

Evaluating Energy Consumption Based On Smart Energy Meter Using Wireless Network

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Abstract- Smart power metering framework or issue is charmed by incalculable benefits. In India and different nations demonstrate that savvy metering is in fact practicable. The primary issues are the genuine estimation of the compensation, the cost included, the appropriation of overheads and gross settlement of keen metering between business sectors parties included. The key necessities of people are power, which is regularly utilized for residential, mechanical and horticultural purposes. Precise expectation/figures of vitality requests (stack) is critical. The advancement in innovation about the electrical dissemination arrange is a constant procedure. To diminish the power utilization in a house or at singular site stays to be a troublesome issue. This uses Smart Energy Meter (SME), a typical type of savvy matrix innovation, are computerized meters that supplant the old simple meters utilized in homes to record electrical use. SEM is an electric gadget having a vitality meter chip for estimating the electrical vitality devoured and a remote convention for correspondence. It introduces a programmed metering and charging framework. This meter can function as either post-paid or paid ahead of time. It maintains a strategic distance from the human mediation, gives exact charging and limit the power utilization in a house. In EB Server Section, Easily we will screen the home segment information and control the heap utilizing Smart Metering framework we can maintain a strategic distance from Wrong Power Usages and so on we can see the qualities remotely utilizing the IOT in the web server and can be controlled.

Index Terms- Electrical vitality, Matrix innovation, , Power utilization, Smart Energy Meter.

1. INTRODUCTION

Internet of Things (IoT) is an interconnection of a few gadgets, systems, advancements and HR to accomplish a shared objective. There are an assortment of IoT based applications that are being utilized in various areas and have prevailing with regards to giving colossal advantages to the client. Information Analytics has a critical task to carry out in the development and achievement of IoT applications and ventures. Power has now turned into a piece of our day by day life and one can't think about a world without power. It is an imperative piece of homes and ventures. All the gadgets in homes, organizations and businesses are running a direct result of power. In creating nations like India, control robbery is a standout amongst the most common issues which cause financial misfortunes as well as the unpredictable supply of power. Along these lines, it has turned out to be essential for the administration to oversee power and gauge it appropriately. With its advancement, the customary utilization of vitality meter can be made as keen vitality.

A savvy meter is another sort of power meter that can carefully send meter readings to your vitality provider for more exact vitality bills. Shrewd meters accompany in home showcases, so buyer can all the more likely comprehend their vitality utilization consistently. The vitality utilization will be day by day checked and in correlation with verifiable information, the vitality robbery is distinguished. The proposed framework will decrease the human intercession. Tests are done utilizing accessible

datasets and results are normal with an expansion in exactness when contrasted with different approaches. This likewise helps the supplier and shopper to have a straightforward and adjusted vitality charging framework. This procedure can be broadened further

2. EXISTING SYSTEM

Utilize the system of SMs as a sensor organize for the matrix checking has been investigated and approved through a devoted trial set-up. Indeed, SMs of the people to come, contrasted with gadgets as of now introduced in a few nations has given a few parameters, similar to dynamic and responsive power, line recurrence, voltage plunges and aggregate symphonious mutilation, which can be utilized by the DSO to screen the status of the system. A system made out of 48 SMs has been conveyed over the LV framework of A2A in the city of Brescia, Italy. Every SM is associated with the MDC by methods for a performing broadband electrical cable correspondence organize. The aftereffects of the checking, performed more than 2 months, feature the potential capacities of an expansive scale observing framework in view of the utilization of a system of second era SMs. Utilizing the SM arrange has been confirmed that the voltage is underneath the 5 % of the ostensible esteem just the 3% of the time in segment of the dispersion network under investigation, notwithstanding the vast nearness of conveyed vitality assets. Likewise, the SMs System distinguishes reversal of the vitality stream in part of the conveyance framework because of an abundance of PV vitality creation contrasted

with clients' utilization. We can see the qualities remotely utilizing the IOT in the web server and can be controlled.

