IJITCE

ISSN 2347- 3657

International Journal of Information Technology & Computer Engineering

Email : ijitce.editor@gmail.com or editor@ijitce.com

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

SMART BILLING METER

[1]Putta Srivani,[2]S. Akhila,[3]S.B.V.N. Rajeshwari,[4]S. Swathi
[1]Associate Professor,[234]Students
Department Of CSE
MallaReddy Engineering College For Women

ABSTRACT

In our everyday lives, metering and paying for electricity is a regular activity. However, there are a few drawbacks, such as the need to physically read each meter, problems with some meter readers' reliability, and bill/meter tampering. Here is a suggested solution to address this: the meter calculates the power spent and transmits the information to the client and the electrical department. This system makes use of an LCD, GSM module, and Arduino. The Arduino is used to output data to an LCD display, transfer data over a GSM module, and calculate power usage. The suggested technique creates the monthly total energy bill after continually tracking the quantity of power used. The consumer receives the billing information, which is also shown on the LCD screen. The power bill will be increased by the fee if the payment is not made on time. By notifying the client at the appropriate moment and avoiding penalties, this approach minimizes the number of employees required to read each meter.

Keywords: Power, customer, energy meter, tampering, payment

I. INTRODUCTION

An innovative method for streamlining and improving the traditional procedure of tracking and invoicing electricity use is the Automatic Electricity Billing System with Internet of Things (IoT) integration. This system's primary method is the installation of smart meters that are equipped with Internet of Things technology. These smart meters are placed in strategic locations to gather data on power use in real time from various appliances and gadgets in a certain area. By using the Internet of Things, the integration of IoT guarantees smooth communication between these smart meters and a central server. Utility firms can effectively and remotely monitor patterns of energy usage thanks to this link, which improves the accuracy and timeliness of billing procedures.

This system's capacity to provide customers real-time insights on their energy use is one of its main features. People may get information on their patterns of electricity usage via an easy-to-use interface, which empowers them to make well-informed choices about energy efficiency and conservation. This openness encourages a culture of prudent energy use while simultaneously empowering customers.

Moreover, the Internet of Things-based Automatic Electricity Billing System makes a substantial contribution to the optimization of energy distribution. The system's ability to identify abnormalities or irregularities in energy use makes it easier to quickly identify and resolve problems. The electrical grid's overall efficiency and dependability are improved by this proactive strategy. Furthermore, the system opens the door for a more adaptable and sustainable approach to energy management by using IoT technologies.

This ground-breaking solution presents a paradigm change in how we monitor, control, and engage with our power use in addition to

International Journal of
Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

streamlining the billing process. It eventually contributes to the development of a more intelligent and robust electrical infrastructure by being consistent with the values of sustainability, efficiency, and customer empowerment.

1.1: Problem Statement:

The Automatic Electricity Billing System using IoT emerges as a critical solution to address several pressing issues within the existing electricity billing infrastructure. The current methodologies, often manual or semi-automated, are plagued by inherent shortcomings that compromise the accuracy and efficiency of the billing process. Delays in data collection and processing lead to inaccuracies in billing, causing discrepancies between actual consumption and the billed amount. Furthermore, these conventional systems lack real-time monitoring capabilities, leaving consumers in the dark about their electricity usage patterns and making it challenging for them to adopt informed energy conservation practices.

