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Smart IoT Based Solar Monitoring and Tariff Based Billing System

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Abstract: *The rapid integration of renewable energy systems, particularly solar power, into the mainstream grid demands intelligent and real-time monitoring systems. This paper presents an IoT-based Smart Solar Monitoring System integrated with a Tariff-Based Billing Model to efficiently track solar energy generation, calculate consumption, and automate billing processes. The proposed system utilizes Arduino Uno, ESP8266 (ESP-01), ZMPT101B voltage sensor, ACS712 current sensor, and ThingSpeak cloud platform for data visualization. This low-cost, real- time, and scalable system ensures energy transparency, enhances user engagement, and supports energy efficiency goals. Experimental results show the system's ability to provide accurate energy readings and dynamic billing under varying tariff rates.*

Keywords: Internet of Things (IoT), Solar Monitoring, Smart Billing, Arduino, ThingSpeak, Energy Management, Dynamic Tariff

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