3. PROBLEM STATEMENT

The Electricity Board (EB) has become used to physically process. Setting off to every single house and creating the bill is an arduous undertaking and requires loads of time (Fig 1). In the event that the shopper isn't accessible, the charging procedure will be pending and human administrator again needs to return to. It winds up troublesome, particularly in stormy season. On the off chance that the buyer did not pay the bill, the administrator needs to go to their homes to disengage the power supply. This is tedious and hard to deal with. To stay away from human intercession in the charging procedure, programmed charging is done to lessen the labor and power utilization (Fig 2).

4. LITERATURE SURVEY

Kasun Amarasinghe., Daniel L. Marino and Milos Manic [1] investigates the viability of utilizing Convolutional Neural Networks (CNN) for performing vitality stack determining at the individual building level. The approach utilizes convolutions on chronicled loads. Climate information to discover the viability of profound learning calculations in stack anticipating.

Yi Wang, Qixin Chen., Tao Hong and Chongqing Kang [2] it leads an application-arranged survey of brilliant meter information examination. It takes after three phases of examination, to be specific, unmistakable, prescient and prescriptive investigation. To give an entire picture and profound bits of knowledge into this zone of huge information issue, advancements of machine learning, novel plan of action, vitality framework change, and information protection and Security.

Gossip Rashed Mohassel., Alan Fung., Farah Mohammadi and Cameroon Raahemifar [3] Advanced Metering Infrastructure gives a required change in the territories of correspondence, information investigation and control plans. Brilliant home framework with RaspberryPi and NodeMCU as the backend that not just fills in as home computerization and simply a switch substitution, however to likewise record and report essential things to the proprietor of the house. Additionally shrewd home improvement with better security and more capacities.

Preethi and G. Harish [4] SME helps client in distinguishing the uses among approved and unapproved clients, which helps in controlling the

power burglary. Correspondence between client/family unit and substation is finished utilizing Zigbee. GSM organize is utilized for sending SMS to the nearby experts.

Yasirli Amri and Mukhammad Andri Setiawan [5] used to compute the influence that has been utilized by electronic gadgets with the goal that property holders can get a good deal on power bills. This enormously encourages the mortgage holder to screen the house, notwithstanding when he isn't at home. Shrewd home framework with RaspberryPi and NodeMCU as the backend that not just fills in as home robotization and simply a switch substitution, however to likewise record and report imperative things to the proprietor of the house. Additionally savvy home improvement with better security and more capacities.

Maninderpal Singh and Er. Varun Sanduja [6] IOT innovation the administration individual can locate the unscrupulous client, it can make the task of the specialists impracticable to take the power, the power robbery. This logical work has been executed to locate the untrustworthy utilize. Vitality meter speaks with raspberry pie through GPIO pins. GPIO pins bring the viable information from vitality meter and it sends powerful information to the raspberry pi, at that point associate the wifi module with raspberry pi. The execution, brilliant meter naturally slices power when anybody attempted to burglary and it likewise screens the power utilization through advanced mobile phone and shrewd meter that sends status if any blame happened in a transmission line.

Darshan Iyer N and Dr. K A Radhakrishna Rao [7] ease of getting to data for customer from vitality meter through IOT. Burglary identification at customer end continuously. LCD shows vitality utilization units and temperature. Detachment of administration from remote server. IoT and PLC based meter perusing framework is intended to constantly screen the meter perusing and specialist organization can detach the power source at whatever point the client does not pay the month to month charge and furthermore it takes out the human association, conveys successful meter perusing, keep the charging botch. IoT vitality meter utilization is gotten to utilizing Wi-Fi and it will enable shoppers to maintain a strategic distance from undesirable utilization of power. The execution of the framework can be upgraded by associating all family unit electrical machines to IoT.