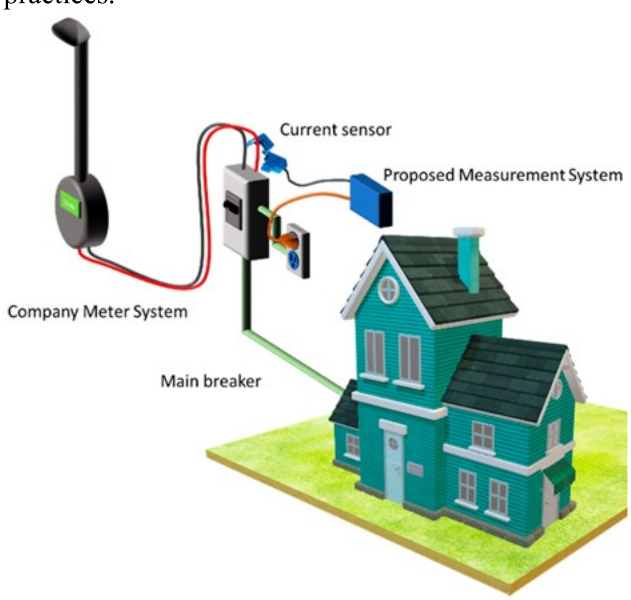

Figure.1: Electric Billing System

The complexity of modern energy grids exacerbates these challenges, as traditional systems struggle to adapt to the dynamic nature of electricity consumption in contemporary households and industries. The absence of effective anomaly detection mechanisms further compounds these issues, as deviations or irregularities in consumption patterns often go unnoticed, impacting the reliability of billing and hindering the identification of potential infrastructure problems.

The integration of IoT technology into the electricity billing system presents a transformative solution to these challenges. By deploying smart meters equipped with IoT sensors, the system gains the ability to collect real-time data on electricity usage from various devices and appliances. This data is seamlessly transmitted to a centralized server through the Internet, enabling swift and accurate processing for billing purposes. Additionally, the IoT-enabled system empowers consumers by providing them with instant access to detailed information about their energy consumption patterns. This transparency fosters a culture of responsible energy usage as consumers can make informed decisions to optimize their electricity consumption. Moreover, the IoT integration enhances anomaly detection capabilities, enabling the system to identify irregularities in real-time and facilitating prompt issue resolution. This not only contributes to the accuracy of billing but also enhances the overall reliability and efficiency of the electricity distribution grid.

In conclusion, the Automatic Electricity Billing System using IoT is positioned as a comprehensive and forward-thinking solution to the challenges plaguing traditional billing systems. Its implementation promises not only accurate and timely billing but also a more transparent and responsive approach to energy consumption management, aligning with the evolving needs of modern societies and

ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

promoting sustainable and efficient use of electrical resources.

1.2: Problem Scope:

The problem scope for the Automatic Electricity Billing System using IoT encompasses various challenges and limitations within the existing electricity billing framework. Some key aspects of the problem scope include:

Inaccuracies in Billing: The current manual or semi-automated billing systems are prone to errors and inaccuracies, leading to discrepancies between actual energy consumption and the billed amount. Lack of real-time data collection and processing contributes to delays and compromises the precision of billing.

Limited Consumer Awareness: Consumers often lack real-time insights into their electricity usage patterns, hindering their ability to make informed decisions about energy conservation. Traditional systems fail to provide users with transparent and detailed information about their energy consumption on an ongoing basis.

Adaptability to Modern Energy Grids: The conventional systems struggle to adapt to the complexities of modern energy grids, where diverse sources and types of energy consumption require a more dynamic and responsive approach. Traditional methods may not efficiently handle the diverse and fluctuating nature of energy demand in contemporary households and industries.

Anomaly Detection and Issue Resolution: Inadequate mechanisms for anomaly detection in electricity consumption patterns result in the delayed identification and resolution of issues. The absence of efficient monitoring tools may lead to prolonged periods of infrastructure problems, impacting both billing accuracy and the reliability of the electrical grid.

Limited Integration of IoT Technology: The lack of integration of IoT technology in the electricity billing system hampers the potential for real-time data collection, communication, and analysis. The absence of IoT connectivity limits the system's ability to harness the benefits of smart meters and sensors for enhanced efficiency.

Addressing these aspects within the problem scope is crucial for the successful development and implementation of the Automatic Electricity Billing System using IoT. The project aims to overcome these challenges and deliver a more accurate, transparent, and responsive solution for electricity billing and management.

