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Design of Remote Health Monitoring Module for Solar PV-System via GSM

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ABSTRACT:The health of the Solar PV systems should be monitored continuously for their better performance and maintenance. For PV systems installed at rural locations, remote monitoring capabilities provide the information in advance when system performance is degraded or is likely to fail. Based on this information, preventive maintenance can be carried out to improve the performance and life of the system, thereby reducing the overall operating cost. Advantages and disadvantages of several monitoring systems for rural application is discussed and an optimum new technique is proposed as a solution to overcome thelimitations of other techniques and also to reduce the cost of the system. The proposed technique uses GSM channel for the communication i.e. by sending and receiving text messages when prompted by the user and when there is any fault occurring on the system The project focuses on the development of a module that can be attached to domestic solar panel systems. These systems are located on the roof and to check them user has to move towards them multiple times a day. A simple module consisting of sensors is attached to the system that calculates the parameter of system and sends them to user via SMS.

KEYWORDS:GSM, PCB, QSPP, WLAN, Wi-Fi, MPPT, GPRS, LAN, CAT5, IP RC.

I. INTRODUCTION

Clean solar electricity can be generated by solar photovoltaic as well as by solar thermal technologies this concept of renewable energy generation is becoming popular not only at National and international but also at domestic levels. Abundant amount of solar energy reaches earth daily an estimate 174,000 terawatts (TW) of incoming solar radiation (insolation) at the upper atmosphere. Solar Generation provides clean energy at low cost. Large number of solar panels are connected each generating power, the combination of large number of discrete units makes the solar generation system unreliable, fault in a small unit can cause a power outage. Even if the probability of a fault or total failure of onecomponent throughout the service life of a PV power plant is extremely low, the very large number of components in one PV system makes this probability likely to happen. Typical fault causes include weather damage from hail or lightning strike, for example. Insects and rodents too can cause faults if they infiltrate the system and cause damage. Overloads in the supply grid can force output power reductions or even shutdowns. A reduction in yield is unavoidable in these cases. Every small fault within a PV power plant can reduce yield and quickly result in significant financial losses. To obtain early warning of faults, monitoring and control of a PV power plant via a central control room is necessary. In this way the repairs and maintenance measures can be carried at an early stage and thus, avoid downtimes. Centralmonitoring and control is therefore also an essential part of preventive maintenance but to establish and install a central control room for every and even the smallest PV-System can be acostly factor therefore keeping this in mind a small , reliable and a cost efficient module design is proposed and implemented using GSM.

II. PROPOSED MODEL

As shown below it can be seen the working of the system ,the input of the Mains and load current being fed by the sensors and passing through the analog filters to the microcontroller which after processing is available for display by user command and is ready to inform the user if any fault occurs via GSM .

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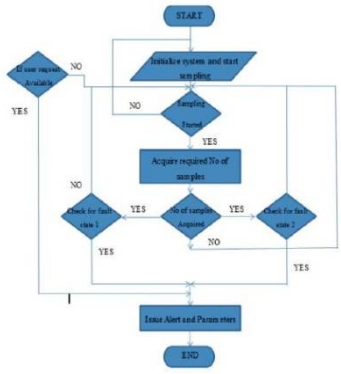

III. RESULTS AND DISCUSSION

Several separate experiments were conducted and observed on The basis of the data received by SMS the results are discussed below.

Charging Mode:

These results were obtained using both main line and solar panels as input and the output of inverter was connected to two 100 watt bulbsthe main voltage was 220 volts which is not constant. These experiments were performed in an area where voltage of main line drops can drop up to 190 volts this was verified using a voltmeter in parallel to the main line. The SMS were taken every ten minutes the SMS reception rate was 100% i.e. no loss of SMS.

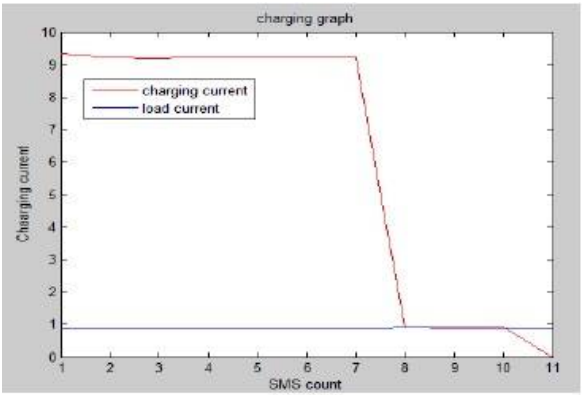

Figure 2: Charging graph.

