Advanced Power Theft Detection Meter Employing IOT Technology

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Abstract-This document is explained as a way to gauge household energy use. As the owner is constantly informed of the quantity of units consumed, this can aid in lowering household energy consumption. Power firms' services are not up to the standards of their customers. In order to minimize technical faults and simultaneously decrease human dependence, we are attempting to provide a notion. Theft of energy raises customer bills and may have detrimental effects on consumer safety. A suggested technique enables the transmission of customer electricity usage and bill information, which is calculated using an ATmega328 microcontroller, via Internet of Things (IOT) connection between the Electricity Board part and the consumer section.

Through the usage of the Internet of Things, power and billing information is continuously transmitted and is supervised by the Electricity Board part. Information is delivered to a web server over Wi-Fi, which also performs IOT operations. The server unit at MSEB receives this data after that. The cost of getting the meter reading is nothing, which lowers labour expenses.

The power use is monitored, and power theft is detectable. If any tampering occurs, the system will automaticallyshut off the energy and send a message to the owner alerting them of the situation. The meter is connected to the internet, and it counts the pulses coming from it and shows them on the LCD screen. It costs nothing to get the meter reading. This technology not only lowers labour costs but also improves the accuracy of meter readings and savesa significant amount of time. As a result,it is possible to decrease the amount of human work needed to obtain meter readings, which formerly requiredvisiting every home.

Microcontroller, Energy meter andGSM, LCD Display, WIFIESP8266 module, Theft Control are some of the related terms.

I.INTRODUCTION

One of the main issues the world is currently dealing with is the energy crisis. The ideal solution for this is to utilize current energy efficiently rather than increasing energy production. The energy problem can be somewhat mitigated by properly tracking energy use and preventing energy waste. Energymonitoring, however, is ineffective, mostly because users are ignorant of their own energy usage. An invoice is only ever issued in India once a year overthe course of two months.

As a result, power users will be in the darkabout their energy use. Nobody would bother to check their electricity meter reading and compare it to the prior readingin this fully digitalized era in order toobtain an idea of their consumption. To properly reduce power use, this complete process should be repeated multiple timeseach month. If users could examine their energy consumption on their smartphones or laptops rather than energy meters, energy management would advancesignificantly. It will be a tremendous benefit if they can track their energy consumption online from anywhere in theworld as the majority of people today are online 24/7. The consumer's demands aregrowing along with the generation, thus technical advancement is required to keepup. So we created the system using IOT, aquicker and better technology. Power theftis one issue related to electricity. Power theft is a serious crime that has an immediate impact on the national economy. Electricity loss occurs electricity generation, transmission, and distribution. In order to effectively use thegenerated power, we must keep an eye on power consumption and losses. We built a solution based on IOT energy meter readings to address these problems.

Existing Meter

The customer only receives feedbackfrom the current system regarding monthly power consumption in the formof a bill. There is no mechanism for theconsumer to monitor their energy use more frequently. Consumers areexpanding exponentially quickly, and the load on the sectors that supply the power is rising quickly. Meter tampering is a significant disadvantage of the current system and contributes significantly to the energy issue.

II.METHODOLOGY

The IoT idea is used in this system to connect energy meters to the internet. With the proposed method, consumers can manage their energy use by regularly monitoring it.

Four components comprise an IOT- based energy meter reading: an ATmega328 microcontroller, a theft detection system, a GSM module, and a Wi-Fi component. A gadget called acontroller plays a crucial part in thesystem. Where all of the information can be transmitted to the other system components through this controller, which also serves as a data storage device. IOT operations are carried out by a GSM and WIFI component. The GSM module attached to the energymeter transmits meter readings to the server.

If a theft is detected, the energy meter connected to the theft detectingcomponent will automatically turn off thepower and send an SMS alert to the firm and the customer. Daily consumption reports are generated and can be seen on a web site or an Android app. A microcontroller logs the energy meter's real-time readings. An LCD display that is attached to the microcontroller can be used to view this. Energy meter readings and theft state are displayed on the LCD screen. The load can then be disconnectedby pulling in the relay.

