IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

A REMOTE MONITORING SYSTEM FOR A STAND-ALONE POWER GENERATION SYSTEM AND METHOD THEREOF

IITM Technology Available for Licensing

Problem Statement

- There is a huge demand for implementation of solar PV unit or solar power plant in the rural areas. As the PV modules and their auxiliary components have reliability challenges, faults can and do occur. On the other hand, the **repair and maintenance** services in remote areas are **expensive and time consuming**.
- Therefore, there is a need for **remote monitoring system** to forecast and monitor energy production and consumption from distributed PV unit remotely.
- The system consists of transmitter (remote location) and receiver (central station), wherein in case of any failure in communication in these standalone units, it reflect the overall performance of the system.
- Further the system includes Low Power WAN technology which extends the range of cellular communication involving **additional infrastructure** and other deficiencies.
- The drawback of currently available monitoring systems is that they do not provide a means of calculating the expected performance of a PV system, and the present invention provides the solution by addressing above issues.

Technology Category/ Market

Solar PV Technology: Smart Solar Power Monitoring system;
Electronics & Communication: Sensors, Long Range (LoRa) transceiver, LoRa WAN;
Industry: Solar and Communication Industry;
Applications: Solar home systems, solar microgrid systems, other offgrid systems (AC/DC mode);
Market: The global smart solar power market size was valued at USD 13.4 billion in 2021, and is projected to reach **USD 47.7 billion** by **2031**, growing at a **CAGR of 13.6%** during forecast period of **2022 to 2031**.

Technology

- Instant invention describes an IoT solution by claiming a remote monitoring system for a stand-alone power generation system (**AC/DC**) and a method thereof.
- The LoRaWAN based remote monitoring system comprises at least one **solar PV stand alone system** remotely located, a **LoRaWAN end node** operably coupled to said stand-alone system, includes a microcontroller unit, LoRa transceiver with antenna, a plurality of sensors, a measurement circuit and a battery for said measurement circuit; **a charge controller,** wherein the LoRaWAN end-node is interfaced with respective positive and negative terminals of charge controller; **a LoRaWAN gateway, a network server** integrated with the LoRaWAN gateway and **an application server** integrated with the network server provide access and enabling visualization of different operational parameters, wherein the network server is provided with an inbuilt capacity to integrate application server with database enabling IoT applications.
- The present system provides the information of solar energy generation, electric energy consumption, battery performance and other indicators, etc.

Intellectual Property

IITM IDF Ref. 2017; IN Patent Application No. 202041033249

TRL (Technology Readiness Level)

TRL- 3/4, Proof of Concept Ready & tested, and validated in Laboratory.

Research Lab

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Key Features / Value Proposition

❖ ***USER Perspective:***

The present system is **user friendly**, **reliable**, **real time operable** with the help of LoRaWAN communication technology.

❖ ***Technical Perspective:***

1. **LoRaWAN end-node** platform is **Adafruit Feather model** with on-board LoRa module, wherein antenna used in conjunction with the LoRa transceiver is a **directional GSM antenna**.

2. **LoRaWAN end node** collects data and transmits to the LoRaWAN gateway via Radio Frequency (RF) communication.

3. Said monitoring system measures various parameters of standalone PV system such as load voltage, load current, battery voltage, solar voltage, solar current, ambient temperature and relative humidity.

❖ ***Industrial Perspective:***

1. **Cost effective** system, and **operational cost** is **low**.

2. The present system enables **easy control and management** of the **solar PV system** to make informed decisions about the performance of the solar PV system.

3. LoRaWAN makes the remote monitoring of stand-alone power generation system **more appropriate** because of **long range** coverage area, **low power** requirement, small data requirement of sensors for IoT applications, **no requirement of service subscription**, **low cost** and **security** based on **end to end encryption**, **mutual authentication** and **integrity protection** and **confidentiality**.

Images

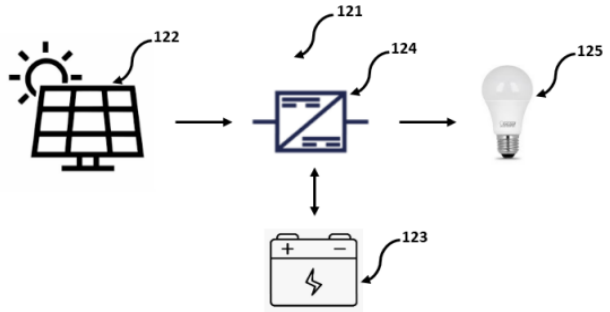

Fig. 1: Illustration of solar PV standalone system

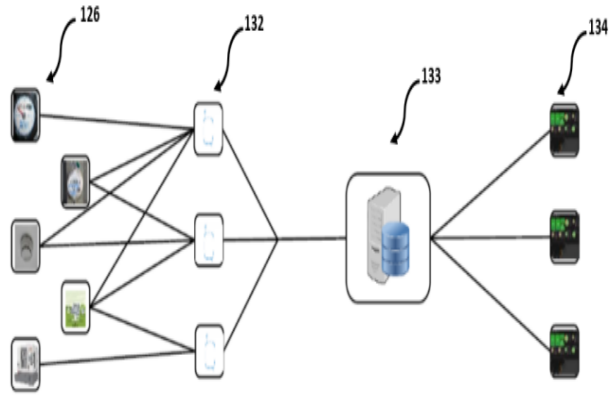

Fig. 2: Illustration of LoRaWAN architecture

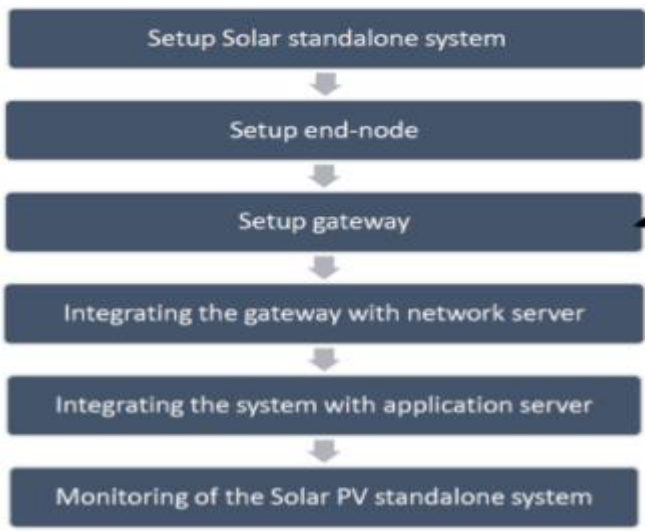

Fig. 3: Flowchart of operational method

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