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REAL-TIME SMART METERING FOR ENHANCED DEMAND MANAGEMENT

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Abstract: The conventional energy meter lacks the ability to provide real-time power measurements and demand information crucial for modern demand management strategies. To address this gap, we developed a smart meter device capable of recording real-time power usage and presenting demand information to consumers via a visual display. Additionally, the device can transmit data directly to consumers' mobile phones in real-time. The fabrication process of the smart meter device involved integrating key components such as current and voltage sensors, a microcontroller, a clock module, a display, and a Wi-Fi module. The current sensor accurately measures AC currents ranging from -30A to +30A. The voltage sensor, specifically the ZMPT101B module, provides precise AC voltage measurements, making it suitable for domestic voltage levels. The microcontroller selected for the device, Arduino Pro Mini V2, offers compact design and essential features for data processing. A clock module (DS1307) ensures accurate timekeeping, crucial for real-time data analysis. The display, a 128x64 Graphic LCD, enables graphical representation of power usage data. Integration with a Wi-Fi module (NodeMCU ESP8266) facilitates real-time data transfer to consumers' mobile devices. The system architecture comprises four subsystems: power calculation, data transfer, online server, and user interaction. Communication between the smart meter and consumers' mobile devices is enabled through the Arduino Pro Mini and the Blynk IoT platform. The smart meter system architecture, including hardware and software components, offers an effective solution for real-time energy monitoring and demand management.

Keywords: Demand; Real-time; Smart; Energy