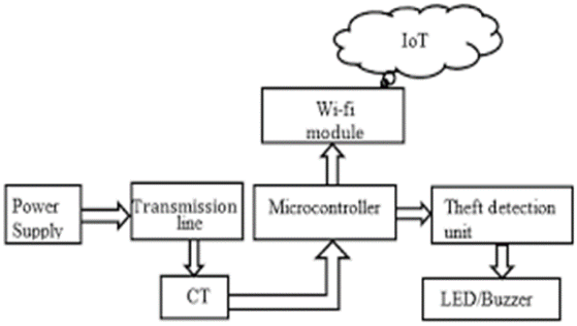

Fig.1. Block Diagram

1.System Implementation

The project's central element, the microcontroller, connects the devices' inputs and outputs. The system also includes additional components like an LCD, a relay, and a buzzer. The loads and relays in this circuit reflectappliances used in homes that need energy or power to function. Buzzer willautomatically sound if theft occurs by turning the load off. Additionally, data istransmitted to the web server via wi-fi connected to the Arduino controller. Every meter reading can be scheduled in the microcontroller to be sent to the energy provider company's central server daily, weekly, or monthly. As an alternative, we can deliver through email. Any microcontroller may connect to Wi-Fi networks thanks to the ESP8266 WI-FI module, a stand-alone Semiconductor with an integrated TCP/IP protocol stack. The ESP8266 may run programs or can delegate all Wi- Fi networking tasks to an additional application processor. A fairly affordable board with a large and expanding community is the ESP8266 module. The project uses an LCD display to show the application's results.We've been using 16x2 LCD, the ATmega328 microcontroller, which is utilized to sense the data from the sensor and transfer to the monitoring area regarding the situation, will be employed in the micro controller unit.

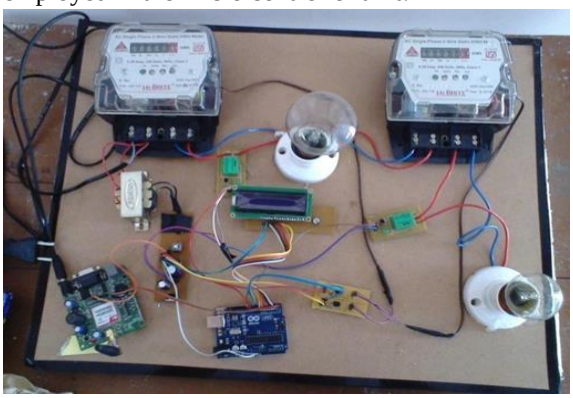

Fig.2. Hardware implementation

Internal analogue to digital conversion takes place in the controller during the sensing phase. Genuine Time Clock Your computer's clock is called a real-time clock (RTC). It typically takes the shape of an integrated circuit that measures the time right now. Almost every electronic gadget that needs to provide accurate time contains an RTC.Switch Section Relay circuits are connected to the microcontroller and energy meter. Relays let one circuit switch a different one. It's possible that the second circuit is entirely distinct from the first. Consumers mains consumption lines are switched from cutoff and mains operation using relay circuits. Unit for Detecting Temper When tempering happens, a tempering unit used to stop energytheft notifies the energy provider company.

III.LITERATURE SURVEY

IoT based Power Theft Detection (IJIET 2017)

In the system put out by M L N Vital,P Yogananda Reddy, and R GiridharBalakrishna They created an IoT systemto detect power theft, which was prevented

by employing Arduino,GSM, LCD, ESP module, and current transformer. One of the two CTs is linked to the source side, and the other is attached to the load side. Arduinoreceives the signals from both CTs. In essence, Arduino compares the information obtained from the CTs on the source and load sides. If any difference outside of the tolerance isfound, it simply means that there is a theft load connected. This data is then sent to the substation using IoT and ESPmodules, which operate on the internet. If the internet is not operational, a GSMmodule is used to send the message to the substation where that line is connected and the theft load isdiscovered. IoT and GSM are both usedin this system to detect power theft. In the event that the IoT system fails, GSM will continue to operate normally in order to ignore the enormous worldwide threat of power theft from the electricalnetwork.

In this article, they made a really solid project proposal. However, it would be more sufficient if we could develop a technology that could identify power theft without a physical examination.

