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A Review for Smart Energy Meter Techniques

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ABSTRACT: Energy consumption meter using IoT present an efficient and cost effective way to transfer the information of energy consumed wirelessly as well as it provides facilities to detect the additional usage of the electricity. The purpose of this study is to measure the amount of electricity and use IoT automatically to make this request. The goal is to identify and control energy. The amount of energy use on the daily basis is sent via GSM through SMS. Communication between the system and users at a lower cost than other smart meter. This meter can also be used as a module in different activities with a MQTT. The molding between the performance meter and the external climate was carried out by Wi-Fi innovations which allow the perception of information continuously to the Google sheet, which facilities in the webpage in ESP8266 module. The data of the meter is sent to the central coordinator via ZigBee protocol. The Arduino microcontroller is used to coordinate measurements with a digital energy system and connect the Wi-Fi system and then the internet and server. The time higher than the energy level, the system sends a warning to the server because it can have the option to automatically disable the power supply. The system is capable of continuously monitoring and being notified about the number of units consumed to the energy provider and consumer. The energy consumptions are calculated automatically and the bill is updated by IoT. This automation can reduce the needs of the manual labors.

KEYWORDS: Power Factor, Arduino, GSM, IoT, ZigBee

I. INTRODUCTION

The use of electricity is very high in this modern age. Excessive use of electricity will generate a lot of electricity. One solution is to reduce the amount of electricity used in each household institution. Smart meters are a way to reduce the use of electricity. Smart meter is an electronic device that records information such as electric energy, voltage level, current and power factor. The customer is able to know the real-time records on the smart meters at regular intervals and we can prevent the rising electricity bill. In addition, the consumer can control the power consumption of each electrical appliance used in the home with the help of smart meter. Communication from the meter to the network is wireless. Wireless communication options in common use include cellular communication, Wi-Fi (readily available), ZigBee (low power, low data rate wireless), GSM, Non-intrusive, power meter using Arduino. Development of an energy meter based on IoT.

II. LITERATURE SURVEY

P.P.Machado Jr and M.Z.Fortes proposed a system "Power factor metering system using Arduino". Power factor (PF) is an electrical amount that is usually related to power quality and energy potency analyzes. A low PF will increase the losses of the conductors; contributes to the occurrence of overload conditions on electrical systems; reduces the voltage level, particularly once it's placed on connection points that square measure off from the feeder; and compromises the capability of transformers and feeders. The PF is calculable in step with the instant values of the present and voltage measured on the load. Based on these quantities, it's doable to calculate the rms current, the rms voltage, P, S, so the PF. Here the board Arduino Mega 2560. It's fifty-four digital inputs and outputs, sixteen analog inputs, and 256 kB of nonvolatile storage operative at sixteen megacycle. The device feeding is provided by USB that is connected to a pc. The Arduino features a 10-bit data converter (A/D). Therefore, the values browse from zero to five V within the analog inputs square measure reborn from zero to 1023 bits. So, the resolution obtained is five V/1024 bits. . The detector ACS712 for currents up to thirty was used for the current activity. For this current level, it has a sensitivity of sixty-six mV/A. The device in operation principles square measure based on the Hall result. Additionally,



it will browse each alternating and DC. There square measure alternative activity techniques accustomed browse current with Arduino, like current transformers associated with voltage dividers. During this work, the ACS712 was chosen because of its sensible accuracy and ease for voltage measurement a special circuit is used which consist of transformers resistor and capacitors. The scan knowledge from each voltage and current measurements are digital values from zero to 1023 bits. Thus, it needs a programming logic that centralizes the waveforms on the horizontal axis and so converts these digital values to analog, considering the Arduino resolution. On this measure, this processing conjointly considers the detector sensibility. Relating to the voltage measurement, the resistor and also the electrical device winding turns quantitative relation should be taken under consideration. The read values come back from the distribution grid, therefore there's a small harmonic distortion on the waveforms. The voltage supply saturation 6500 was employed in the tests. Concerning the adjustment, it absolutely was adjusted to a 127 VRMS pure sinusoid for each assays. On its graphical interface, this supply displays the period of time measurements of IRMS, VRMS, P, S, FP and alternative electrical quantities, with a 16-bit exactitude. The voltage provides saturation 6500 was used within the tests. Regarding the adjustment, it fully was adjusted to a 127 VRMS pure sinusoid for every assay. On its graphical interface, this provides displays the amount of your time measurements of IRMS, VRMS, P, S, FP and different electrical quantities, with a 16-bit truth. Due to the many drop within the electrical cables, it was necessary to live the rms voltage at points settled near the load. The multimeter ICEL MD-6220 was used; it's a zero.1V resolution for the dimensions of 400V. In order to verify the accuracy of the developed meter, two tests were performed: the first one with a purely resistive load, consisting of incandescent lamps, and the second one with an Comparing the graphics supported Arduino measurements to the electronic equipment graphics, it is possible to conclude that Arduino will, with affordable accuracy, reproduce the voltage and current waveforms of load R, furthermore because the voltage wave of load RL. However, the reproduction of this wave of load RL is restricted, due to the many ThD. Therefore, the accuracy of this meter is restricted to low ThD hundreds.

