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SMART GRID MONITORING SYSTEM USING IOT TECHNOLOGY

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ABSTRACT:

This project describes the digitization of load energy usage readings over the internet. The proposed system design eliminates the involvement of human in electricity maintenance. The user can monitor energy consumption in watts from a webpage by providing a channel id for the load. The Webpage utilizes the THINGSPEAK analytics to analyze the energy usage to give more detailed description and visualization of theenergy usage statistics. Wi-Fi unit performs IOT operation by sending energy data of the load to the webpage which can be accessed through the channel id of the device. In the proposed system, consumer can do power management by knowing energy usage time to time. This proposed system utilizes an ESP8266 Node MCU microcontroller. The unit which is generated can be displayed on the webpage through the Wi-Fi module.

INTRODUCTION:

The Internet of things (IOT) concept enables us to connect the normal day to day devices with each other over the internet. The devices connected through IOT concept can be analyzed remotely. The IOT concept provides the basic infrastructure and opportunities to form a connection between the physical world and computer based systems. Supply and distribute electricity to consumers.This technology uses two-way digital communication for more efficient distribution. It Not only distribute the energy, the system also provides monitoring, control, communication, as well as anlaysis within the supply chain. The main of the smart grid system is to reduce the energy cost and consumption as well as improve the reliability and transparency of the energy supply chain.The smart uses ICT (Information and communications technology) to improve power grid.

PROPOSED SYSTEM:

A proposed smart grid monitoring system using iot technology would leverage advanced sensors, communication networks, data management systems, energy management systems, and analytics to enable real-time monitoring and control of the power grid, reduce energy waste, and improve reliability and efficiency. Smart Grid Monitoring System using IoT technology should be able to provide real-time monitoring, predictive maintenance, energy efficiency, remote control, and data visualization. Additionally, the system should be scalable, secure, and able to integrate with other smart grid systems to provide a comprehensive solution.

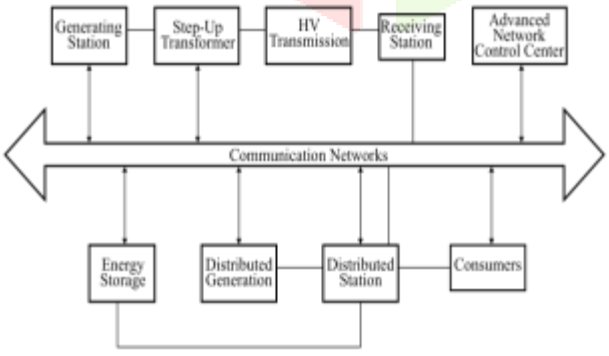
EXISTING SYSTEM:

There are many existing Smart Grid Monitoring Systems using IoT technology that are helping to improve the efficiency, reliability, and sustainability of power grids. Smart Grid Monitoring Systems using IoT technology provide similar features and functionalities to the proposed system, including real-time monitoring, predictive maintenance, energy efficiency, remote control, and data visualization. However, the specific implementation and integration of these features may vary between systems.

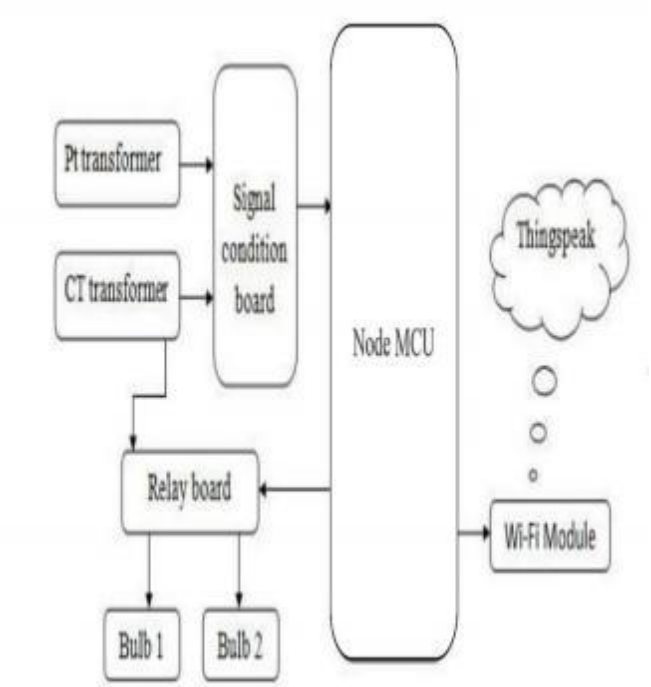
WORKING PRINCIPAL:

Smart Grid = Information Technology + Electrical Grid

The smart grid uses a two-way digital communication of technologies and computer processing which enables electricity industry to better manage energy delivery and transmission. It is capable of providing real time information and enable the nearby quick balancing of supply and demand.