IoT Based Power Theft Detection And Monitoring System (IJIREICE 2017)

A smart energy meter connected at the beginning of the transmission line and another at the load end were employed in the system described by N Kunan1 and Poornima BK2; the signals from both weresent to the Arduino. Arduino gathers data from each smart meter on the consumer sideand compares it to the source current reported by the source side smart meter. The system will be separated from the supply byusing a relay circuit and a message will be sent to the utility company by using a GSMmodule if the difference is greater than the tolerance and indicates that a theft load is connected to the system. If the distinction iswithin the tolerance, then there is no theft load connected. This entire process is carried out utilizing an Arduino board and aBeagle Bone Black computer. As a result, this technology detects power theft from connection and takes the necessary action without human intervention.

Electric Power Theft Detection And Location Tracking Using IoT

In the system put out by Chandan Kumar, Ajay Mahato, Abhishek Nanda, and Ajay Kumar Pal They offer IoT-based power theft detection and location tracking to combat this global issue. In this method, a current and voltage sensor is connected before the wire leading to the meter, and a connection from the energy meter is also provided to the PIC microcontroller, which compares both values of current. If a difference is detected by the PIC microcontroller, it indicates that a theft has resulted in the system, and the circuit will be cut off from the supply by using a relay circuit and a message will be sent to the utilities company by using a GSM module.

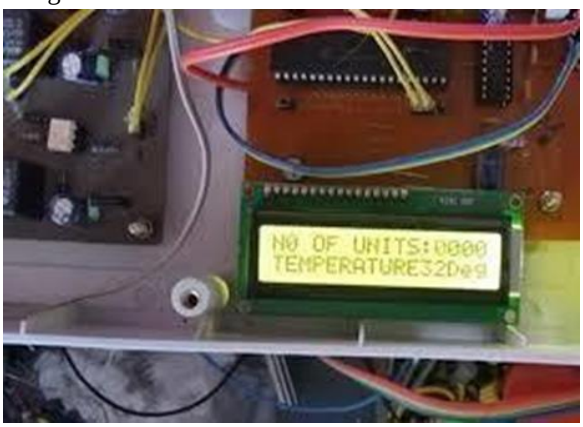

Fig.3. LCD display of energy meter

Problem in the present system

- The system does not detect electricity theft in real time or identify the actual location of the theft.
- The usage of an infrared sensor in this system results in false detections as a thermal signal could activate the infrared sensor, leading the camera to take a picture.
- This technique is also impractical because not all transmission towers can have cameras installed. This method is unable to pinpoint where theft occur.

Proposed System

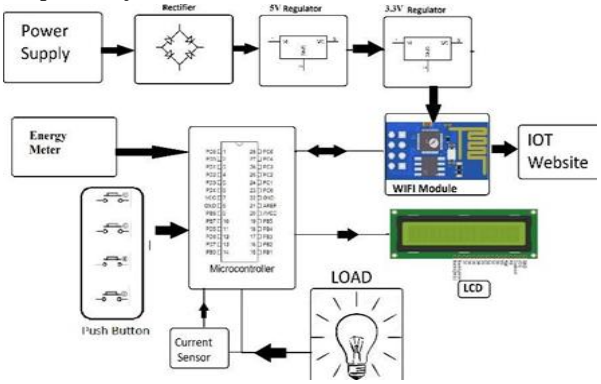

Fig.4. System Implementation

Overview of the System Our suggested method promises to identify electricity theft in instantaneously and pinpoint its location. The system will feature an online database where all of the distribution system's data, along with the date and time will be stored. This information includes the amount of power transmitted, the voltage used at a pole, and the electric pole's serial number. We'll plot the voltage value versus time.

