IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SMART ENERGY METER

S GUNASEKARAN[1], A. PARTHIBAN[2], RR. KRISHNA NAVEEN[3], A. KRISHNA PRASATH[4]
1 ASSISTANCE PROFESSOR 2, 3,4 UG SCHOLAR
COMPUTER SCIENCE AND ENGINEERING
V.S.B. ENGINEERING COLLEGE, KARUR, TAMILNADU, INDIA

ABSTRACT

One of the most crucial aspects of our daily lives is electricity. For the full and proper use of our electricity, it must be done in the right manner. However, despite the fact that the country has a surplus of energy in many locations, there are still a large number of places that cannot even get access to it. Our goal is to lower monthly bills by using wireless technology and sending payments from remote locations straight to the electricity billing office. By doing this, we can cut down on the amount of time and effort now needed to visit every home in our system. The disadvantage of our existing bill payment system, which is a postpaid system, is that users' electricity use is not under any kind of user control. We intend to create a prepaid system for bill payment in order to reduce errors, as well as an IOT-based energy meter. This paper allows you to obtain the electricity bill, electricity providing days, and the previous bill. Our presented framework focuses on the part of smart grid parameter monitoring and calculation using IoT enabled smart meters (SMs). Our proposed system's first concept is that the load will consume the unit of energy and a bill will be generated based on the number of units consumed. The webpage will also provide real-time analysis. With the help of LCD displays, we can precisely determine the amount of energy consumed in the consumer node. In the second notion, we can observe the number of units consumed by the consumer side and, if they don't pay the Appropriate amount, we can use an IoT relay to disconnect the power supply. The third idea is to update to IoT while monitoring the current transformer of how much power the user uses.

Keywords: Energy Meter, Internet of Things & LCD display

1. INTRODUCTION

Electricity is one of the most important issue of our day by day lifestyles. It has to be in right way for complete and proper usage of our power. But in case of united states there's surplus supply with electricity in many areas however there are such a lot of regions which could not even get right of entry to of energy. Reasons for above troubles are our policies of distribution that they cannot expect the precise necessities of power and nevertheless strength theft is winning. In our present machine services of electricity corporations also are no longer desirable and best. Customers also are now not glad with the contemporary machine due to the fact frequently they have complaint approximately to statistical mistakes in month-to-month bills. Thus we are trying to constitute the idea approximately minimization of blunders, reduce the paper work, human dependency within the machine. Our purpose is to lessen monthly bill by way of wireless generation and from far flung vicinity at once to electricity billing workplace. By doing this human hours and efforts are decreased which can be required to visit each home in our present machine. Our cutting-edge system for invoice fee is postpaid system and downside of the modern-day bill price system is there's no manage on users associated with intake of electricity. We understand that the supply of electricity is limited and as a responsible citizen it's our obligation to use it in efficient way. We are aiming to layout to pay as you go machine for bill fee to lessen mistakes and IOT primarily based electricity meter. This wireless meter can be used in industries, residential condo, and many others. This paper focuses on

