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TO DEVELOP MONITORING OF ELECTRICAL PARAMETERS USING IOT

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Abstract : Electricity is a resource that currently exists in various sectors of the community. Each person's electricity needs are different depending on the needs of the electronic equipment used. Excessive use of electronic equipment creates extreme electrical power. Electricity consumption is an issue that has been discussed since a long ago. This paper aims to present a custom electronic sensor to monitor electricity parameters based on the Internet of Things. This paper presents a study and design of a monitoring system for the continuous measurement of electrical energy parameters such as voltage, current, power and temperature. This system is designed to monitor the data remotely over the internet.

The IoT-based monitoring system for electrical parameters presented in this paper contributes to enhancing the reliability, efficiency, and safety of electrical infrastructure. This paper entails the development of an IoT-based system utilising an ESP32 microcontroller to monitor and control electrical parameters. Integrated with AC voltage and current sensors, alongside a single-channel relay module for appliance control, the system enables real-time data collection and remote operation. Powered by a 9V adaptor, the ESP32 collects data from sensors, transmitting it to the Blynk application for visualisation and control. By leveraging IoT technology, this system offers a scalable and intelligent solution for monitoring and managing electrical networks in various settings, including industrial, commercial, and residential applications.

IndexTerms **-IoT Technology, Energy Management, Power Measurement.**

I. INTRODUCTION

In an era characterised by increasing digitization and connectivity, the Internet of Things (IoT) has emerged as a transformative technology with profound implications across various industries. One such domain where IoT holds immense potential is in the monitoring and management of electrical systems. With the growing complexity and criticality of electrical infrastructure, there is a pressing need for advanced monitoring solutions that can provide real-time insights, enhance reliability, and optimise performance.The paper aims to address this need by proposing the development of an IoT-based monitoring system specifically tailored for electrical parameters. Traditional methods of monitoring electrical systems often rely on periodic manual inspections or stationary monitoring devices, which are limited in scope, scalability, and responsiveness. In contrast, IoT offers a paradigm shift by enabling the seamless integration of sensors, connectivity, and data analytics to create intelligent monitoring systems capable of continuously monitoring and analysing electrical parametersin real-time.

This IoT-based monitoring system represents a significant advancement in the field of electrical engineering and infrastructure management. By leveraging the power of IoT, advanced analytics, and cloud computing, the system offers a comprehensive solution for monitoring, managing, and optimising electrical parameters in diverse applications ranging from industrial plants and commercial buildings to smart grids and smart homes. This paper harnesses the power of IoT technology and the versatility of the ESP32 microcontroller. By integrating AC voltage and current sensors alongside a single-channel relay module, the system enables comprehensive real-time data collection and remote appliance management. With a focus on user accessibility, the system interfaces seamlessly with the Blynk application, providing an intuitive platform for monitoring and controlling electrical parameters from anywhere. This innovation holds promise for revolutionising smart home systems, industrial automation, andefficient energy management practices.

II. LITERATURE REVIEW

1. José Varela-Aldás et al. In this paper the author has presented the development of a two-channel electrical parameter-monitoring system based on the M5 Stack Core2 kit. The acquisition of variables is done through PZEM 004T V3.0 sensors, and the data are sent to the ThingSpeak cloud database. Local readings are done through the LCD, and data is stored on a micro SD card. Remote monitoring is done through two applications, namely a web application and a mobile application, each designed for different purposes. To validate this proposal, a commercial device with IoT features (Gen 2 Vue Energy Monitor) is used, comparing the active power and active energy readings recorded continuously for 7 days. The results indicate an accuracy of up to 1.95% in power and 0.81% in energy, obtaining a low-cost compact product with multiple features

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2. D Eridani et al. In this paper the author has presented a custom electronic sensor to monitor electricity consumption based on the Internet of Things. Different from this research using an Android smartphone with Blynk Application instead of a web-based monitoring system. Compared to, this research focused on the development process and the correlation of the input and output current and voltage measured in the custom electronic sensor. The system build can monitor the current andvoltage used in the measuring point and send it to the Blynk application directly. There are 8.41% differences in voltage sensors and 4.14% differences in current sensors during the input and output system's measurement process. It is better to measure the value by using the peak of the voltage and current value using differentiation as a suggestion.

3. Hrushikesh Sakharkar et al. In this paper the author has presented the study and design of a monitoring system for the continuous measurement of electrical energy parameters such as voltage, current, power and temperature. This system is designed to monitor the data remotely over the internet. The electronic power metre is based on a microcontroller from Microchip Technology Inc. PIC family. The design takes into consideration the correct operation in the event of an outage or brown out by recording the electrical values and the temperatures in EEPROM internally available in the microcontroller. Also a digital display is used to show the acquired measurements. A computer will remotely monitor the data over the internet.

4. Noor Nateq Alfaisaly et al. In this paper the author has presented The "Smart energy management system" is considered to be one of the most enabling technologies which helps in leveraging the connectivity that is posed by IOT bringing back the measurement track and control that optimises for consumption of energy through building of certain complexes. The "Smart Design Dower Monitoring System" helps in providing communication with the GSM modem with the embedded controller, which helps in transmitting the data. This system also consists of the motion sensor which helps during the time when there is no human in the house and there is an automatic power cut. The energy saving is considered to be one of the most significant in challenging issues.