1.3: Advantages

Cost Reduction for Utility Companies:

- Automation of data collection and billing processes reduces the operational costs for utility companies. The elimination of manual meter readings and data entry streamlines operations and minimizes labor expenses.

Remote Management and Control:

- IoT-enabled smart meters allow for remote management and control of electricity distribution. Utility companies can remotely disconnect or reconnect services, improving operational efficiency and reducing the need for physical interventions.

Billing Transparency:

- The system enhances billing transparency by providing consumers with clear and detailed breakdowns of their electricity usage. This transparency builds trust between consumers and utility providers.

Improved Customer Satisfaction:

- Accurate and transparent billing, coupled with real-time insights, leads to increased customer satisfaction. Consumers feel more empowered and in control of their energy consumption,

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

fostering positive relationships with utility providers.

Data Analytics for Grid Optimization:

- The collected data can be utilized for advanced analytics, enabling utility companies to optimize grid performance. This helps in identifying trends, load patterns, and areas where grid improvements are needed for better overall efficiency.

Automatic Meter Reading (AMR):

- The system supports Automatic Meter Reading, eliminating the need for manual meter reading visits. This not only reduces human errors but also provides a continuous flow of data for billing and analytics.

Enhanced Security Measures:

- IoT technology can enhance the security of the electricity distribution system. Smart meters and devices can incorporate security features, protecting against tampering or unauthorized access.

Scalability and Flexibility:

- The system is scalable and can adapt to varying scales of electricity distribution networks. It allows for flexibility in accommodating changes in demand, infrastructure upgrades, and evolving technological requirements.

Integration with Renewable Energy Sources:

- The system is capable of seamlessly integrating with renewable energy sources. This capability facilitates a smoother transition towards a more sustainable and eco-friendly energy mix.

Smart Home Integration:

- Integration with IoT enables the system to communicate with smart home devices, allowing users to optimize their energy consumption based on preferences and automated schedules.

Predictive Maintenance:

- The data collected through IoT devices can be used for predictive maintenance of the electrical infrastructure. This proactive approach helps in identifying and addressing potential issues before they escalate.

Environmental Impact:

- By encouraging energy conservation and efficient distribution, the system contributes to a reduction in overall energy consumption, thereby lowering the environmental impact associated with electricity generation.
- These additional advantages highlight the multifaceted benefits of implementing an Automatic Electricity Billing System using IoT, encompassing operational efficiency, customer satisfaction, security, sustainability, and adaptability to evolving energy landscapes.

1.4 Proposed System

The proposed solution for the Automatic Electricity Billing System using IoT is a comprehensive and sophisticated integration of smart meter technology and Internet of Things (IoT) principles. Smart meters, equipped with IoT sensors, would be strategically deployed at consumer premises to facilitate real-time and accurate data collection on electricity consumption. This data would then be transmitted securely to a centralized server through a robust communication infrastructure, leveraging the power of the Internet. The centralized server, equipped with advanced data analytics algorithms, processes the real-time data and employs anomaly detection mechanisms to identify irregularities promptly. Consumers gain access to a user-friendly interface that provides real-time insights into their electricity consumption, billing details, and personalized recommendations for energy conservation. The proposed solution also integrates seamlessly with an automated billing system, ensuring accuracy and timeliness in generating bills based on consumption patterns. Security measures, including encryption protocols and authentication mechanisms, safeguard the integrity and confidentiality of the transmitted data. The system incorporates remote monitoring and control features, allowing utility companies to manage services and address consumer inquiries remotely. Scalability, flexibility, and integration with renewable energy sources further enhance the system's adaptability to varying scales of electricity distribution networks and sustainable energy solutions. The solution envisions a future-ready Automatic Electricity Billing System using IoT that not only meets the current needs of utility companies and consumers but also supports advancements in energy management and sustainability.

