

## **DC-based smart PV-powered home energy management system based on voltage matching and RF module**

### **ABSTRACT**

The main tool for measuring system efficiency in homes and offices is the energy monitoring of the household appliances' consumption. With the help of GUI through a PC or smart phone, there are various applications that can be developed for energy saving. This work describes the design and prototype implementation of a wireless PV-powered home energy management system under a DC-distribution environment, which allows remote monitoring of appliances' energy consumptions and power rate quality. The system can be managed by a central computer, which obtains the energy data based on XBee RF modules that access the sensor measurements of system components. The proposed integrated prototype framework is characterized by low power consumption due to the lack of components and consists of three layers: XBee-based circuit for processing and communication architecture, solar charge controller, and solar-battery-load matching layers. Six precise analogue channels for data monitoring are considered to cover the energy measurements. Voltage, current and temperature analogue signals were accessed directly from the remote XBee node to be sent in real time with a sampling frequency of 11–123 Hz to capture the possible surge power. The performance shows that the developed prototype proves the DC voltage matching concept and is able to provide accurate and precise results.