demonstrating the bidirectional energy go with the flow among technology gadgets and the customer's unit, clever strength metering, and home automation gadget. Solar photovoltaic (PV) gadget is materials energy to the home equipment with the grid and when the power solar PV is sufficient, it can make contributions to the grid. The smart billing machine affords the billing facts to the users via IOT. Energy conservation is the crucial needs in these days. Increasing the demand for power intake their power monitoring might be taking crucial role therefore it's far considering as the research that specialize in each energy purchaser and provider. This paper affords the capability to get the power bill, strength imparting days, and the previous bill additionally. Using the Internet of Things technology, the shifting records may be very easy to see for each the providers and purchasers and even smooth to make payment of energy invoice and to keep the continuation method and discontinuous manner without difficulty. Growth of populace and the inception of recent devices each day comes with an incessant rise in energy consumption and has delivered outstanding demanding situations in phrases of electricity management at the consumer facet. With the evolution of technology, Renewable energy based totally clever meters (SMs) aren't best considered merely as gear to degree strength consumption however act as a first-rate resource of power management structures. The improved energy consumption accompanied through improvement in renewable electricity generation have resulted in outstanding mission to power industry. Pursuing the requirement of multiplied strength performance have resulted in the studies and development of sensible strength networks as the destiny energy community. Renewable Energy Based Smart Electricity Energy Meters can be taken into consideration because the basic fundamental component of the future intelligent community or smart grid, measuring the power waft and changing records on energy intake among utilities and clients and additionally tracking and controlling domestic home equipment and devices with patron records. Smart metering is a modern subject matter with fast and continuous development. Smart metering gives the blessings of software running systems in measuring and handling the building utilities such as electricity, water, gas, etc. The layout and development of an IoT-primarily based smart power meter with a real time strength tracking machine device has been said in this have a look at paper. In nowadays scenario all of the technology are operated in computerized circumstance from everywhere around the world. Based on our authority's machine first one hundred unit of power is not calculated via electricity meter, which is used to calculate the energy fed on unit within the patron node. Generally, the IoT's are used for home automation software including fan and lamp become controlled with the aid of mobile phones based totally on cloud platform. The current microcontroller is used to control best one facts at a time for cloud primarily based process. However, to manipulate the records but can't provide maintains strength to the purchaser node. This cloud platform is most effective stores the dates and control to the controller parts with use of cayenne cloud server. Exponential increase in urban improvement has created a hard trouble of electricity intake control in energy sector. Especially, inside the international locations wherein temperatures are very high, devices like aircon eat massive energy, creating even extra difficult state of affairs for the energy sector to control demand at consumer facet. In recent years, loads of smart solutions have been proposed to conquer the problem of call for aspect electricity control. Such solutions include designing of power management systems (EMS) using combination of numerous strategies like renewable assets (RES) based micro grids, smart grids, clever manage of customer gadgets the usage of the neighborhood location networks (LANs) or net of factors (IoT) etc. With the inclusion of IoT in EMS has given start to clever EMS (SEMS) as IoT enabled gadgets can be controlled well from everywhere in the global. In this paintings, we've got provided the deployment and validation of an IoT primarily based SEMS for imparting green energy management. Our presented framework makes a specialty of a part of monitoring and calculating the clever grid parameters the usage of IoT enabled clever meters (SMs).

2. LITERATURE SURVEY

P Kalyan Chakravarthi; D. Yuvaraj et al proposed "IoT–based totally clever power meter for smart grids' – IEEE, 2022.

This existing gadget, a shrewd meter which matches on IOT is carried out on this work. Instead of calculating electricity intake with meter reading on my own, can control and calculate the intake with the aid of uploading thru cloud. Further the buyer can observe it. As an end result, customer power evaluation turns into appreciably less complicated and greater controllable. This programmer also aids within the detection of energy fraud. As a result, it'll

provoke a brand new step in the direction of digital India by way of taking clever meters in to the actual time strength consumption calculations.

Saikat Saha; Swagata Mondal et al proposed "Design and Implementation of IoT Based Smart Energy Meter" – IEEE, 2021.

As a first step towards such cyber-assault related researches and trying to find feasible mitigation techniques, it is vital that a clever meter be developed that has the function of community integration. The current contribution reports the layout, fabrication, and operation of an Internet of Things (IoT) based smart meter using Arduino to function an indispensable part of a smart grid gadget.

Bibek Kanti Barman; Shiv Nath Yadav et al proposed "IOT Based Smart Energy Meter for Efficient Energy Utilization in Smart Grid" – IEEE, 2018. The existing power meter gadget has many troubles associated to it and one of the key problem is there may be no full duplex verbal exchange. To clear up this hassle, a smart energy meter is advanced based totally on Internet of Things (loT). The present smart electricity meter controls and calculates the electricity intake the usage of ESP 8266 12E, a Wi-Fi module and uploads it to the cloud from wherein the consumer or producer can view the reading. Therefore, power analyzation through the patron turns into a good deal easier and controllable. This device additionally helps in detecting electricity robbery.