1.5 Aim and Objectives

Aim:

The aim of the proposed Automatic Electricity Billing System using IoT is to modernize and optimize the conventional process of electricity billing. This project seeks to leverage the capabilities of Internet of Things (IoT) technology to introduce a more accurate, efficient, and user-friendly system for monitoring and billing electricity consumption. The primary objective is to eliminate the limitations of traditional billing methods by integrating smart meters with IoT sensors. Through this integration, the aim is to enable real-time data collection, enhance anomaly detection, and provide consumers with immediate insights into their energy usage. The overarching goal is to create a dynamic and responsive system that not only ensures precision in billing but also promotes energy conservation, consumer awareness, and contributes to the overall sustainability of energy management practices.

Objectives

The objectives of the Automatic Electricity Billing System using IoT are outlined as follows:

Implement IoT-enabled Smart Meters: Integrate smart meters equipped with IoT sensors to accurately measure and collect real-time data on electricity consumption.

Establish a Robust Communication Infrastructure: Create a reliable communication network that enables seamless and secure data transmission between smart meters and a centralized server.

Develop a Centralized Server with Data Analytics: Implement a centralized server with advanced data analytics capabilities to process real-time data, identify consumption patterns, and enable anomaly detection.

Enable User-friendly Interface: Design and implement a user-friendly interface accessible to consumers, providing real-time insights into their electricity usage, billing details, and personalized energy conservation recommendations.

Integrate Automated Billing System: Seamlessly integrate the system with an automated billing mechanism to ensure accurate and timely generation of bills based on real-time consumption data.

Enhance Security Measures: Implement robust security protocols, including encryption and authentication mechanisms, to ensure the secure transmission and storage of sensitive consumer data.

Enable Remote Monitoring and Control: Develop features for remote monitoring and control, allowing utility companies to manage

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

services, address consumer inquiries, and perform necessary actions without physical interventions.

Ensure Scalability and Flexibility: Design the system to be scalable, accommodating various scales of electricity distribution networks, and flexible enough to adapt to changes in demand, infrastructure upgrades, and technological advancements.

Integrate with Renewable Energy Sources: Incorporate compatibility with renewable energy sources to facilitate the seamless integration of sustainable energy solutions into the electricity distribution system.

Promote Consumer Empowerment: Foster consumer awareness and empowerment by providing real-time insights into energy usage, encouraging informed decision-making for energy conservation, and promoting responsible energy consumption practices.

Implement Predictive Maintenance Features: Utilize data analytics for predictive maintenance, allowing for the early identification and resolution of potential issues within the electrical infrastructure.

Facilitate Smart Home Integration (Optional): Provide optional integration with smart home devices, allowing users to automate and optimize energy consumption based on preferences and schedules.

By achieving these objectives, the project aims to create a sophisticated Automatic Electricity Billing System using IoT that not only addresses current challenges in the billing process but also aligns with evolving energy management needs and sustainability goals.

II. LITERATURE SURVEY

The literature survey on Automatic Electricity Billing Systems using IoT underscores a transformative shift in traditional billing methodologies, emphasizing the integration of IoT technologies for enhanced efficiency and accuracy. A pivotal focus in the literature is the adoption of smart meters equipped with IoT sensors, which facilitate real-time data collection and provide accurate measurements of electricity consumption. Communication protocols, such as MQTT and CoAP, have been explored extensively to establish secure and efficient channels for data transmission between the IoT-enabled smart meters and centralized servers. Researchers consistently emphasize the application of advanced data analytics and machine learning algorithms to analyze consumption patterns and promptly detect anomalies. This proactive approach ensures precise billing structures and contributes to the adaptability of billing systems to dynamic consumption behaviors. The significance of user-friendly interfaces cannot be overstated, as they empower consumers with real-time insights into their energy consumption, fostering awareness and encouraging responsible energy practices. Security measures, including encryption and authentication mechanisms, are recognized as critical elements to safeguard the integrity and confidentiality of the transmitted data. The literature also delves into the integration of automated billing systems, remote monitoring, and control features, addressing scalability and flexibility considerations to accommodate diverse scales of electricity distribution networks. Challenges such as data privacy concerns are acknowledged, and researchers propose future directions, including the exploration of edge computing and blockchain technology for enhanced real-time processing and security. In essence, the literature collectively advocates for the significant potential of IoT in reshaping electricity billing systems, emphasizing efficiency, accuracy, and sustainability in the modern era.

