"IOT BASED SMART MONITORING IN DISTRIBUTION SYSTEM"

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Abstract

The Smart Monitoring and Distribution System is one of the features of smart city model. It is energy consumption monitoring and management system. Smart grids are based on communication between the provider and consumer. One of the main issues with today's outdated grid deal with efficiency. The grid becomes overloaded during peak times or seasons. It is also possible to hack the system, and basically, take free Electricity. By using Smart Monitoring and Distribution System consumer and owner get daily electricity consumption reading and owner can cut electricity supply if bill is not paid. One more thing, the data collected from the smart meters should not be accessed by any unauthorized entities. In case meter tempering is happened then owner and consumer get message and then owner take the action accordingly. Fitting the circuit on customer's energy meter, from that energy consumption data can be acquired. After acquiring of data, that data can be updated on cloud service, so that consumer and provider can access that data through internet. The proposed smart energy meter controls and calculates the energy consumption using ESP 32, a Wi-Fi module and uploads it to the cloud from where the consumer or producer can view the reading. Therefore, energy analyzation by the consumer becomes much easier and controllable. This system also helps in detecting power theft.

Keyword:

Internet of Things, ESP32 Node MCU, Current Sensor

Introduction:

At this time, the traditional electrical community device is arguably old-fashioned to be capable to pursue the speedy boom of demand for electrical electricity availability we required smart monitoring and distribution system. The Internet of Things (IoT) is a network of connected smart devices enabling to transfer data. The 'thing' in IoT may want to be a individual with a coronary heart display or an car with built-in sensors i.e. objects that have been assigned an IP tackle and have the capability to accumulate and switch information over a community except guide help or intervention. The embedded technological know-how in the objects helps them to have interaction with inner states or the exterior environment, which in flip influences the choices taken. With speedy boom and development, electricity disaster has turn out to be a very large issue. An relevant gadget has to be made in order to analyze and manage energy consumption. The present device is error prone, labor and time ingesting .The values that we get from the present device are now not specific and correct even though it might also be digital kind however it is constantly vital that a problem individual from the strength branch need to go to the purchaser residence in order to word down the facts and error can get brought at every and each and every step. Therefore, the treatment for this answer is clever electricity meter. The smart grid performs a brilliant position in our existing society. Tens of thousands and thousands of the people's each day lifestyles will be degraded dramatically due to the fact of the unstable and unreliable strength grid. Smart meter is a dependable fame actual time monitoring, automated series of information, consumer interplay and energy manage device. It affords a two way glide of facts between customers and suppliers imparting higher controllability and efficiency. It presents actual time consumption data offering electricity consumption control. Whenever the most load demand of clients crosses its top value, the grant of electrical energy for the clients will be disconnected with the assist of smart power meter. In perfect surroundings with ordinary work load condition, the existence span of the smart meter is about 5 to 6 years. But in actuality smart electricity meter suffers environmental problems and decreases its existence span with peculiar consumption of electricity The elements affecting lifespan of a smart meter consists of existence expectancy, genetics, surroundings elements , alternate over time and confined toughness .

IOT based totally power meter gadget in general consists of three fundamental components i.e. Controller, Wi-Fi and Theft detection part. Whenever there is any fault or theft, the theft detection sensor senses the error and circuit response in accordance to the statistics it receives. The controller performs a most important position in the device making certain all the aspects are working fine. Therefore, IoT can enhance the overall performance and effectiveness of the smart grid in most cases in the three phases. Firstly, it will increase the reliability and durability secondly; it focuses on enablement i.e, series and analyzation of records to manipulate lively gadgets inside the clever grid. Lastly, controlling can be achieved by using examining the end result bought from the 2nd segment which helps the grid branch to make excellent decision for future upliftment.

The power meter handy until now can solely manipulate and reveal the electricity consumption of customers. Smart meter developed using power line communication (PLC) helps in power loss. Several machine the usage of Arduino as nicely as micro-controller have been developed even though the effectively to measure electricity consumption extensively multiplied however due to price nice it may also now not be regarded as the appropriate one.

The customer can't have a appropriate and correct song of the electricity consumption on a extra interval groundwork .The traditional meter two two has some of the frequent blunders like time consuming, chance of theft error while taking the information and extra human involvement Thus, we proposed a smart system which permits the purchaser as nicely as producer to reveal and manage the strength consumption on extra on the spot basis.