Gitanjali Mehta; Ruqaiya Khanam et al proposed "A Novel IoT based Smart Energy Meter for Residential Energy Management in Smart Grid Infrastructure" – IEEE, 2021.

Smart Electricity Energy Meters may be taken into consideration as the primary fundamental thing of the future smart network or clever grid, measuring the strength drift and replacing facts on power intake among utilities and purchasers and additionally monitoring and controlling home equipment and gadgets with customer information. In this paper, the authors advise an IoT based totally Smart Energy Meter with Arduino and ESP8266 Wi-Fi unit that could offer data of strength invoice through SMS or E-mail and can also provide strength tracking utilization every time and anywhere within the world.

Md. Hasibul Islam; Touhidul Islam Talukder et al proposed "An IoT-Based Smart Energy Meter with Real-Time Power Tracking System: A Review" – IEEE, 2021.

The proposed gadget consists of a clever sensing unit so that it will detect the house electrical appliances used for each day sports by way of following distinctive tariff fees. It will lessen charges for the customers and thereby improve grid balance. For strength tracking, there will be voltage and cutting-edge sensors, microcontrollers, and Wi-Fi modules. Consumers may be capable of get entry to peer the energy scores through a cellphone app from anywhere and whenever. Finally, solar and grid electricity may be connected to the tool as a strength source.

3. SYSTEM DESIGN

3.1 EXISTING SYSTEM

In this paper, we propose a trendy ensemble-primarily based deep-studying detector that allows the SO to locate false readings inreal time. To do this, we _rst train several deep gaining knowledge of models on samples generated from a sliding window of the readings. Then, we use the high-quality-performing model to educate numerous models on exceptional ratios of fake readings and use them in our ensemble-primarily based detector. Extensive experiments are performed, and the effects suggest that evaluating to the literature, our detector can hit upon the false readings after sending some false readings (round 15) evaluating to the existing day by day and weekly detection procedures that want one hundred forty-four and 1,008 readings, respectively.

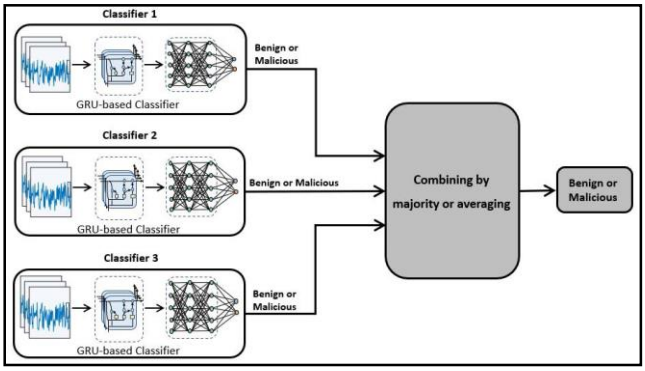

Fig. 1 Existing Block Diagram

3.2 PROPOSED SYSTEM

In the IoT server, we are able to display whether the consumer ingesting solar energy or power board electricity and manipulate the weight through Internet of Things. In the electricity meter, there's LED which blinks continuously. The blinking

of 3200 blinks of an LED gives 1 unit of strength consumption. As consistent with this understanding the microcontroller IC counts the wide variety of blinks and in keeping with the range of gadgets consumed the bill get generated also the real time analysis may be accessed through the website. Based on our authority's device, first 100 unit of power isn't always calculated with the aid of electricity meter, that's used to calculate the power ate up unit in the patron node. So that we are able to recognize, the ate up strength inside the patron node precisely with assist of LCD displays. The wireless power meter monitoring machine pursuits to limit these problems by using presenting energy meter monitoring via wireless Wi-Fi medium. Power fed on through purchaser within the home side module is monitored by Electricity Board via Wi-Fi era the usage of IoT. An electric powered meter is a tool that measures the quantity of electrical strength fed on by means of a residence, a business, or an electrically powered tool. Electric utilities use electric meters established at patron's premises for billing functions on the cease of the month a person from the power branch has to go to the purchaser premises and be aware down the reading. This device makes problem-free for electricity branch to get admission to the energy consumed by using the patron from the purchaser Id additionally the purchaser display the electricity fed on in line with day and every day invoice get generated on the webpage. The gadget reads the facts from the strength meter without tampering it, the proposed model is used to calculate the power consumption of the family. In the cayenne software/internet server, we can view the wide variety of unit consumed via purchaser facet, EB invoice/value. Thus, this smart meter allows in domestic automation the usage of IoT and enabling wireless conversation that's a superb step closer to Digital India.

