ESP 32. Theenergy meter can display consume energy in kwh with their associated cost. It also provides short circuit protection and earth leakage protection An energy meter is an electrical device that measure the electrical power being consumed. But some time we have to face problems related to energy meters. i.e. In the electricity meter Shows only the unit of electricity used b[y us but common humans do not understand that. So, to Overcome this problems we are making smart energy meter. It is a advanced. In this circuitary Arduino used as a microcontroller. Project presents the real time energy meter reading using Voltage sensor, current sensor and Arduino. The meter can display consumed energy in kwh with Their associated cost. So, it became easy for us to understand how much money we got per unit . The meter also provide short circuit protection, overload protection, earth leakage protection and Give accurate readings because of that our Safety and security increased and also accuracy too.

III. OBJECTIVE

The objective of designing and implementing an IoT-based smart energy meter is to improve energy management and cost-saving strategies for both customers and utility companies. Here are some benefits of using an IoT-based smart energy meter:

- Real-time data: Customers can view their energy consumption data in real-time and adjust their usage.
- Better energy management: Utility companies can use the data to balance energy supply and demand, which can help reduce blackouts and brownouts.
- Reduced energy wastage: The meter can help reduce energy wastage and overload usage.
- Reduced power theft: The meter can help reduce power theft.
- Home automation: The system can be used for home automation.
- Future energy consumption prediction: Cloud analytics can be used to predict future energy consumption.

IV. LITERATURE SURVEY

The history and evolution of energy meter dates back to the 1880s, a little before the widespread use ofelectricity. The era of gas lamps also contained the energy measurement system where the amount ofenergy consumed per household was calculated. With the discovery and use of electricity, the electriclamps rapidly replaced the gas lamps, proving to be brighter and more cost efficient. A new system forconsumption measurement was required. DC meters measured charge in the unit ampere-hours. Withtime the DC meters proved to be insufficient. Then came Edison's meters classified as electrolytic andelectrochemical meters. The electrochemical meters, though sufficed the purpose, were laborintensiveto read. Thus, not welcomed by users. It was in 1889, that a Hungarian named Otto Blathy created andpatented the first AC meter using kilowatt-hour as the standard unit, whose operating principle is usedtill date.

Design and implementation of IoT based smart energy meter

1. S Saha, S Mondal, A Saha, P Purkait

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Modern day smart grid technology relies heavily on communication networks for two-way communication between load, generation, transmission, and control centre. As a part of the smart grid, smart meters use advanced metering infrastructures (AMI) that are widely distributed and interconnected to the communication network. Such integrated infrastructure has made the power network easy to diagnose and control. But unfortunately, this has made power system networks vulnerable to various forms cyber-attacks that have caused major concerns to power researchers in recent times. As a first step towards such cyber-attack related researches and searching for possible mitigation techniques, it is necessary that a smart meter be developed that has the feature of network integration. The present contribution reports the design, fabrication, and operation of an Internet of Things (IoT) based smart meter using Arduino to serve as an integral part of a smart grid system

2. Abhinandan Jain, Dilip Kumar, Jyoti Kedia

In the year of May 2012, the authors Abhinandan Jain, Dilip Kumar, Jyoti Kedia presented a paper titled "SMART & INTELLIGENT GSM BASED AMR SYSTEM". This paper represents the development of fully automated energy meter which is having capabilities like remote monitoring & controlling energy meter. It saves huge human labour.

3. S. V. Anushree T. Shanthi

In the year of November 2016, the authors S. V. Anushree T. Shanthi presented a paper titled "IOT BASED SMART ENERGY METER MONITORRING & THEFT DETECTION USING ATMEGA". The main objective of the system is detection of theft of electricity increases the cost paid by customers & can have serious safety consequences. Identify the theft by sending alert SMS to owner send meter reading & rate every month to the owner. This system has an additional set up of IOT which portraits the global connection environment to the user & allow them to view the status of meter reading from anywhere at any time theft of electricity as a material impact on customers in terms of cost & safety

