Green energy solar monitoring project

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As solar photovoltaic (PV) systems become increasingly popular as a clean and renewable source of energy, it’s crucial to ensure that these systems are performing efficiently and effectively. A solar Panel Monitoring System helps to identify potential issues, optimize energy production, and extend the lifespan of your investment. In this blog post, we’ll introduce you to a simple yet powerful DIY solar PV monitoring system that enables you to track essential performance parameters, such as voltage, current, temperature, power, and energy.

The DIY monitoring system is built around the XIAO ESP32 MCU, a versatile and cost-effective microcontroller that forms the core of the system. To measure the electrical parameters, we’ll use the ACS758 current sensor for accurate current readings and a voltage divider circuit for voltage measurements. Additionally, we’ll incorporate the DS18B20 temperature sensor to monitor the temperature of the solar panels or other system components. Optionally, you can also add an OLED display to visualize the data in real-time.

This project not only offers a cost-effective solution for monitoring your solar PV system but also provides a fantastic learning experience for those interested in electronics, solar energy, and programming. By building your own monitoring system, you gain a deeper understanding of your solar PV system’s workings, and you can customize it to suit your specific needs.

In the following sections, we’ll provide a list of the required components, detailed instructions on setting up the circuit, and the Arduino code to get your DIY solar PV monitoring system up and running. So, let’s dive into the world of solar PV monitoring and make the most out of the clean energy harnessed by your solar panels.

1. It gives clear information about various solar parameters, extracted energy, fault detection, historical analysis of the solar plant, and associated energy loss.

XIAO ESP32 MCU: The microcontroller serves as the central processing unit, gathering data from sensors, performing calculations, and controlling the OLED display.

ACS758 Current Sensor: The ACS758 measures the current flowing through the solar panel by converting the magnetic field generated by the current into a proportional output voltage. The XIAO ESP32 MCU reads this voltage and converts it into the actual current value.

Voltage Divider: The voltage divider, composed of two resistors in series, is connected to the solar

panel’s positive terminal and GND. The junction between the two resistors provides a scaled-down voltage, which the XIAO ESP32 MCU reads and converts back to the actual voltage value. This method allows the circuit to measure voltages higher than the MCU’s maximum analog input voltage.

DS18B20 Temperature Sensor: This digital temperature sensor measures the temperature of the solar panel or other system components. It communicates with the XIAO ESP32 MCU using the OneWire protocol, providing accurate temperature readings that can help identify performance issues related to temperature variations.

OLED Display: The OLED display is used to visualize the collected data in real time. It communicates with the XIAO ESP32 MCU using the I2C protocol, allowing you to easily display voltage, current, temperature, power, and energy readings.