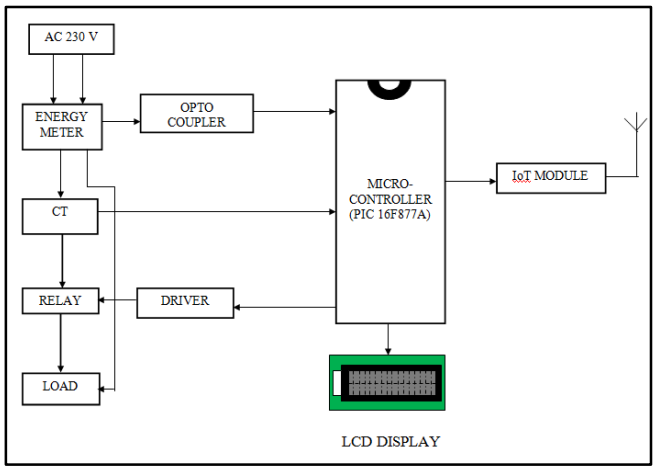

Fig.2 Proposed Block Diagram

4. HARDWARE DESCRIPTION

Power Supply
Electricity Meter
Optocoupler:
Pic Microcontroller
Relay Driver
Lamp Load
Iot Module
Lcd Display

5. RESULTS AND DISCUSSION

This paper is described to degree power consumption inside the house and generate its bill robotically the use of cloud conversation. The predicament of unconsciously exploiting those sources is not conquering by a power control answer itself however consumers ought to be prudent in addition to acutely aware of the surroundings to deter misuse of energy assets. The number one advantage is that a customer can get a carrier wherein facts on power usage may be acquired in actual-time and can communicate with the established loads (which include HVAC and lighting fixtures). Furthermore, the presented SEMS on this work can be integrated into new or existing systems without the use of a copyrighted solution provided with the aid of any producer. Therefore, IoT-based totally SEMS can be used in a huge form of situations where best control and power utilization are wished. Various packages may be incorporated inside the offered SEMS such as real-time monitor and control of strength exceptional and power utilization. Consumers, with the help of a middleware module, can allow/disable HVAC or lights circuits for green electricity consumption. This will prevent the depletion of power resources. Such clever answer, if followed by mass industries, can assist identify energy-intensive device and processes allowing them to increase energy savings strategies, finally resulting in universal strength consumption picture of a bigger place (a town or a country). This can help in decreasing strength intake in residence because the proprietor is constantly being notified about the number of devices that are fed on. It goal is to generate invoice automatically with the aid of checking the strength unit's intake in a residence and in a way to reduce the manual hard work. The calculations are achieved mechanically and the bill is up to date at the internet by way of the use of a network of Internet of Things. The bill amount can be checked via the proprietor everywhere globally.

The net of aspect allows item to be sensed and managed remotely across current community infrastructure, developing opportunities for more direct integration between the physical world and pc primarily based structures, and resulting in stepped forward performance, accuracy and monetary advantage. "REAL TIME EECTRICITY MONITORING USING CLOUD COMMUNICATION" saves the patron's time by way of making them paintings "leaner". The operation of the calculating the electricity value is straightforward and doesn't involve delays, PIC (16F877A) microcontroller alongside serial verbal exchange has been used to interface with the digital terminal. The IOT primarily based Energy meter for calculating fee and displayed in LCD has been executed using MPLAB and PIC 16F877A. The energy cost is ship thru serial verbal exchange to the Virtual terminal built in PROTEUS. This undertaking can therefore enlighten management about wasted time, and pointless trips, eBook retaining and billing as it gives an accurate accounting of devices. In our venture we're showing the information about the strength fed on in terms of gadgets, approximately the bill. Hence each user can check the facts everywhere globally. Cayenne web page is used for displaying the statistics of the project.

