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IoT BASED DISTRIBUTION LINE CUT OFF SYSTEM

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ABSTRACT: -

These days, everyone discusses the issue with electricity that the government is facing. Given this circumstance, creating an automated system for a household power gadget becomes intrinsically motivated. In this project, we presented an automatic cutoff system that would be put into place as soon as a customer's power consumption reached its limit, hence improving the efficiency of services. The system is made up of network embedded devices that are connected to the data center's main management system.

INTRODUCTION: -

In the era of rapidly expanding Internet connectivity, automation has become a captivating subject, particularly in addressing pressing issues such as electricity management. This project focuses on constructing an embedded controller network for automating household electricity cutoffs. With the prevalent discussions surrounding government electricity challenges, the motivation to develop such a system is profound. The setup comprises an embedded device controlling the main power switch and synchronizing data in a centralized center. Customers are notified of impending cutoffs via GSM and short message services. In regions plagued by non-payment consumers and electricity theft, traditional methods of disconnecting supplies encounter resistance, bribery, and meter tampering. To mitigate these issues and ensure timely revenue collection, the project proposes an automated system that instantly disconnects power for delinquent customers. Leveraging technologies like the NodeMCU ESP8266, the system operates from the pole itself, effectively addressing various forms of power theft, including meter tampering and physical obstruction. Furthermore, the system suggests an automated meter calculation similar to postpaid mobile plans, with a user-friendly interface for easy access and management.

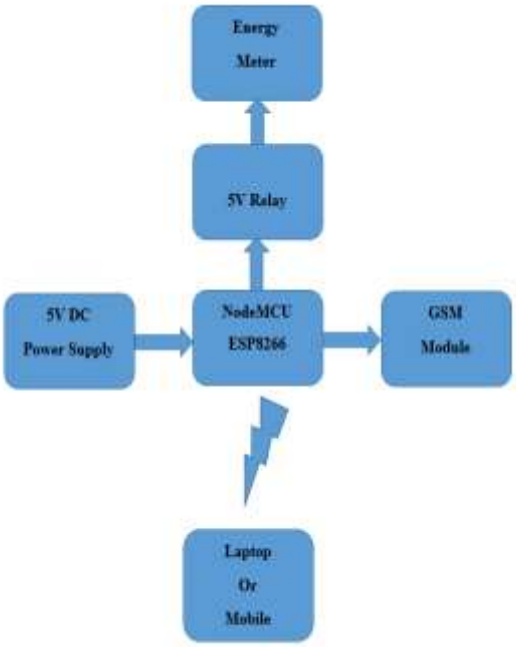
OBJECTIVES OF PROJECT:

The project aims to establish a system that promptly disconnects a customer's electrical connection to the pole if they fail to pay their electricity bill on time. This system comprises an embedded device responsible for

managing the main power supply switch and updating data in the data center. Users receive cutoff warning messages via GSM and short messaging services. With the ability to instantly cut off electricity when the allotted amount is exceeded, the system helps reduce overhead costs for the electrical provider. Instances of intentional bill non-payment by some clients, often resulting in attempts to circumvent meter connections or resorting to bribery when MSEB officials seek to disconnect the supply, are addressed. Consequently, the government benefits from increased revenue generation and timely bill payments.

Additionally, the study proposes developing firmware for a smart switch capable of remotely controlling any electrical appliance in the house via the internet. Accessible through Wi-Fi, computers, smartphones, tablets, or other internet-connected devices, users enter the pre-programmed IP into a web browser to configure network data and establish the connection. After selecting the network and security type and setting a passphrase, users restart the Smart Switch to gain internet access. They can then operate the device remotely by sending commands to toggle the electrical outlet on or off, either via the internet or a local network.

Furthermore, the article suggests integrating software and communication technologies with existing meters to create a unique network communication system for energy meter reading. This system integrates an electronic energy meter with a wireless or wired communication system, enabling remote access to electricity usage data. Despite being separate components, the communication system connects to the electrical regional/sub-regional office, which functions as a base station. Utilizing secure existing communication service infrastructures eliminates the need for developing a distinct communication system and backbone, with the customer's number serving as a means of identifying the secure communication channel.