Pooja D Talwar, Prof. S B Kulkarni [8] to produce charge naturally by checking the power unit's utilization in a house and in an approach to diminish the difficult work. The figurings are performed consequently and the bill is refreshed on the web by utilizing a system of Internet of Things. The bill sum

can be checked by the proprietor anyplace all inclusive. Wifi ESP8266 is an ease chip and a microcontroller. Showing the data about the vitality devoured as far as units, about the bill and if any robbery that happens will be shown in the site. The primary change for what's to come will make vitality meter readings, altering recognizable proof procedures, and association and separation and furthermore the pre data giving to the clients all will occur on wifi web.

Mr. Rakeshkumar D. Modi, Mr. Rakesh P. Sukhadia [9] the outline can take out the labor inclusion to keep up the power. The shoppers of power need to pay according to the use of power on plan, some way or another purchasers neglect to pay, the transmission of power can be killed from the far off server naturally. Vitality meter gives arrangement to the purchasers that they can screen the vitality utilization in units by utilizing a website page. The keen power vitality meter comprises Microcontroller, LCD show, robbery identification unit, temperature sensor, PLC (Power Line Communication) modem and Wi-Fi module. Robbery recognition and provider can separate support of the shoppers in case of meter altering or unapproved utilization of power. It dispenses with the labor required for meter perusing.

Manasi Giridhar and S. Kayalvizhi [10] monitoring the frameworks in shrewd network and gather the data of power utilizes then settled correspondence with the purchasers, which can be helpful for suppliers and additionally customer by utilizing message line telemetry transport convention. In furthermore it gives ongoing evaluating and observed utilization data to the buyers. Current and voltage sensors are utilized for estimating the power consumption. Those readings are sent to the purchaser and also Electricity Board by utilizing ZigBee and message Queue Telemetry Transport (MQTT) convention. MQTT is a system convention which is utilized to exchange information among distributor and supporter. It is a distributor and supporter convention. IoT vitality meter utilization is gotten to utilizing Wi-Fi and it will enable shoppers to maintain a strategic distance from undesirable utilization of power. The execution of the framework can be upgraded by interfacing all family unit electrical machines to IoT.

Ning Lu., Pengwei Du Xinxin Guo and Frank L. Greitzer [11] defining every individual load profile. In home vitality administration frameworks (HEMS), day by day vitality utilization examples can be a vital variable to screen and activating client activities. A 15-minute meter and climate informational collection gathered by specialists at Pacific Northwest National Laboratory (PNNL). For clients, notwithstanding, every day observing for

security and vitality utilization is superior to month to month checking on the grounds that clients have restrictive data about their power use. Spotlights on concentrate the information connection among different information sources from both the appropriation and transmission control matrices. Vitality utilization shifts every day because of climate, inhabitation, and diverse client utilization designs, day by day data alone is of little incentive to an utility except if a variation from the norm in month to month vitality utilization is recognized.

Xiufeng Liu., Lukasz Golab and Ihab F. Ilyas [12] SMAS, our brilliant meter examination framework, which shows the noteworthy knowledge that customers and utilities can get from shrewd meter information. SMAS, our brilliant meter examination framework, which shows the significant knowledge that purchasers and utilities can get from keen meter information. The incline of the 90th percentile line comparing to high temperature is the cooling inclination, and the slant of the line relating to low temperature is the warming slope. Besides, the stature of the tenth percentile lines at their most minimal point is the base load, which relates to stack because of machines that are dependably on, for example, an icebox.

Savita Pawar, Dr. B. F. Momin [13] the keen meter primary usefulness is estimating, catching and changing information identified with utilization or utilization of power, gas or water and occasions, for example, meter status and power quality. Shrewd meters and savvy matrix will be the predominant piece of Internet of Thing (IoT) which coordinate different perspectives of people groups' necessities and administrations to fulfill them and in this way numerous explanatory difficulties emerges, for example, ongoing examination.

Dr. P. Mathiyalagan., Ms. A. Shanmugapriya., Geethu. A. V [14] electricity utilization information of a shrewd meter are utilized at a testing rate of one moment. The gushing information are stacked into HDFS in a hive table, which is additionally sent out into R keeping in mind the end goal to perform prescient examination and load profile investigation. The information are amassed into day by day, week after week, month to month and quarterly arrangement, and utilized ARMA and ARIMA model to anticipate the future power utilization.