Literature Survey:

1. GSM and Arduino based totally power theft detection and protection, the design, simulation and development of a GSM-based electricity theft have been achieved. It has blanketed more than a few types of electrical energy theft which consist of unaccountability of servicemen, irregularities of billing main to a discount of money with the aid of the utility organizations has additionally been done as this work prevents one on one contact between the stop person and the workers. With far flung monitoring of the meter studying and sending SMS, on every occasion there are unusual readings, in the patron electrical energy meter, the developed machine may also in a position to assist Utilities to minimize the incidences of family electrical energy theft. An automated circuit breaker can be built-in into the unit so as to remotely reduce off the energy provide to the residence or customer who tries to indulge in electricity theft. This machine format by and large concentrates on single section electrical distribution system. Automation of the patron billing machine has been finished as the meter maintains music of the consumer's load on a well timed basis. This design, therefore, gets rid of the guide analyzing of meters with its connected penalties of time-consuming gadget and consignment manipulation which influences the organization while including greater payments to the consumer. The work additionally revolves round the automated disconnection and connection when the recharge is low or excessive respectively and greater value due to re-connection can additionally be removed.

2. Design of a Smart Energy Meter with Overload Trip Facilities: In this assignment we started out with a proposed method of electricity administration from the consumer point of view so that how one can conscious the consumer from the strength administration so that he can manipulate his load and can limit the invoice and additionally take phase in the power saving. So first we studied extraordinary aspects that are wanted for this project, chosen a micro-controller that is least expensive and fulfill the necessities of our project. ARDUINO UNO is used for this cause and it is programmed in C language, the use of Arduino software program as compiler and efficaciously compiled our code and then it used to be efficaciously loaded to micro-controller. We interfaced extraordinary digital aspects like GSM, ACS712 and Relays to the Arduino on veero board and examined our hardware. Current and voltage are measured for all the three phases and energy is calculated in accordance which administration of load takes place. Whenever the predefined threshold price was once surpassed a message used to be ship to the consumer showing "System Overload". For every phase, unique approach of reclosing is used, Phase I is reclosed by using urgent a button, Phase II reclosed after a length of one minute whilst section III will reclose upon.

3. Development of Arduino Based IoT Metering System for On-Demand Energy Monitoring, This lookup developed an IoT based totally smart metering gadget whilst inspecting its integration procedure. Using a Composite Design methodology, the work furnished a easy and beneficial answer in the structure of an electricity consumption price Wi-Fi meter. The device used to be proven to be profitable in measuring current, electricity consumption and additionally processing the value incurred by using a customer. These metrics are speaking the electricity consumption and price to the cloud server. This makes it less complicated for clients to view consumption price ubiquitously. An

4. Evaluation with published that the developed IoT clever metering relaxed these necessities viz: Quantitative measurement, manage and calibration, verbal exchange (sending and receiving of statistics effectively); potential to get hold of enhancements from firmware, fine energy management, show as properly as timing synchronization. These are fundamental between the meter and the utility provider's system. In the work, Demand Side Management thought has been satisfactorily achieved. However, the existing lookup presently does no longer cowl ideas for the validation of the machine specification roadmap as introduced in . Hence, future lookup will be carried out to look at chances for an automatic validation of the device specification involving the necessities for extending GSM Wi-Fi communication, with WiMax (4G LTE) and optic fiber for lengthy distance communication. Also introducing an open tampering method in the **IOT** clever meter to display any structure of tampering reducing the load .

Problem Statement:

1. Avoid the opportunity of hacking the system, and basically, taking free electricity.
2. To forestall meter tempering.
3. Real-time Models and diagram strategies describing dependable interworking of heterogeneous structures (e.g. technical/economical/ social/environmental systems).

3. To decrease the human efforts, and to reduce the energy routinely if the consignment is no longer paid.

Proposed   System:
The proposed device is fee wonderful and compact, so, installment will become an awful lot easier. The end result is uploaded at each and every interval into cloud area referred to as "Thinksspeak" and monitoring can be performed with the aid of consumer/customer as nicely as supplier/ producer. In this proposed system, an strength IOT meter is linked to ESP32 NODE MCU by optocoupler. An LED show is additionally related to the system.A modern sensor is additionally outfitted to decide the energy theft.
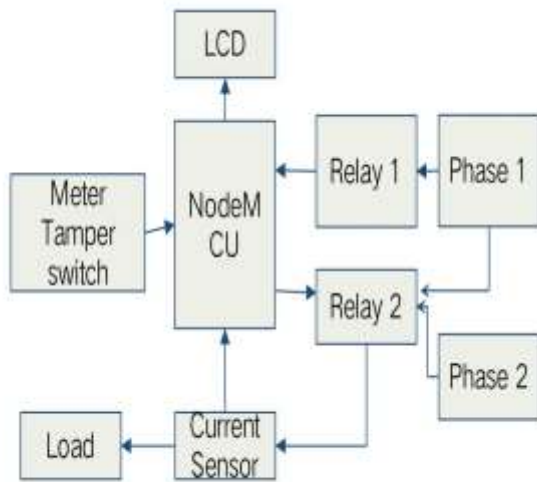

Fig.1 Block Diagram

The most important purposeful unit of this device is mentioned hereafter.