BLOCK DIAGRAM:



COMPONENTS REQUIRED:

- Node MCU
- LCD display
- Current Transformer
- Potential Transformer
- Relay board

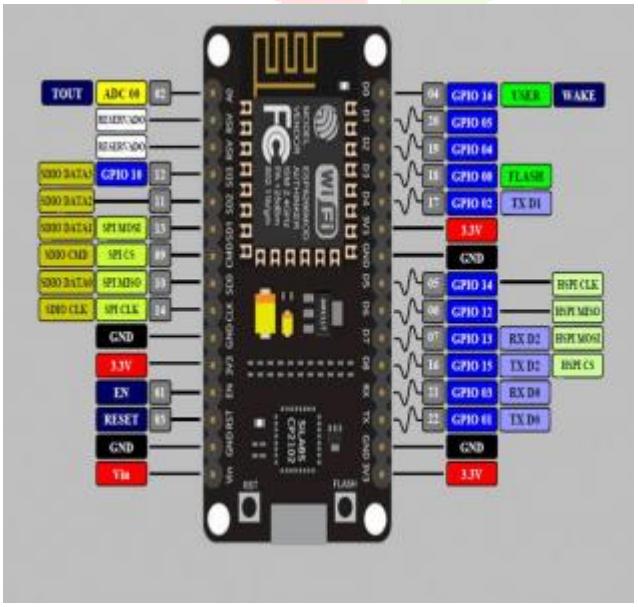
NODE MCU:

NodeMCU is an open-source firmware and development kit based on the ESP8266 Wi-Fi module, which is designed for IoT applications. The NodeMCU firmware is a Lua-based firmware that provides a simple and easy-to-use programming interface to develop IoT applications.

Fig:1

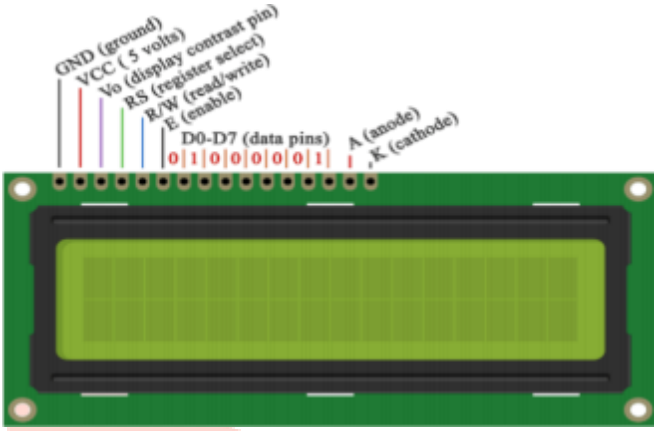
The NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. Programming is done in C/C++ language or Lua script.NodeMCU has 16 GPIO pins which can be used to control other peripheral devices like sensors,LEDs,switches etc.These pins can also be used as PWM pins. The operational voltage of NodeMCU is 5V.it uses L106 32-bit processor, and the processor's speed is 80-160MHZ

Pin description:



LCD DISPLAY:

LCD stands for Liquid Crystal Display. It is a type of flat-panel display used in electronic devices, such as calculators, digital watches, smartphones, and televisions. LCDs use liquid crystals to create an image and require backlighting to be visible.



CURRENT TRANSFORMER:

A current transformer (CT) is a type of transformer that is used to reduce or multiply an alternating current (AC).It has two windings, just like the voltage transformer. AC is induced within the secondary winding.

Whenever AC is supplied throughout the primary winding, an alternating magnetic flux is produced. The load impedance for this kind is relatively low.