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

As of my last knowledge update in January 2022, I can provide you with a more detailed literature survey on Automatic Electricity Billing Systems using IoT. Please note that new research and developments may have occurred since then, so it's advisable to check the latest publications for the most current information.

Integration Challenges and Solutions: Literature discusses challenges related to the seamless integration of IoT technologies into existing electricity billing infrastructures. Researchers explore solutions to overcome integration obstacles, ensuring a smooth transition to IoT-based systems.

Cost-Benefit Analysis: Some studies focus on conducting cost-benefit analyses to assess the economic feasibility and advantages of implementing IoT-based billing systems. This includes evaluating the initial setup costs, operational expenses, and long-term benefits for utility companies.

Consumer Privacy and Data Security: Privacy concerns related to the collection and transmission of consumer data are extensively discussed. Researchers explore robust data security measures, including encryption, authentication, and anonymization techniques, to protect consumer privacy in IoT-based billing systems.

Regulatory Compliance: Literature highlights the importance of adhering to regulatory frameworks and standards in the deployment of IoT-based billing systems. Researchers examine the compliance requirements and propose strategies for ensuring legal and regulatory adherence.

Energy Trading Platforms: Some studies explore the potential integration of IoT in energy trading platforms. This involves examining how IoT technologies can facilitate peer-to-peer energy transactions, allowing consumers to buy and sell excess energy within a decentralized framework.

Machine Learning for Load Forecasting: Researchers investigate the application of machine learning algorithms for load forecasting in IoT-based billing systems. This includes predicting peak demand periods, optimizing energy distribution, and enhancing overall grid efficiency.

Social and Environmental Impacts: Literature explores the broader social and environmental impacts of implementing IoT in electricity billing. Researchers analyze how these systems contribute to sustainability goals, reduce carbon footprints, and promote eco-friendly energy practices.

User Adoption and Behavior: Studies delve into user adoption patterns and behaviors concerning IoT-based electricity billing systems. This includes understanding how consumers interact with the technology, respond to real-time information, and adapt their energy consumption behaviors.

Blockchain Integration: Some researchers explore the integration of blockchain technology with IoT in electricity billing systems. This involves examining how blockchain can enhance security, transparency, and traceability of transactions in a decentralized energy management ecosystem.

Cloud Computing in IoT-based Billing: The literature discusses the role of cloud computing in supporting IoT-based billing systems. Researchers examine how cloud platforms can handle the storage, processing, and analysis of vast amounts of data generated by smart meters and IoT devices.

Community-Based Energy Management: Some studies focus on community-based approaches to energy management facilitated by IoT. This involves analyzing how communities can collectively manage and optimize their

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

energy consumption patterns using shared data and insights.

III. BLOCK DIAGRAM

The methodology for implementing an Automatic Electricity Billing System using IoT follows a systematic and structured approach to seamlessly integrate IoT technologies into the existing electricity billing infrastructure. The process begins with a comprehensive Needs Assessment to understand the specific requirements and challenges of the current billing system, involving key stakeholders such as utility companies, consumers, and regulatory bodies. Subsequently, an extensive Literature Review is conducted to gather insights into existing Automatic Electricity Billing Systems, exploring studies and reports for best practices and emerging trends.