WiFi module: - ESP32 NODE MCU is used right here which is a programmable module with 80 MHz Microcontroller. As the module doesn't have separate USB port, we need to use an exterior USB to Serial adapter such as our FT232R Serial to UART Board to enhance code the use of this module.

• LED Display: - A 16*2 LED show is used two right here which doesn't want backlight. The show can self-illuminate excessive resolution.

• IOT Energy meter: - The analog meter used right here. An optocoupler senses the led calibrated from the strength meter and sends its output to ESP 8266 NODE MCU.

• Current Sensor: - ACS712 cutting-edge sensor offers specific present day size for each AC and DC signals. These are proper sensors for metering and measuring ordinary electricity consumption of systems. The ACS712 cutting-edge sensor measures up to 5A of DC or AC current. In this device it is used in order to measure the electricity theft.

• Load: - A 100W bulbs are related as masses to the system.

• Power supply: - 230V ac energy furnish is given to the gadget in order to strength the strength meter.Wi-Fi module energy is provided   through   5   V   DC.

The Wi-Fi module is programmed the use of Arduino IDE software program in order to calculate the pulse from strength meter. It senses the pulse by way of optocoupler and despatched the facts received to the cloud the usage of ESP 8266 NODE MCU.The LED blinks 3200 instances for 1 unit. The blinking of LED is calculated for ate up electricity in devices alongside with the fee of the units. The monitoring is achieved in each and every interval. The machine additionally gives a energy theft function which is performed the use of the cutting-edge sensor linked to the system. Thus, the gadget doesn't contain human presenting much   less   human   error.

PRACTICAL IMPLEMANTATION:
To evaluation the proposed strength monitoring system, the device is virtually enforce in the lab. The important points realistic implementations are defined below: Initially the gadget is now not related to the major furnish i.e the machine is in OFF condition.After verifying all the hardware connection, furnish is given to that hardware system. two illustrates that the gadget is in ON condition. As quickly as the Wi-Fi module is related to the server the relay journeys and the load energies. The Wi-Fi module is attempting to join to the reachable server. If there is any server on hand close to that system, it receives connected. two The Wi-Fi module connects to the server and the device is now   geared   up   to   take   the   information.
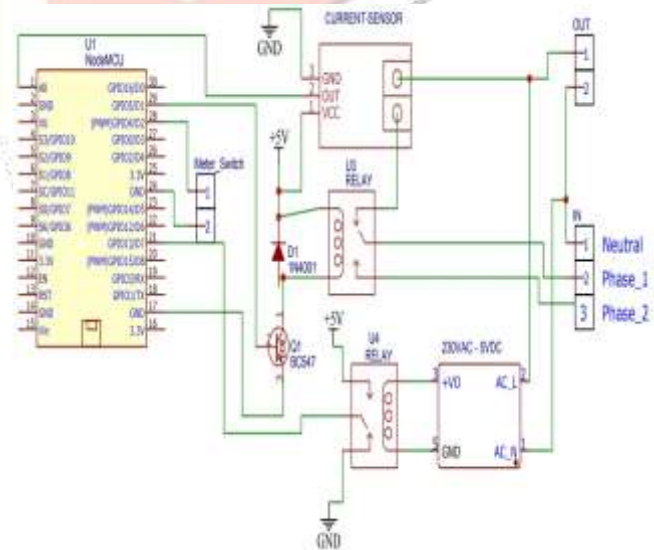

Fig.2 Circuit Diagram

After connecting the Wi-Fi with that system, machine is equipped to provide the data concerning the load or strength consumption by way of the customers. Two the preliminary data on the LED show when the load is no longer energies i.e. there is no load linked to the system. As a result, LED show is displaying '0' reading. its suggests the studying on the LED show when the gadget begins taking pulses from the electricity meter. When the machine doesn't take any pulses, the device detects that there is a strength Theft in the device and the LED shows the identical

information. After there is a strength theft, the machine is definitely grown to become off. At the identical time the machine contacts the Power Department to supply the facts about the electricity Theft and then the Theft records is uploaded in the cloud too.

Fig.3 Hardware

CONCLUSION:

This paper offers Wi-Fi meter studying device that can screen and analyze the statistics at each interval supplying correct effects with much less error. Some of the Advantages of this smart system are: -
• Energy conservation.
• Lots of time and energy saving from power department.
• Automatic manages of electricity meter.
• To make patron preserve the song of power meter.
• Power theft detection.
Some of the hazards are:-
• Sometime the gadget takes time to add the statistics relying on the Internet Speed and Module baud rate. The IoT thinking can additionally be carried out in quite a number working surroundings such as domestic automation, automated water degree detector and visitors manipulate gadget etc.

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