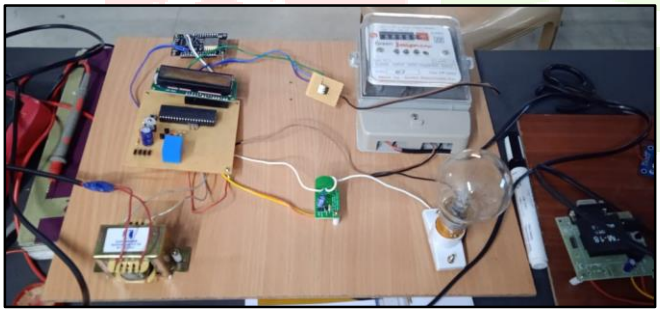

Fig. 3 Smart energy meter hardware

Fig.4. Smart energy meter IoT firebase result

Fig. 5. MIT companion app creation result

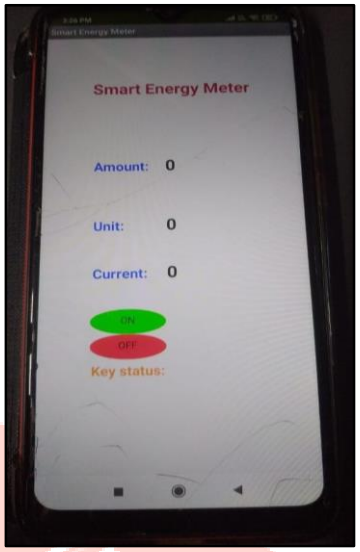

Fig. 6. MIT app in mobile control using IoT

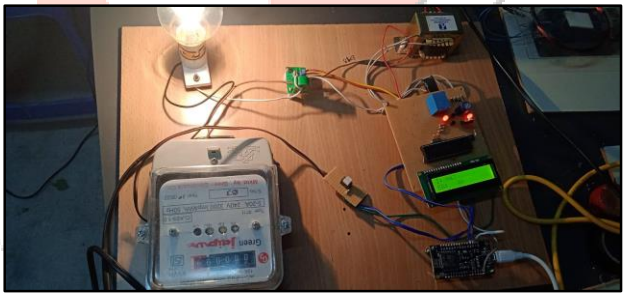

Fig. 7. Result of the hardware

6. CONCLUSION

Main goal of this research is to expand, plan, assemble, exhibit, and validate a low priced SEMS solution to tune each day electricity usage the use of an IoT-based approach the use of renewable sun energy. In the technology of clever metropolis advancement, this assignment is targeting the connectivity & networking issue of the IoT. In this task, an energy intake calculation primarily based on the counting of calibration pulses is designed and implemented the usage of PIC16F877A MCU in embedded device area. In the proposed paintings, REAL TIME EECTRICITY MONITORING USING CLOUD COMMUNICATION system is

designed to constantly monitor the meter analyzing. Ease of having access to statistics for purchaser from power meter thru IoT. The LCD shows power intake devices. Using IoT communique protocols, it collects and in addition transmits the gathered statistics to the middleware module, which manages and gives customers with their strength usage records thru client software. For actual time records collection, the established SMs perform on-line. The presented system can be mounted in clever houses or in other clever environments which require daily electricity consumption. Normally, people screen their electricity usage manually or depend on the measurements taken by way of energy service imparting companies, which can be normally misguided or have deficiencies. Due to technological advance, customers are actually more knowledgeable and are a lot concerned about monitoring in their real quantity of strength consumption and utilization. With using supplied SEMS, consumers can monitor and preserve their power intake effectively as now they can reveal their actual time records on electricity usage. This will in the end limit their electricity consumption, for that reason saving both cash and electricity. This has been demonstrated on this painting via an intensive evaluation of the provided SEMS using an intensive case look at-based evaluation. In this work, it has been tested that IoT is a critical part of the supplied SEMS, because it no longer most effective offers motoring of the real time facts, however -way manipulate of the related devices for efficient energy management, each on the consumer and carrier issuer ends. In quick, the use of IoT gives a sensible solution for day by day based totally strength tracking and manipulate. Based at the case have a look at furnished on this paintings, it's miles concluded that the offered SEMS facilitates consumers to without difficulty, effectively, reliably, and as it should be song their electricity consumption, for that reason, helping them to recognize and manipulate the undesirable use of energy, for this reason, resulting in strength conservation. Furthermore, this painting justifies the use of rising information and communique generation (ICT) needs.