Krzysztof Gajowniczek, Tomasz Ząbkowska [15] Forecasting power utilization is an essential errand to give insight to the savvy brace. Precise anticipating will empower an utility supplier to design the assets and furthermore to take control activities to adjust the power free market activity. The clients will profit by metering arrangements through more prominent

comprehension of their own vitality utilization and future projections, enabling them to all the more likely oversee expenses of their use. In this verification of idea paper, our commitment is the proposition for precise here and now power stack anticipating for 24 hours ahead, not on the total but rather on the individual family level.

Jiankun Hu, and Athanasios Vasilakos[16] the advancements in the current huge vitality information investigation and security. A few scientific categorizations have been proposed to express the captivating connections of different factors in the field. The restricted accessible petroleum derivatives and the call for manageable condition have realized new advances for the high productivity in the utilization of non-renewable energy sources and presentation of sustainable power source. Keen matrix is a developing innovation that can satisfy such requests by consolidating propelled data and correspondences innovation (ICT). The inescapable organization of the progressed ICT, particularly the brilliant metering, will create huge vitality information regarding volume, speed, and assortment. The created huge information can convey colossal advantages to the better vitality arranging, proficient vitality age, and dissemination.

Kasun Amarasinghe, Daniel L. Marino, Milos Manic[17]it examines the adequacy of utilizing Convolutional Neural Networks (CNN) for performing vitality stack determining at singular building level. The exhibited system utilizes convolutions on recorded burdens. The yield from the convolutional task is nourished to completely associated layers together with other relevant data. The displayed system was actualized on a benchmark informational index of power utilization for a solitary private client. Results got from the CNN were thought about against results acquired by Long Short Term Memories LSTM succession to-arrangement (LSTM S2S), Factored Restricted Boltzmann Machines (FCRBM), "shallow" Artificial Neural Networks (ANN) and Support Vector Machines (SVM) for the same dataset. Exploratory outcomes demonstrated that the CNN beat SVR while delivering similar outcomes to the ANN and profound learning philosophies. Additionally testing is required to think about the exhibitions of various profound learning models in stack determining.

Ramyar Rashed Mohassel, Alan S. Fung, Farah Mohammadi, and Kaamran Raahemifar[18] this review paper is a portion of a more far reaching study on Smart Grid (SG) and the job of Advanced Metering Infrastructure (AMI) in SG. The overview was done as a component of a plausibility contemplate for the formation of a Net-Zero people group in a city in Ontario, Canada. SG is anything

but a solitary innovation; rather it is a blend of various zones of designing, correspondence and administration. This paper plans to center around AMI, which is in charge of gathering every one of the information and data from burdens and customers, as the establishment for SG. AMI is likewise in charge of executing control flags and directions to perform essential control activities, including Demand Side Management (DSM). In this paper we present SG and its highlights, build up the connection among SG and AMI, clarify three fundamental subsystems of AMI and examine related security issues.

Maninderpal Singh, Er.Varun Sanduja[19] an administration individual can locate the exploitative client by demonstrating the status of vitality meter at the back end of power office. To achieve this, vitality meter speak with raspberry pi through GPIO pins. GPIO pins get the viable information from vitality meter and it send compelling information to the raspberry pi and associate raspberry pi with the web. At the backend, government individual can see the status of vitality meter as charts. IOT utilize things to things association with get to the web of things, enable information to store and access administrations. Administrations over web of things advancement as per need of individual to individual and thing to individual, machine to machine communication without human association. A brilliant vitality meter is utilized to limit the power robbery. Essentially vitality meter is a gadget that figures the expense of power devoured by homes, business, or an electrical gadget. It decreases the burglary of power.