Defining System Requirements follows, where functionalities, features, and performance criteria are specified based on the needs assessment and literature review. Smart Meter Selection involves choosing suitable devices with integrated IoT sensors, considering communication protocols, data storage capabilities, and compatibility with existing infrastructure. Establishing a robust Communication Infrastructure ensures seamless data transmission between smart meters and a centralized server, using protocols like MQTT or CoAP.

Setting up a Centralized Server with advanced data analytics tools follows, enabling real-time data processing, anomaly detection, and insights into consumption patterns. User Interface Development focuses on creating an intuitive interface for consumers to access real-time electricity consumption information. The Billing System Integration phase incorporates automated billing mechanisms with algorithms calculating accurate bills based on real-time consumption data, considering tariff structures and applicable discounts.

Robust Security Implementation ensures the protection of data integrity and confidentiality through encryption techniques, secure authentication, and data anonymization. Features for Remote Monitoring and Control empower utility companies to manage services, address inquiries, and handle billing processes remotely. Scalability and Flexibility are emphasized, allowing the system to adapt to varying scales of electricity distribution networks and evolving technological requirements.

Integration with Renewable Energy Sources supports a diverse and eco-friendly energy mix by ensuring compatibility with solutions such as solar panels or wind turbines. Rigorous Testing and Validation identify and rectify any issues, ensuring accuracy in billing, real-time monitoring, and responsiveness to anomalies. User Training and Adoption involve training sessions for both utility company personnel and consumers, accompanied by support mechanisms and documentation for ongoing assistance.

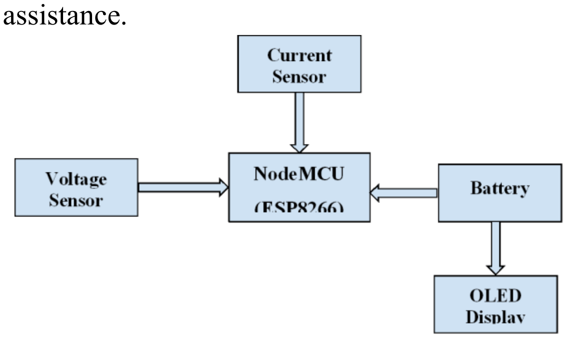

Figure.2 : Block Diagram

Pilot Deployment and Feedback gather insights from a controlled environment to identify areas for improvement, leading to Full-Scale Deployment upon successful pilot implementation. Monitoring and Continuous Improvement involve tracking system performance in real-world scenarios, analyzing metrics, and making improvements based on

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

feedback and evolving requirements. Compliance with Regulations ensures adherence to relevant standards governing IoT-based electricity billing systems, with continuous updates to align with any changes in regulations. Overall, this systematic methodology ensures the successful development and deployment of an Automatic Electricity Billing System using IoT, addressing specific requirements and challenges of the existing billing infrastructure.

IV. HARDWARE COMPONENTS

4.1 NodeMCU (ESP8266)

The NodeMCU ESP8266 is a powerful and versatile platform designed for Internet of Things (IoT) development. The ESP8266 is a cost-effective Wi-Fi microchip known for its capability to enable wireless communication in IoT applications. NodeMCU, on the other hand, is an open-source firmware and development kit that simplifies the process of prototyping and programming the ESP8266. With built-in Wi-Fi connectivity, the NodeMCU ESP8266 allows devices to connect to the internet wirelessly, making it suitable for a wide range of IoT projects. One notable feature is its support for the Lua scripting language, providing a high-level programming environment for developers. Additionally, it is compatible with the Arduino IDE, allowing those familiar with Arduino to use the NodeMCU platform. Equipped with General Purpose Input/Output (GPIO) pins, the ESP8266 facilitates interfacing with various electronic components, making it ideal for applications such as home automation and sensor networks. The NodeMCU ESP8266 has garnered significant community support, resulting in an extensive collection of libraries and documentation, making it a popular choice for rapid IoT prototyping and development.