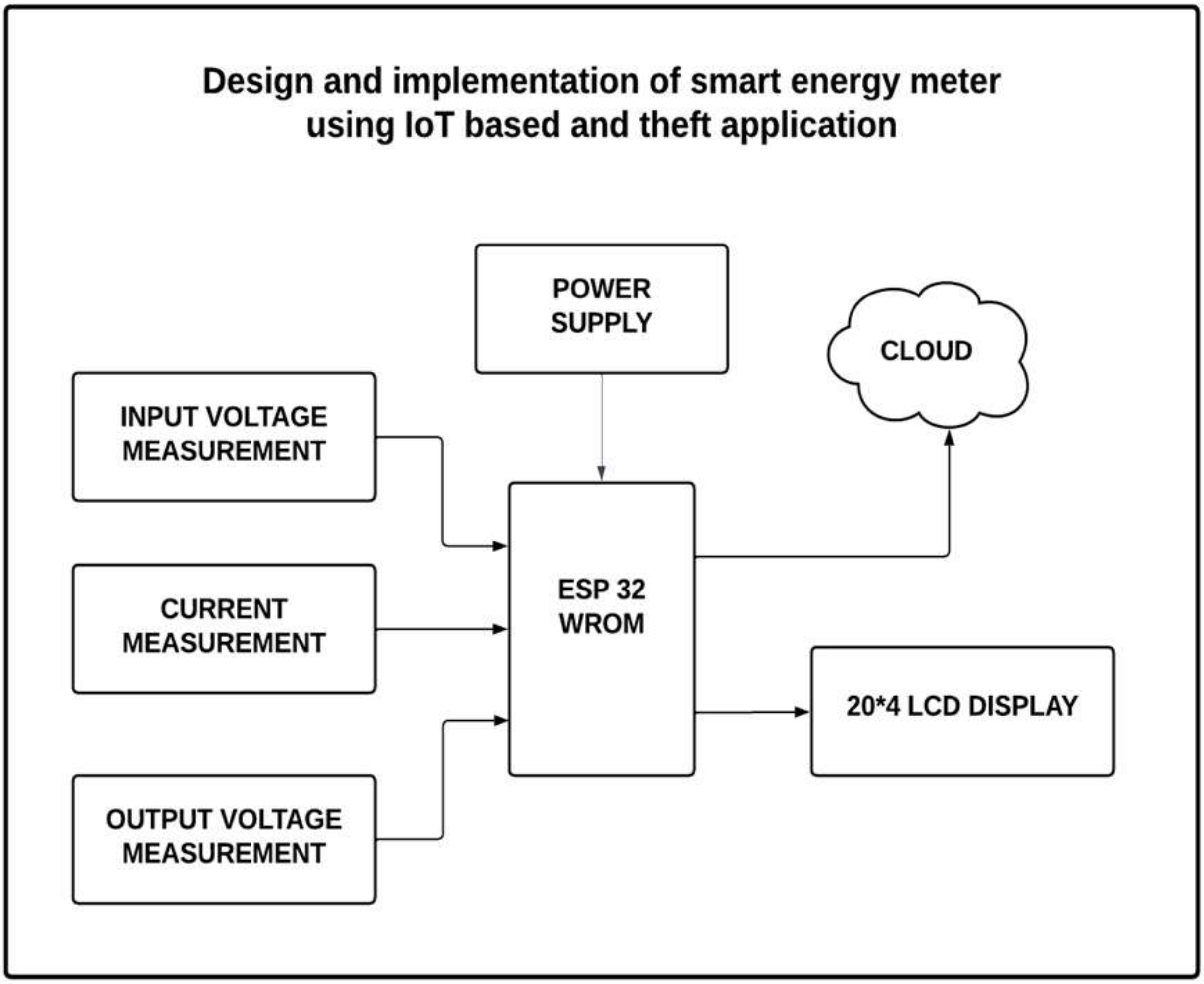
V. DESIGN AND IMPLEMENTATION OF IOT BASED SMART ENERGY METER

- In this project Arduino mini pro is used as main controller. It is connected to 16*4 LC Display, Load control, ELCB and setting.
- Li-ion batteries are used for battery backup when the power gets off it provides power to Arduino.
- In Indian household 230 volt is standard voltage. In this project 12 Volt voltage regulator circuit is used. It convert 230 volt AC into 12 volt DC.
- Voltage regulator circuit is important while dealing with Arduino and LCD because it works on different voltage.
- The main supply is provided to voltage sensor and current sensor. It measures voltage and current. Output of voltage sensor and current sensor is fade to Arduino.
- The values of voltage and current are processed by Arduino such that using voltage divider formula it measures the power. 1000Watt is 1 Unit. In India price for 1Unit is 3Rs.We can manualy change it using POT. It coverts it into Rupees.
- The total consumed power associated with its cost, year, month, date and time is displayed on 16*4 LCD. The LCD is connected to Arduino.
- The load control circuit provides short circuit protection and overload protection. When The current gets higher than 5 Ampere meter trips and all devices get turn offs. The ELCB provides protection against earth leakage. Short circuit of live or neutral line to the ground then ELCB automatically trips. It guards human against electrical shock.

VI. PROPOSED SYSTEM

Below is the architecture of smart electricity energy meter .this is the architecture and simplified diagram of our project .This is used to learn the diagram easily. In this architecture
there are following blocks are used as follows:

- Main supply
- Battery backup
- Voltage sensor
- Current sensor
- ESP 32
- LCD Display
- Load control unit
- ELCB circuit
- Setting



Schematic diagram

VII. OUTPUT

VIII. RESULT

In this paper, we are explaining a technique of electricity energy meter reading based on IoT concept. This design implements the energy meter using the IoT concept. This whole procedure based on the Arduino. The internet of things is the internet operational of physical devices which permits object to exchange data in the above system energy meter is connected to the internet by using IoT. So there is a method to track their energy consumption time to time for consumer so that they can control their use as they plan. This system is suitable for consumer and supply. This method eliminates man power during this connection and disconnection upload. It plays a vital role to inform supplier about any theft that is happing in the sensor.

IX. ADVANTAGES

- Consumes less power and high efficiency.
- If any user uses more electricity, indication will be sent and web server gives alert.
- Voltage and Current sensor are used for measuring the voltage and current state of the EB meter.
- we can avoid the wastage of power and power saving will takes place .
- A Web server facility is provided for monitoring and control using PC .
- No man power need for taking current readings.
- Avoid high usage of electricity.
- Can identify the high electricity used industries easily

X. CONCLUSION

The smart energy meter using Arduino with the capability to show units in rupees,providing short circuit protection and earth leakage protection is a promising solution for efficient energy management. The device is designed to be user-friendly and cost-effective, making it an attractive option for consumers. The use of Arduino ensures that the device is easily customizable, and the inclusion of safety features such as short circuit protection and earth leakage protection adds to its overall appeal.

XI. FUTURE SCOPE

- Integration with smart home systems
- Use of renewable energy sources
- Improved user interface and user experience
- Real-time monitoring and alerts
- Advanced energy management and control features.

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