Darshan Iyer N, Dr. K A Radhakrishna Rao[20]it portrays PIC18F46k22 Microcontroller based plan and execution of vitality meter utilizing IoT idea. Theproposed framework configuration dispenses with the human association in Electricity support. The Buyer needs to pay for the use of power on plan, in the event that that he couldn't pay, the power transmission can be killed autonomously from the far off server. The client can screen the vitality utilization in units from a site page by giving gadget IP address. Robbery recognition unit associated with vitality meter will advise organization side when meter altering happens in vitality meter and it will send burglary identify data through PLC modem and burglary identified will be shown on the terminal window of the organization side. Wi-Fi unit plays out the IoT activity by sending vitality meter information to site page which can be gotten to through IP address.

Karthikeyan S, Bhuvaneswari P.T.V[21] the displayed framework gives pervasive and nonstop access to vitality utilization to the buyer by misusing

the progression of IoT innovation. The proposed framework is financially savvy as it requires a straightforward update on the current meters than finish substitution. Further, it is light weight and minimal with the utilization of SoC for control and correspondence. Through the trial examination, it is discovered that from the gathered information, it is conceivable to acquire the example of utilization and brokenness present in the current framework. The exhibited work can likewise be stretched out to huge scale from which stack circulated in the territory can be evaluated so the framework can be fortified to improve execution.

Rahul Rajesh B, Mohan Kumar S, Nayabz Sharief, Sourabh Kothari, K Ezhilarasan[22] the proposed framework will consequently detects the utilized vitality, records these readings and stores it in a cloud organize where it very well may be observed consistently continuously limitations. A framework which will give charging data and month to month utilization measurements to the client through a web server will be more appropriate in the data age. Likewise, the framework is made adaptable by giving the client a choice to remodel the regular post-paid meter to function as a prepaid one. IOT is the innovation used to make this interconnected framework not just takes care of the issue of manual meter perusing yet in addition give extra highlights, for example, control separation because of remarkable levy, control reconnection in the wake of making the vital installments, control cut alarm, altering caution and so on, immediately.

Pooja D Talwar, Prof. S B Kulkarni[23] it is depicted to quantify vitality utilization in the house and produce its bill naturally utilizing telemetric correspondence. This can help in lessening vitality utilization in house as the proprietor is ceaselessly being told about the quantity of units that are devoured. Its objective is to produce charge consequently by checking the power unit's utilization in a house and in an approach to lessen the difficult work. The counts are performed consequently and the bill is refreshed on the web by utilizing a system of Internet of Things. The bill sum can be checked by the proprietor anyplace all inclusive.

buyers to keep the power burglary, and furthermore it encourages in charge installment utilizing RFID.

Rohit Bhilare, Shital Mali[26] presents keen home framework in light of IoT with the assistance of Web application. Web on Things (IoT) is getting to be critical and fundamental part in the present IT industry and displaying potential market. Power utilization and proficiency with a client's solace level is most imperative issue amid this stage while performing

Mr. Rakeshkumar D. Modi1, Mr. Rakesh P. Sukhadia[24] this Review center around the outline and usage of IoT based savvy power vitality meter. This plan can be take out the labor inclusion to keep up the power. The customers of power need to pay according to the usage of power on plan, by one means or another buyers neglect to pay, the transmission of power can be killed from the inaccessible server consequently. Vitality meter gives arrangement to the buyers that they can screen the vitality utilization in units by utilizing website page giving gadget IP address. Vitality meter comprises robbery identification unit will advise organization side in case of meter hardening or burglary rehearse happen in vitality meter and furthermore it will send data in regards to robbery recognition by utilizing PLC modem and the robbery distinguished will be shown on the terminal screen or window of the organization side. IoT task can be performed by Wi-Fi gadget which sending vitality meter information to the page through the IP address. This keen

power vitality meter comprises Microcontroller, LCD show, robbery location unit, MAX232, Triac switch circuit, temperature sensor, PLC modem and Wi-Fi module. Catchphrases : IoT(Internet of Things), Microcontroller, LCD show, robbery discovery unit, MAX232, Triac switch circuit, temperature sensor, PLC modem and Wi-Fi module.