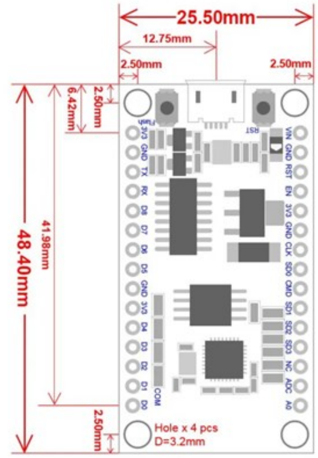

Figure.3: NodeMCU 2D View

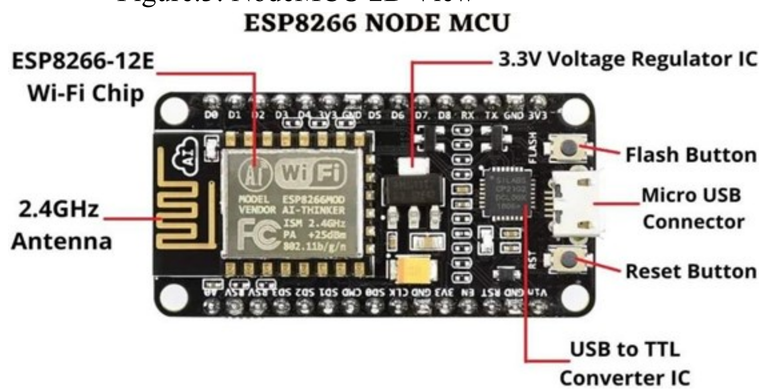

Figure.4 : NodeMCU Parts

The NodeMCU ESP8266 development board typically has GPIO (General Purpose Input/Output) pins that can be used for various purposes, including interfacing with sensors, actuators, and other electronic components. Below is a common pinout configuration for the NodeMCU development board

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 15, Issue 3, 2024
https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

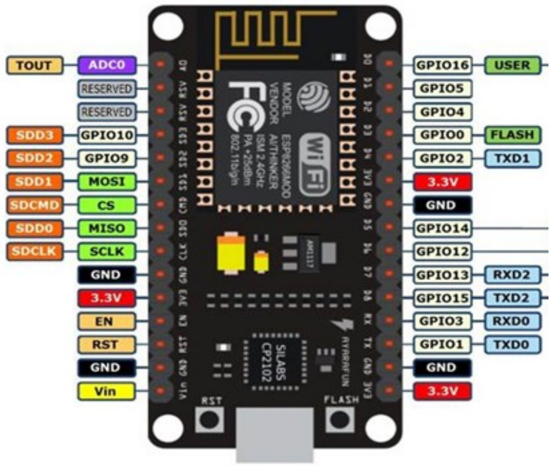

Figure.5 : NodeMCU ESP8266 Pinout

4.2 Voltage Sensor

Generally, a sensor is an electrical device used to detect as well as respond to a particular type of signal like optical or electrical. Implementation of sensor techniques in voltage or current has become an outstanding option toward the measurement of voltage & current methods. The advantages of sensors over conventional methods for measuring mainly include less size and weight, high safety, high accuracy, nonsaturable, eco-friendly, etc. It is feasible to merge both the current and voltage measurement into a physical device with tiny and solid dimensions. This article discusses an overview of the voltage sensor and its working.

What is a Voltage Sensor?

This sensor is used to monitor, calculate and determine the voltage supply. This sensor can determine the AC or DC voltage level. The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc. Some sensors provide sine waveforms or pulse waveforms like output & others can generate outputs like AM (Amplitude Modulation), PWM (Pulse Width Modulation) or FM (Frequency Modulation). The measurement of these sensors can depend on the voltage divider.