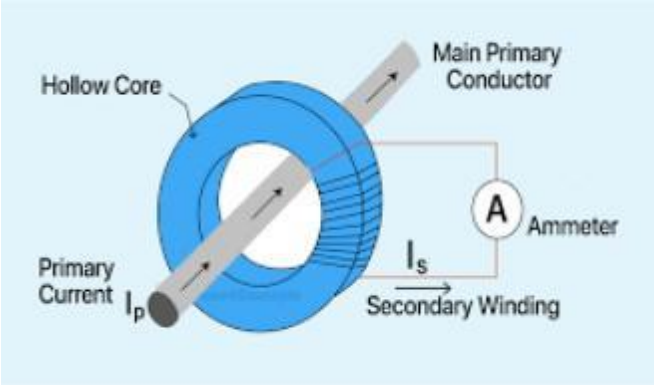


Fig: 2

POTENTIAL TRANSFORMER:

A potential transformer (P.T.) They are also called VT's or voltage transformers. A potential transformer is mainly used to measure high alternating voltage in a power system.The working of PT is similar to any conventional transformer. The electrical energy is transferred between the primary & secondary winding through magnetic induction. The alternating voltage at the primary generates alternating magnetic flux in the transformer core.

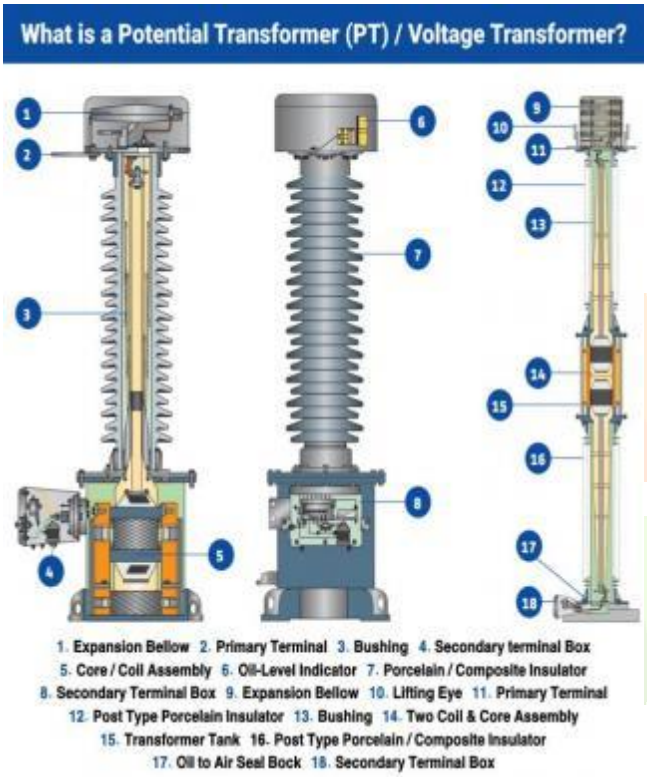


Fig: 3

RELAY BOARD:

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Fig: 4

ESP8266 WIFI MODULE:

ESP8266 wifi module is low cost standalone wireless transceiver that can be used for end-point IoT developments. ESP8266 wifi module enables internet connectivity to embedded applications. It uses TCP/UDP communication protocol to connect with server/client.

To communicate with the ESP8266 wifi module, microcontroller needs to use set of AT commands. Microcontroller communicates with ESP8266-01 wifi module using UART having specified Baud rate (Default 115200).

Fig: 5

FEATURES & ADVANTAGES:

- Realtime monitoring.
- Automated outage management and faster restoration.
- Dynamic pricing mechanisms.
- Incentivize consumers to alter usage during different times of day based on pricing signals.
- Better energy management.
- In-house displays.
- Web portals and mobile apps.
- Track and manage energy usage.

RESULT:

Firstly we have to switch on the mains. Current sensor senses the power utilized by the load. Which gives output in analog form. The output of the sensor is supplied as input to the analog input part in the NodeMCUNano Board. Node MCU board has inbuilt analog to digital convertor which converts analog input of power to digital output.

The NodeMCU is used to connect internet with the monitoring hardware system. The power utilized by the load is displayed in the cloud viz, ThingSpeak cloud in graphical format as shown in the Chart -1 and Chart -2 below. It shows time to time power utilization of the load/loads connected to the system.

CONCLUSION:

control home appliances remotely over the cloud Energy Monitoring using IOT is an innovative from anywhere in the world. In the proposed application of internet of things developed to project current sensor is used to sense the current and display it on internet using IoT. The system updates the information in every 1 to 2 seconds on the internet using public cloud THINGSPEAK.

In the present system, energy load consumption is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity. IoT system where a user can monitor energy consumption and pay the bill Online can be made. Also, a system where a user can receive SMS, when he/she crosses threshold of electricity usage slab can be equipped. We can make a system which can send SMS to the concerned meter reading man of that area when theft is detected at consumer end. Also using cloud analytics we can predict future energy consumptions.

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