Manasi Giridhar, S.Kayalvizhi[25] proposes a novel system to forestall different types of power burglary. Power robbery can be as meter assorted variety, charging ill-conceived and charging irregularity. It likewise acquires a novel development the type of a savvy meter which is a critical innovation for the previously mentioned issue situation by observing the frameworks in shrewd lattice and gather the data of power utilizes then build up correspondence with the purchasers which can be valuable for suppliers and additionally customer by utilizing message line telemetry transport convention. In furthermore it gives constant valuing and checked utilization data to the purchasers. A reproduction system has been produced that can assess values for vitality, current and voltage for different apparatuses which can be sent to the power office and in addition

different activities. Controller is appropriate for control utilization in framework and productivity explores different avenues regarding size factor. E-controller is spoken to by consolidating installed innovation with IoT.

Milanpreet Kaur, Dr. Lini Mathew, Alokdeep and Ajay Kumar[27] depicts the observing of vitality utilization with Arduino Uno board and Ethernet utilizing IoT (Internet of Things) idea. This proposed

configuration kills human consideration in the protection of power. The customer can get the data about utilization of vitality by utilizing IP address on their gadgets. The web customer code is transferred for checking the customer data, for example, area, substance, association, and separation to the web server. Brilliant lattice framework with different correspondence advancements which can be practical and electrical segment to have a bidirectional correspondence in which data about electrical vitality utilization is shared between shoppers and also by utility for remote checking This proposed framework gives solid and precise data in regards to electrical vitality administration framework (EMS) through Internet of things (IoT).

Mr. Samarth Pandit, Miss. Sneha Mandhre, Miss. Meghana Nichal[28] extends the way to screen vitality utilization at household level. This aides in decreasing vitality utilizations and screens the units devoured. The goal is to make the electrical apparatuses clever and give solace to purchaser and to decrease control utilization in web applications. Outline and usage of the venture is essentially founded on Arduino UNO controller and IoT innovation. In the event that any altering happens the controller will send the information to the server and in addition it is chopped down the vitality supply naturally. Ethernet plays out the IoT task through which the information is send to the site page.

S.V. Anushree , T. Shanthi[29] the primary destinations of this framework are depicted unmistakably as takes after: burglary of power expands the costs paid by clients and can have genuine security results. Distinguishing power burglary has

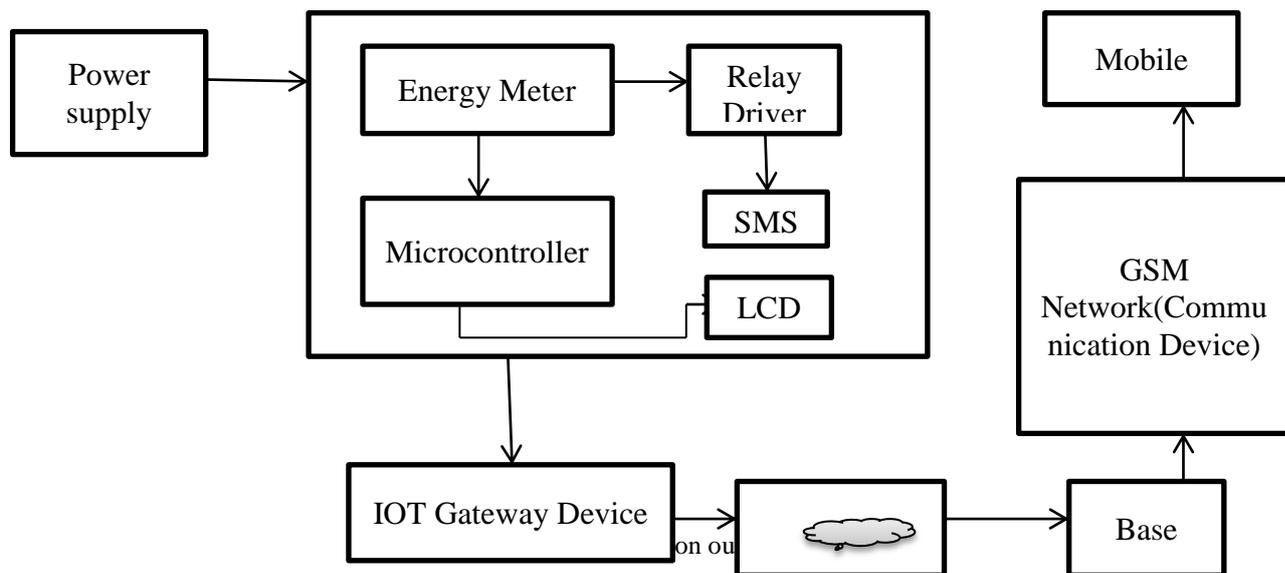
been generally tended to by physical checks of alter clear seals by field faculty and by utilizing balance meters. Recognize the burglary by sending ready SMS to the proprietor. Sent meter readings and rate each month to the proprietor. Including with these setup a productive Internet of Things (IoT) is characterized, which pictures the worldwide association condition to the clients and enable them to see the status of meter perusing and robbery affiliations comprehensively from anyplace whenever. Burglary of power materially affects clients regarding cost and security. Dispersion Network Operators (DNOs) in handling burglary when it isn't obligation of providers. to help providers in exploring, identifying and averting robbery. For all the whole framework is helpful for aversion of burglaries and comprehensively associated medium to representation the meter persuing to its clients adequately.