7. REFERENCES

[1] M. S. Saleh, A. Althaibani, Y. Esa, Y. Mhandi, and A. A. Mohamed, ‘‘Impact of clustering micro grids on their stability and resilience during blackouts,’’ in Proc. Int. Conf. Smart Grid Clean Energy Technol. (ICSGCE), Oct. 2015, pp. 195–200, doi: 10.1109/ICSGCE.2015.7454295.

[2] G. Dileep, ‘‘A survey on smart grid technologies and applications,’’ Renew. Energy, vol. 146, pp. 2589–2625, Feb. 2020, doi: 10.1016/ j. renene.2019.08.092.

[3] M. Faheem, S. B. H. Shah, R. A. Butt, B. Raza, M. Anwar, M. W. Ashraf, M. A. Ngadi, and V. C. Gungor, ‘‘Smart grid communication and information technologies in the perspective of industry 4.0: Opportunities and challenges,’’ Compute. Sci. Rev., vol. 30, pp. 1–30, Nov. 2018, doi: 10.1016/j.cosrev.2018.08.001.

[4] F. Yanine, A. Sánchez-Squella, A. Barrueto, A. Parejo, F. Cordova, and H. Rother, ‘‘Grid-tied distributed generation systems to sustain the smart grid transformation: Tariff analysis and generation sharing,’’ Energies, vol. 13, no. 5, p. 1187, Mar. 2020, doi: 10.3390/en13051187.

[5] V. P. Singh, N. Kishor, and P. Samuel, ‘‘Distributed multi-agent system based load frequency control for multi-area power system in smart grid,’’ IEEE Trans. Ind. Electron., vol. 64, no. 6, pp. 5151–5160, Jun. 2017, doi: 10.1109/TIE.2017.2668983.

[6] T. Ahmad, H. Chen, J. Wang, and Y. Guo, ‘‘Review of various modeling techniques for the detection of electricity theft in smart grid environment,’’ Renew. Sustain. Energy Rev., vol. 82, pp. 2916–2933, Feb. 2018, doi: 10.1016/j.rser.2017.10.040.

[7] L. Tronchin, M. Manfren, and B. Nastasi, ‘‘Energy efficiency, demand side management and energy storage technologies—A critical analysis of possible paths of integration in the built environment,’’ Renew. Sustain. Energy Rev., vol. 95, pp. 341–353, Nov. 2018, doi: 10.1016/j.rser.2018. 06.060.

[8] T. Logenthiran, D. Srinivasan, and T. Z. Shun, ‘‘Demand side management in smart grid using heuristic optimization,’’ IEEE Trans. Smart Grid, vol. 3, no. 3, pp. 1244–1252, Sep. 2012, doi: 10.1109/TSG.2012.2195686.

[9] N. Javaid, S. Javaid, W. Abdul, I. Ahmed, A. Almogren, A. Alamri, and I. Niaz, ‘‘A hybrid genetic wind driven heuristic optimization algorithm for demand side management in smart

grid,'' Energies, vol. 10, no. 3, p. 319, Mar. 2017, doi: 10.3390/en10030319.
[10] P. Samadi, H. Mohsenian-Rad, R. Schober, and V. W. S. Wong, ''Advanced demand side management for the future smart grid using mechanism design,'' IEEE Trans. Smart Grid, vol. 3, no. 3, pp. 1170–1180, Sep. 2012, doi: 10.1109/TSG.2012. 2203341.a