Himanshu K. Patel, TanishMody and AnshulGoyal proposed a system "Arduino based smart energy meter using GSM". This new generation meets many of their needs through the use of electricity. We cannot imagine a world without electric equipment. Therefore, a lot of electricity will be required in the daily routine. Based on this problem, electricity bills are high. The idea put forward by the paper "**Arduino Smart Energy Meter using GSM**", to reduce the amount of electricity consumption and thereby reduce the rising electricity bill. In addition, the amount of energy we use on a daily basis is sent via GSM to the mobile app via SMS. First we connect the LDR sensor to the existing smart meter. It is sent to microcontroller via GSM shield which is the data shown in the LDR. It also notify the customer of the amount of energy via SMS. It cost less than other Smart meter and communication between the system and user. Unlike other meters, this system is not based on speculation. In addition to reducing the use of paper as part of environmental protection, the consumer receives information on recording meter directly via SMS from the region with this system; all type of customers can easily understand the data as seen in the meter. It is better than any other system and its construction cost is less than the existing meter. Today our country is moving towards modernity in this scenario, this system is not only essential but also an important component that can be used in the upcoming smart cities.

Wesley W.V.Souza, MohamadS.A.Ali, Allyson F.M.Borges, JosielP.P.Oliveira, Diego R.C.Silva, MarceloB.Nogueira and Marconi C. Rodrigues proposed a system "Development of an energy meter dependent on IoT". It estimating a few circuits, figure power quality boundaries and with quick and bidirectional correspondence. The proposed arrangement demonstrated its viability, showing on the web results about current and voltage, power utilization, and force quality boundaries. The framework could likewise be arranged distantly, demonstrating the bidirectional correspondence. Overseeing energy utilization in houses, businesses or then again urban areas is a basic territory where IoT can contribute. This work present an ease energy meter dependent on IoT, prepared to do estimating a few energy circuits with a solitary microcontroller. The meter likewise gives power quality boundaries, and is able of on the web and bidirectional correspondence, so the framework can get information and send orders to the meter. This empowers designing its estimating boundaries and furthermore making energy saving arrangements or gear assurance. The advancement of the gadget can be partitioned into blocks which depend on information course through the framework. These blocks, which will be depicted in more detail along these lines, are information obtaining, enrollment, preparing and transmission. To secure sensor information we could pick to utilize the simple port of the ESP8266. Since the ESP has just a single simple port, when we need to peruse more than one sensor, we might have utilized a multiplexer. To empower the gadget to work accurately, the microcontroller should have the option to convey and get information from the Advertisement converter, measure those information and send it to a middleware. To register energy utilization and power quality, we should gauge two boundaries: voltage also, current. A key piece of the turn of events of the proposed gadget is the microcontroller. It is mindful for perusing sensor

information, handling and transmission. In the wake of being gained and prepared by the microcontroller, the information should be distributed some place. Other than the actual sensors of the framework (voltage and current), we likewise added three virtual sensors/regulators on the SAIOT framework to design how the meter sends information. It proposes lessening the utilization by breaking down utilization information given by the framework. Utilizing counterfeit knowledge related to Large Information innovations, we can learn utilization designs and propose strategies to lessen it.