Maha Aboelmaged, Yasmeen Abdelghani, Mohamed A. Abd El Ghany[30] the developing of IoT idea as of late in our lives, has offered the opportunity to set up vitality effective shrewd gadgets, frameworks and urban areas. Because of the asking requirement for preserving vitality, this paper proposes an IoT based vitality effective remote keen metering framework plan. It rivals the current meters similar to a minimal effort totally coordinated metering framework. It offers an effectively worked Android application for clients and a Website and database for the power provider organization. The proposed framework configuration has a precision level of 97% and it is around 25% lower cost than its companion in the worldwide market. The proposed configuration lessened the power utilization by 16%

5. RESEARCH METHODOLOGY

The proposed framework has two segments, specifically, Home Section and Electrical Base Station. The correspondence between these two is finished by remote system. It screens the heap and computes the power devoured precisely by the client at a given time. Vitality used and the relating current, voltage, power and sum will be shown on LCD consistently and imparted to the base station. A SMS containing month to month charge alongside due date is sent to the individual meter proprietor utilizing GSM. IOT Gateway Device with wifi is utilized to

transmit the power devoured to the Electricity Board site(Fig.1.). If there should arise an occurrence of bill not paid, the programmed control slice is done through Relay Driver Circuit. The framework can go about as either paid ahead of time or post-paid. In prepaid mode, the power utilization (in watts) regarding time that comparing sum is deducted from the aggregate sum and is shown on the LCD persistently. On the off chance that the energized sum is diminished to half of the aggregate sum a bell is initiated and constantly cautions the buyer. In post-paid mode, it just shows the power utilization and the comparing sum on LCD consistently



6. CONCLUSION

The Electrical conveyance arrange is a constant procedure in the present innovation. A progressed metering street and rail arrange set forward the elbowroom for helper vitality unified administrations, for example, request side administration and cognizance of virtual power plants. The capability of shrewd metering depends significantly on the approach and conclusiveness of the administrative bodies stirred up. Vitality reserve funds and an enhanced security of supply are the real drivers and dams in brilliant metering as colossal focuses of a country. The Smart metering framework will screen the expended control specifically home and transmitted through IOT Gateway Device. It stays away from human mediation in the charging procedure, Lack of subtle elements in meter cards. Deferral in meter perusing by assessors, Failure to transfer meter readings on primary server regardless of whether done instantly and assessors wrongly advising the date of appraisal in the meter cards.

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