Project Proposal: IoT Based Smart Electricity Energy Meter

1. Project Overview:

This project aims to develop **a Smart Electricity Energy Meter** powered by the Internet of Things (IoT) technology. The proposed system will enable real-time monitoring, recording, and management of energy consumption through a user-friendly interface. The **Node-Red** interface will be equipped with advanced features like remote monitoring, usage analytics, cost prediction, and automated alerts to help users optimize their energy usage and reduce costs.

2. Objectives:

- Develop a smart electricity energy meter with IoT integration.
- Enable real-time energy monitoring and analysis for users.
- Provide detailed consumption data via a Node-Red Dashboard.
- Implement alert mechanisms for abnormal usage patterns or potential faults.
- Improve energy efficiency by providing actionable insights to users.

3. Circuit Diagram

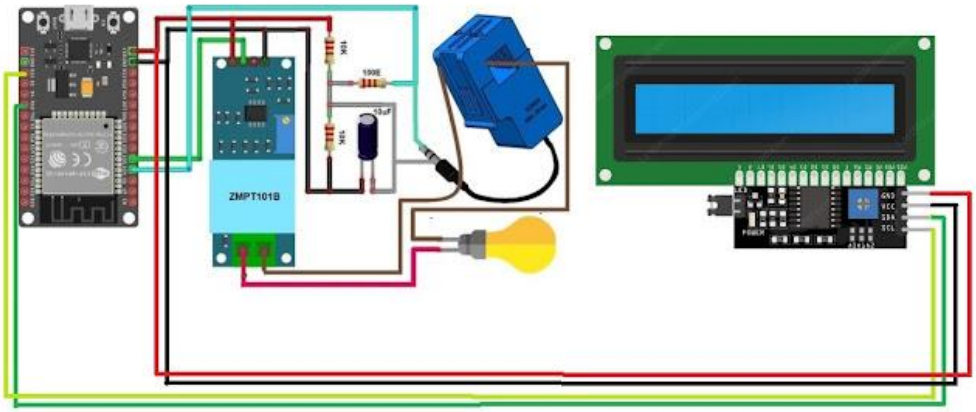

Fig. Circuit Diagram of Smart IoT Based Energy Meter

4. System Components:

4.1 Hardware Components:

- Use microcontroller ESP32 for IoT connectivity.

- Integrate energy metering ICs (e.g., ADE7758) to measure energy usage accurately.
- Add sensors to detect voltage, current, and power factor.

4.2 Software:

- Node-Red Dashboard: For User-friendly Interface for remote data Monitoring
- Arduino IDE: For programming of ESP32
- IoT Cloud: For Integration of system with Node-Red and for data management

5. System Functionality:

The **IoT-Based Smart Electricity Energy Meter** will provide the following functionalities:

5.1 Real-Time Energy Monitoring

- Shows live electricity usage data on a mobile app or web interface.
- Helps users see how much energy they are using at any moment.

5.2 Billing and Cost Estimation

- Calculates the electricity bill based on usage and displays it in real time.
- Predicts future bills to help users plan their energy expenses.

5.3 Alerts and Notifications

- Sends alerts when energy usage is higher than normal.
- Notifies users about system faults or power overloads.

5.4 **Remote Control and Insights**

- Allows users to monitor their electricity usage from anywhere via an Node-Red Dashboard.

5.5 **Overload Protection**

- Detects when electricity usage exceeds safe levels and automatically shuts off power to protect appliances.

5.6 **Utility Integration**

- Helps electricity providers monitor usage remotely for accurate billing.
- Reduces the need for manual meter readings.

5. Expected Outcomes:

- Enhanced energy monitoring and management capabilities for users.
- Improved operational efficiency for utility providers.
- Reduction in energy waste and associated costs.

6. Conclusion:

This IoT-based smart electricity energy meter project will empower users to monitor and control their energy usage effectively. By integrating advanced IoT connectivity and real-time alerts, the system addresses the inefficiencies of traditional meters while providing a scalable solution for future energy management needs.