PROBLEM DEFINITION:

Our project is driven by the need to address challenges faced when M.S.E.B. officials attempt to disconnect the supply due to non-payment, only to face resistance and bribery attempts from customers. Some clients even resort to connecting their home appliances directly to the main power supply, bypassing the system altogether, even after the supply has been cut off. Therefore, our

proposed solution involves developing a prototype that utilizes the Node MCU ESP8266 and relays to automatically cut off the electric supply in response to instructions from a microcontroller situated on the pole itself.

BLOCK DIAGRAM:

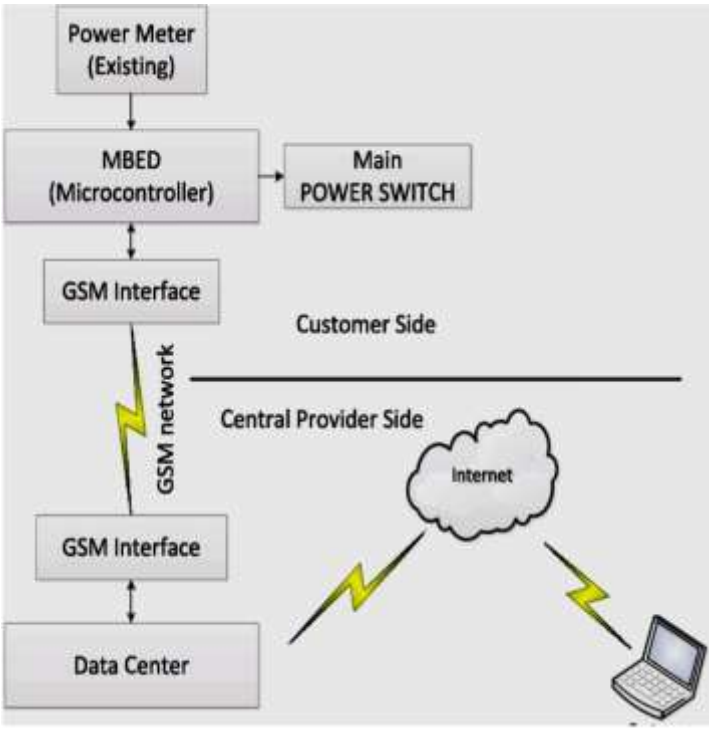


Fig 1: - Block diagram

In this project, we introduced an automated cutoff system designed to activate once a customer's power consumption reaches its limit, thereby enhancing service efficiency. The system comprises network-embedded devices connected to the main management system of the data center, encompassing application, alert, and billing modules. Illustrated in Figure 1, the system is delineated into two subsystems: the customer side and the central provider side.

On the customer side, a microcontroller oversees the meter reading subsystem. These microcontrollers, part of the ARM-based development boards, facilitate rapid prototyping with agility and minimal risk. They assess energy theft by aggregating readings from the energy meters. We are developing a "smart energy controlling system" to address existing system limitations, with the architecture comprising relays, GSM800l, and the Node MCU ESP8266. Monthly, MSEB employees compute energy consumption, with the online system capable of grid shutdown and SMS notification for non-payment scenarios.

MSEB provides load supply to users, storing all usage data in the MSEB Database Center. With the controller's aid, MSEB manages consumer load supply based on electricity bill payments. The online control panel contains all necessary information to activate or deactivate grid supply for individual customers.

METHODOLOGY:

The "Node MCU" board we are utilizing features an ESP8266 module, which we will be programming. All necessary drivers are pre-installed, along with the latest version of Micro Python. However, it's worth noting that the pin numbers labeled as D0, D1, and D2 on the board may differ from those used by Micro Python due

to its original design for another program. Refer to the illustration below to match the correct pins. The board connects to the device via a small USB connector, and a reset button is located on the side for convenience. Two rows of pins on either side of the board allow for cable connections.