The pole number provides us with the precise location of the power theft. For a period of time, the system will compile and create statistics data to track voltage levels in the area where theft is occurring. The authorities can then carefully monitor the area and carry out a survey to determine where power theft happens. We will measure the voltage levels at the sender side and the receiving end, assess the demand for the load, and schedule a close check if the difference exceeds the allowable value. This information can be used by the authorities to identify the areas where power consumption is actually increasing and where theft of electricity is taking place. 3.2 Operation. The Arduino UNO, LCD, GSM, ESP8266 module, energy meter, two transformers, and loads make up the circuit. The input power delivered by the source is measured using an energy meter. The voltage utilized in two distinct locations is measured using two transformers. This project's Arduino Uno controller is its brains. Through the use of a bridge rectifier, it is used to receive voltage signals from two transformers, transformers 1 and 2. The voltage magnitude is then compared to the voltage drop predicted for that location. When there is no theft, the potential difference will be very little and there won't be any systemic theft. There will be a significant voltage loss if theft occurs. Bridge rectifiers are primarily used to convert AC to pulsing DC, which is subsequently smoothed out by capacitor-based filter circuits. The voltage level is reduced and set to 5 volts using a potentiometer and resistors. To indicate the actual voltage being supplied, the voltage provided by the transformer is increased by a certain amount. The usage of GSM will notify the function through SMS and email if the voltage indicated by the transformers falls below a specific value specified, indicating that the load in the area has grown and theft is taking place. Using the THINGSPEAK server, an online database is constructed where the data of voltages of various places are kept and updated automatically. It enables the analysis of data using MATLAB and the area of monitoring. It provides a graphic representation of the voltage change in a given area. Different locations load voltages are displayed on an LCD. The Arduino Uno board may connect to the internet with the ESP8266 Wi-Fi module, allowing the monitoring agency to access the information online. By installing numerous transformers in the load line at a certain distance, the specific location of the electricity theft is located in order for monitoring authorities to take legal steps against the offender.

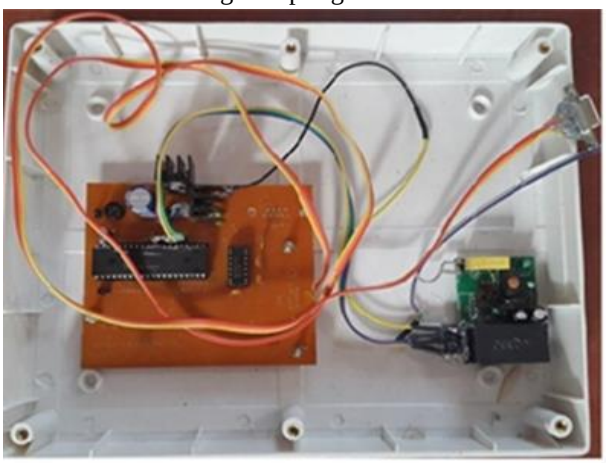

Fig.5. Service provider end implementation

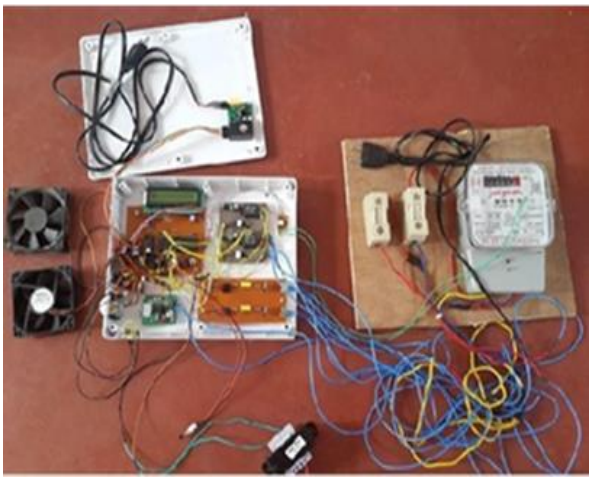

Fig.6. Consumer end implementation

IV.RESULT

In addition to the energy consumption of the meter and the state of the meter, the live reading of the meter are displayed on the webpage made by the electricity board department. In the event that a power theft occurs, a notification will be flashed on the homepage and LCD. This system can no longer be set by the user; instead, a representative of the authorized agency must reset the entire system.

V.CONCLUSION

Given that the amount of interaction between people has been reduced, this system will be highly accurate. When the bill is generated, it is made available as an SMS, and if the consumer is enrolled, he can make the payment online. The building of an energy monitoring circuit at the transmission line pole will be among the upcoming tasks. This can pinpoint the sites of power theft as well as the sort of issue and where it is. This system also makes use of mobile technology to maintain control over the various home appliance units, which operates in accordance with the signal supplied by the mobile.

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