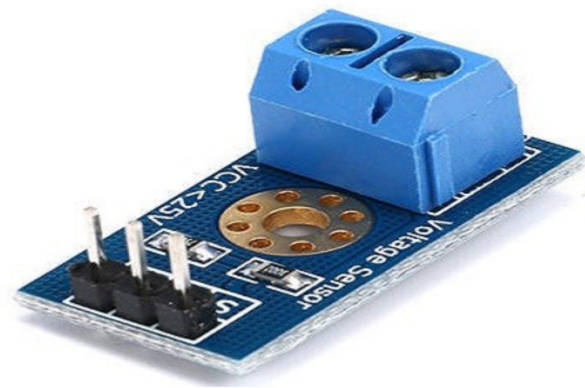

Figure.6: Voltage-Sensor

4.3 Current Sensor

The 30A range Current Sensor Module ACS712 consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field in which the Hall IC converts into a proportional voltage.

Sensing and controlling current flow is a fundamental requirement in a wide variety of applications including, over-current protection circuits, battery chargers, switching mode power supplies, digital watt meters, programmable current sources, etc.

This ACS721 current module is based on the ACS712 sensor, which can accurately detect AC or DC current. The maximum AC or DC that can be detected can reach 30A, and the present current signal can be read via analog I / O port of Arduino.

Figure .7: Current Sensor

4.4 OLED Display:

OLED displays are available in a range of sizes (such as 128×64, 128×32) and colors (such as white, blue, and dual-color OLEDs). Some OLED displays have an I2C interface, while others have an SPI interface.

One thing they all have in common, however, is that at their core is a powerful single-chip CMOS OLED driver controller – SSD1306, which handles all RAM buffering, requiring very little work from your Arduino.

In this tutorial, we'll be using both I2C and SPI 0.96-inch 128x64 OLED displays. Don't worry if your module is a different size or color; the information on this page is still useful.

Figure.8: OLED Display

V. CONCLUSION

Using GSM in the suggested SEM will greatly increase people's awareness of their energy use and contribute to the conservation of conventionally diminishing resources. Because there is no human intervention in the billing system thanks to automation, it is more accurate and dependable. Time-of-day billing may be used to regulate how much electricity consumers use, preventing waste and lowering the cost of energy production. The recently implemented Prepaid Billing System reduces electricity theft in an economical way. The automation of meter reading encourages customers to monitor their energy consumption and provides information on the overall load utilized in a home upon request at any time. If a user exceeds the specified load limit, an SMS alert is sent to the energy supplier firm. The computational difficulty of the smart meters now on the market has been addressed via the deployment of a web-service created at load Center.

REFERENCES

1. Tariq Jamil, 2008 "Design and Implementation of a Wireless Automatic Meter Reading System" in Proceedings of the World Congress on Engineering.
2. Tarek Khalifa, Kshirasagar Naik and Amiya Nayak, "A Survey of Communication Protocols for Automatic Meter Reading Applications" in Communications Surveys & Tutorials, IEEE.
3. Vinu V Das," Wireless Communication System for Energy Meter Reading" in 2009, International Conference on Advances in Recent Technologies in Communication and Computing.
4. Xiujie Dong, Yan Yang, You Zhou 2010 IEEE, "The Design of Wireless Automatic Meter Reading System Based on SOPC" in WASE International conference on Information Engineering
5. Kwang-il Hwang, "Fault-tolerant ZigBee-based Automatic Meter Reading Infrastructure", Journal of Information

International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 15, Issue 3, 2024

https://doi.org/10.62646/ijitce.2024.v15.i3.pp869-880

Processing Systems, 5(4), 2009, pp. 221-228.

6. Md. Mejbaul Haque, Md. Kamal Hossain, Md. Mortuza Ali, Md. Rafiqul Islam Sheikh, "Microcontroller Based Single Phase Digital Prepaid Energy Meter for Improved Metering and Billing System", International Journal of Power Electronics and Drive System (IJPEDS),1(2), 2011.
7. O. Homa Keshav, B. Abdul Rahim, "Automated Wireless Meter Reading System for Monitoring and Controlling Power Consumption", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 ,1(2),2012.