Discharging Mode:

During this mode the main power was disconnected and the only input was solar power. Load was kept the same in this mode the inverter was working as a power source it supplied the load with a constant voltage 230 volts. The output load and was kept the same i.e. two 100 watt bulbs battery was fifty percentage charged. The SMS were taken every ten minutes reception rate was 100% i.e. no loss of SMS.

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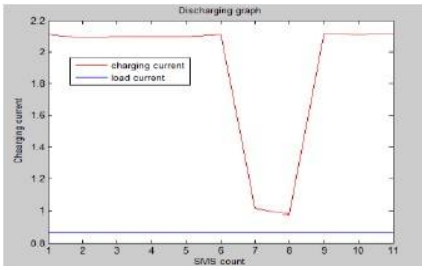

Figure 3:DisCharging graph.

Random check

During this process the main power was connected and so was the solar power. Load was kept the same in this mode the inverter was charging the battery input to the inverter was solar power and main power. The output load and was two 100 watt bulbs battery was being charged. The SMS were taken every five minutes reception rate was 100% i.e. no loss of SMS.

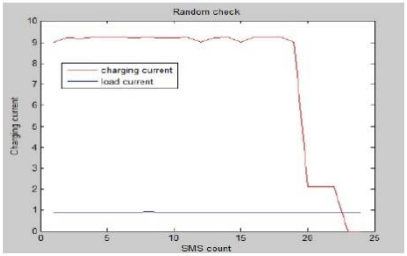

Figure 4: Random check.

Overloading Conditions

During this test the inverter was being charged by the main power and initially the load was kept constant two bulbs of 100 watts SMS reception rate was 100%. The inverter was charging up to SMS no 6 as shown in table 6.6. After receiving this SMS we overloaded the inverter by using 4 bulbs of 200 watts.Right after the overload condition was done the inverter started making alarm sounds and was automatically turned off to save the internal circuitry. After 7 seconds we received the SMSfrom module “THE SYSTEM HAS FAILED PLEASE CHECK”. Along with this Alert we received the parameters in which charging current, output load & output current all had the values equal to this means that whenever overload condition is breached the system cuts off the main supply and also cuts off the supply to load and turns off.

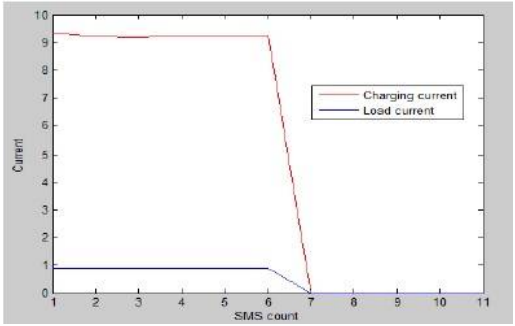

Figure 5: Overload Conditions.

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Failure of Solar power supply

During this mode the main power was disconnected and the only input was solar power. Load was kept the same in this mode the inverter was working as a power source it supplied the load with a constant voltage 230 volts. The output load and was kept the same i.e. two 100 watt bulbs. The SMS were taken every ten minutes reception rate was 100% i.e. no loss of SMS.

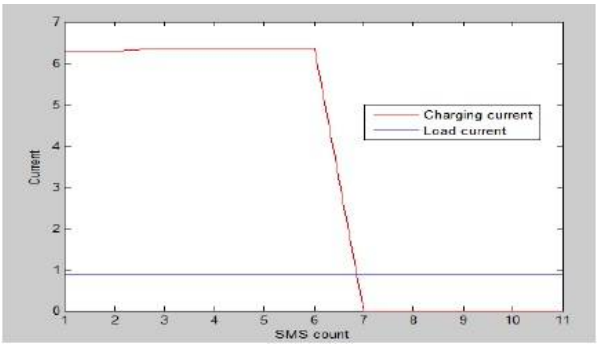

Figure 6: Failure of Solar power supply.

IV. CONCLUSION AND FUTURE WORKS

Various remote monitoring configurations have been studied and issues related with each communication technique have been also discussed. A new technique has been proposed for communication using GSM. This project emphasized on the fault detection and alert on the solar PV-System using GSM and in the end it can be seen from the results that by using GSM the user can be alerted quickly within seconds. We can boldly make this claim because we have experimented and received the SMS within 8 seconds of requesting the parameters from system. In the future this system can be implemented within the solar PV-System instead of adjusting separate modules with it and we can use Wi-Fi technique linked with this system keeping the system working anytime in case of signal failure or jammer working in that region. Using Wi-Fi technique android app will help to monitor and control continuously easily without any failure and it will also be cost effective.

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