Hugo Tavares, Bruno Prado, Kalil Bispo and Daniel Dantas proposed a system “A non-intrusive approach for smart power meter”. This paper presents the improvement of a non-nosy smart power meter equipped for giving its clients strategies for distant administration of electric force utilization data. It has as goals the constant observing of electric energy utilization utilizing non-meddling, with diminished size and low cost sensors, and the remote administration of the information. This meter can likewise be utilized as a module in different tasks, by utilizing the MQTT convention. The emonLib library was utilized, permitting power factor estimation and similarity with non-intrusive current sensors. Correspondence between the force meter and the external climate, was made through Wi-Fi innovation, permitting perception of the information continuously, either through Google Sheets, the HTTP web worker facilitated in ESP8266 module or on the other hand on MyDevices Cayenne stage through MQTT convention. Thus, some power-mindful application like ongoing force utilization or energy charge forecast cannot be directly incorporated to portable or online systems. It computes the normal burned-through power alongside its cost in continuous and saves an information log to a SD card. The recorded data incorporates constant date and time for information maintenance, if there should arise an occurrence of force disappoinment recuperation. The proposed gadget is prepared to do observing a three-stage load utilizing a non-nosy current sensor, however far off admittance to information has not been executed. Additionally estimated electrical energy utilization of each home gadget; however the utilization data can just be gotten to locally through Wi-Fi. Assembled an observing framework for some electrical boundaries, such as RMS current and voltage, genuine force, obvious force and power factor, utilizing non-meddling current sensor and access to utilization data through Bluetooth Low Energy (BLE) innovation. It likewise gives well-disposed far off information access and makes the expectation of the power bill as an examination case. Correspondence is performed by the MQTT convention and the meter was tried by estimating momentary force and energy utilization in ten burdens, having their qualities contrasted with the Peacefair PZEM-002 off-the-rack meter. The outcomes acquired from immediate force estimation was acceptable, introducing a 5.8% blunder rate. From the energy utilization see, the qualities estimated by the two meters were not extraordinary, making our meter doable for being economical, simple to introduce and of ease. Not at all like ordinary meter models, our meter sends the data to myDevices Cayenne stage, to Google Sheets and furthermore to a site page facilitated on the ESP8266, showing flows, voltages and momentary force for each stage, as well as the energy utilization and expectation of the expense of the power bill. The principle commitment of this work is the improvement of an ongoing shrewd force meter that permits the distant checking of data and that can be utilized as a module for different works. In expansion, we mean to encourage the alignment interaction of the meter, utilizing programming rather than equipment. For this, we will add trimmer potentiometers (trimpots) for the client to manage the alignment steady without having to re-record the firmware in Arduino.

Nanda Kishor Pandar, Mayank Senapati, Meikandasivmam S, Vijayakumar D and Jaganath Pandian proposed a system “ZigBee based clamp-on IoT energy meter”. This article describes the implementation of a wireless energy monitoring system that includes a simple and economical product of smart meter design with a topology of the communication network to effectively transfer the meter data to the coordinator and finally the platform cloud for the actual display of time data with the short characteristics of the weather forecast. While forecasting of charging with high voltage data has been popular with research and utility, forecasting of charging with smart meter technology due to a lack of data previous domestic data with the development of technology meters. Many smart meters use proprietary protocols for communication. While this allows for greater security, the lack of information about the protocols ensures that there is no specific way to assess their security. This avoids the significant integration of multiple smart metering devices. The existing structures suffer from different operating problems due to their invasive nature. This requires additional skills to implement these devices, but also add the entire implementation value. The architecture proposed in this article tries to solve the above mentioned problems with non-invasive sensors, open source communication protocols, economics devices. The described process includes three parts smart meter, communication with user's vision. The smart meter consists of physical measuring instruments including current and voltage transformers. The measured analog signals are calibrated and replaced by the corresponding digital counter meters with ADC and microcontrollers. The system includes X Bee nodes and X Bee coordinators that send information about internet access in the cloud. The ZigBee wireless protocol works on IEEE standards that determine the operation with a low wireless area. The equipment module following the ZigBee protocol is called X Bee. Actual current performance, immediate



reactive performance, power factor, RMS current and voltage mathematical formulation calculated with the microcontroller Arduino Uno. The data from the smart meter is sent to a central coordinator via the ZigBee protocol. The coordinator is connected to the internet via Wi-Fi. The Python script uses for the X Bee series data. The script limits the data and sends it to the HTML website and the created server using a flash library. This system attracts users. More energy and money results. The average error is 2.94% which gives an accuracy of 97.06%.

III. CONCLUSION

In this article the power factor metre using different method is discussed. The PF is calculable in step with the instant values of the present and voltage measured on the load. Based on these quantities, it's doable to calculate the rms current, the rms voltage, P, S, so the PF. So by measure PF we will get the energy consumption of every application. Distinctive energy consumption is vital. Supported its result we have a tendency to may understand that instrumentality consumes additional energy and that we will create steps to cut back consumption.

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