5. Atharva Punde et al. In this paper the author has presented the pressing need for a system which can monitor the multiple number of machines simultaneously and make the data accessible to the concerned person beyond the locality of plant or area that hosts the machines. The existing systems, though efficient and accurate in measurements, lacked the accessibility beyond a particular area as they were mostly wired data acquisition systems. However, enabling the system with upcoming technology of Internet of things (IoT) will provide unlimited range of accessibility as the observed data can be accessed from anywhere around the world having internet connectivity.

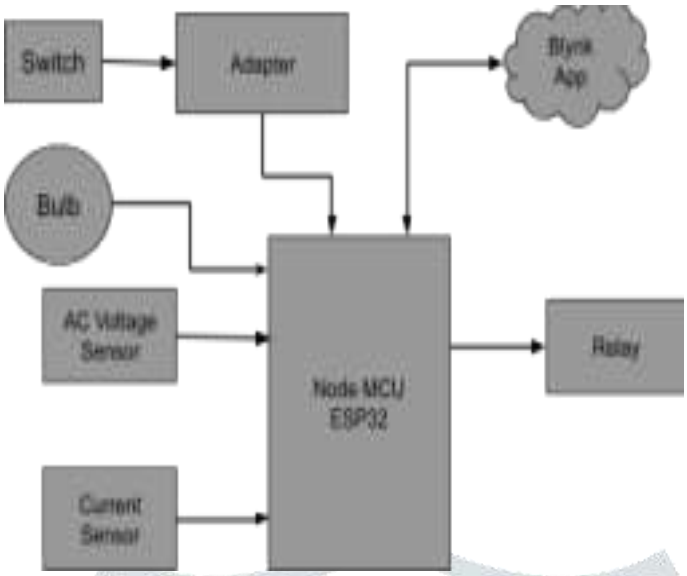
6. Kajal Vijay Talele et al. In this paper the author has presented Real-Time monitoring as the effective way to observe factual data. Internet of things based online monitoring is useful to access data remotely. IoT is the network of physical objects embedded with electronics, software and sensors that enable them to collect and exchange data. IoT enables the flexibility and liberty to access the machine placed in a remote area to keep a continuous track of the machine behaviour in real time. Application of this technology in electrical engineering is beneficial to observe different parameters which are not easy to access. Electrical equipment performance can be monitored on a real time basis to improve the operatingspan. This is carried out using an online monitoring system.

7. Musa Shuaib Yahya et al. In this paper the author has presented the Energy management system (EMS) is a system that optimizes energy consumption through monitoring and measuring electrical energy activities in a particular environment. These systems can be deployed in various areas such as homes, healthcare, logistics as well as industries. Managing electrical appliances can be carried out by collecting and analyzing continuous energy data, identifying optimization in appliances schedules, calculating rate of energy utilised and executing energy optimization solutions.

8. Korakot Luechaphonthara et al. In this paper the author has presented the electricity consumption on household appliances that was monitored and analysed in a single household of four members. The study was conducted with two full time working appliances, Refrigerator and water dispenser. The results of theanalysis showed the energy consumption on weekends is more compared to the weekdays. The analysis also showed that the electricity consumption at night falls ahead compared to day time. The introduction of smart systems will help the consumerto monitor and do an analysis of power consumption in order to adjust the usage that will in turn help in lowering the electricitybill.

9. G V P S Manikanta et al., In this paper the author has presented a case study of a wireless sensor network (WSN) to support power management using Web services. The system is designed by the integration of WSNs with Ethernet/ Internet/ Web Service communications to acknowledge the power management and provide information services using the IOT platform. It is based on the idea of collecting energy information using various wireless devices operating with different communication standards. The WSNs are increasinglybeing used in the home for energy controlling services. Regularhousehold appliances are monitored and controlled by WSNs installed in the home. New technologies include advancements in Information technology, sensors, metering, transmission, Distribution, and electricity storage technology, as well as providing new information and flexibility to both consumers and providers of electricity.

Mohammad Kamrul Hasan et al. In this paper the author has presented an integration of both hardware and software. The software is used to monitor power usage and the consumption of household appliances and control systems through overcurrent relay and notification of any mismatches. The developed system consists of Arduino UNO, a WiFi module (ESP8266), a relay, a low current sensor breakout (ACS712), and a liquid crystal display (LCD). Arduino UNO is a microcontroller used to program customised coding for executing output at any instant time. It is also a very capable



In this Block Diagram, we have used the NodeMCU as a microcontroller. In the input devices we have used an AC voltage sensor and Current sensor connected to the microcontroller. And in the output device we have used the Relay module connected to the microcontroller and we have used the Blynk app to show all the notifications.

IV.SYSTEM REQUIREMENT

HARDWARE REQUIREMENT

1. **Node MCU**
2. **Switch**
3. **AC Voltage Sensor**
4. **Current Sensor**
5. **Relay**
6. **9V Adapter**
7. **AC Wire**
8. **AC bulb**

SOFTWARE REQUIREMENT

1. **Arduino IDE**
2. **Proteus**

V.CONCLUSION

The development of an IoT-based monitoring system for electrical parameters represents a significant advancement in the field of electrical engineering and infrastructure management. Through the integration of IoT technology, advanced analytics, and cloud computing, the proposed system offers a comprehensive solution for monitoring, managing, and optimising electrical infrastructure across various applications and environments. The system enables real-time monitoring, predictive maintenance, and optimization of energy usage, leading to improved reliability, safety, and efficiency of electrical infrastructure. By leveraging remote accessibility, scalability, and flexibility, stakeholders can proactively monitorand manage electrical parameters from anywhere at any time, enhancing operational responsiveness and decision-making.

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