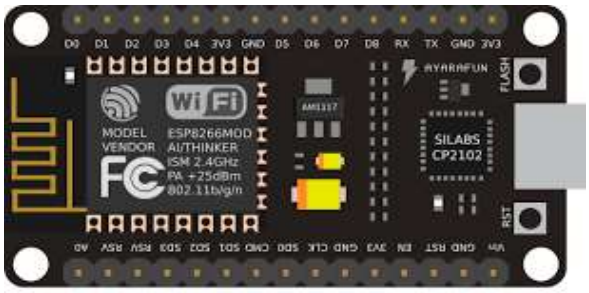


Fig 2 - Node Microcontroller ESP8266

NODEMCU ESP8266:

The ESP8266EX, a fully integrated Wi-Fi SoC solution developed by Espresso, meets the ongoing demands of users in the Internet of Things (IoT) sector by delivering reliable performance, compact size, and efficient power consumption. With its comprehensive set of independent Wi-Fi networking functions, the ESP8266EX can operate either as a slave to a host MCU or as a standalone application. When hosted, the ESP8266EX launches the application directly from the flash, optimizing system memory and enhancing performance through its integrated high-speed cache. It can serve as a Wi-Fi adaptor for any microcontroller design using UART or SPI/SDIO interfaces. The ESP8266EX integrates various essential components such as filters, power management modules, low-noise receiver amplifiers, power amplifiers, antenna switches, and RF baluns, reducing PCB size and external circuitry requirements. Furthermore, Tensilica's L106 Diamond series 32-bit processor and on-chip SRAM are embedded within the ESP8266EX, allowing for interfacing with external devices and sensors via GPIOs. The Software Development Kit (SDK) provides sample programs for a variety of applications, enhancing its versatility and usability.

RESULT: -

This project proposes an IoT-based Distribution Line Cut-Off System for Non-Bill Paid Consumers, facilitating energy consumption tracking and grid status control remotely in the event of non-payment of electric bills. Users can access this data via a web page, eliminating the need for human intervention. Additionally, the system includes an SMS alert feature that notifies consumers when their grid supply is cut off by MSEB due to non-payment, effectively controlling energy consumption. Consequently, it mitigates energy wastage and fosters awareness about energy consumption practices.

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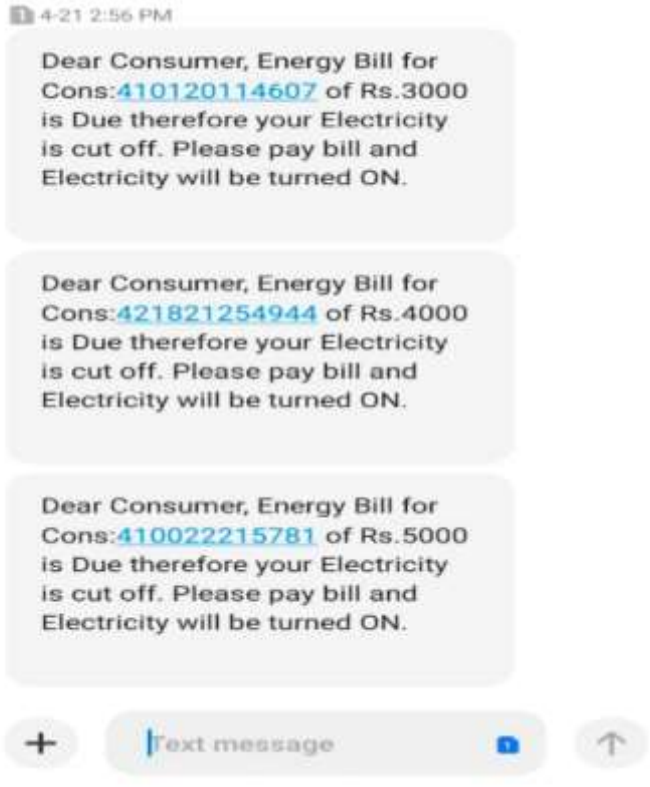

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