International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 07 | July 2021 www.irjet.net p-ISSN: 2395-0072

Solar Powered Wi-Fi Weather Station

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Abstract – *There is an increasing need for real-time weather data today, in order to prevent the loss of life and wealth. Climate change and the need for Clean Energy is also an important subject today. This article aims to remotely monitor basic weather parameters like Temperature, Humidity, Barometric Pressure, and Altitude by making a simple and reliable solar power harvesting circuit. The Whole Setup Kept in a Stevenson-Screen, sends data to the Phone via Wi-Fi Connection. A movable weather station is crucial for remote areas where setting up a big weather station is impossible and where real-Time Monitored data isn't available. This project will be beneficial for farmers who need constant monitoring of weather conditions daily.*

Key Words: Weather Station, Climate change, Real-time, Solar, Stevenson-Screen, Wi-Fi, Farmers, Remote areas, Weather Parameters.

1. INTRODUCTION

A weather station is a facility that measures Atmospheric parameters by using various instruments and Equipment. In order to study Climate and Weather, it provides atmospheric data like atmospheric pressure, temperature, humidity, Precipitation amounts, and Wind speed.

A Stevenson screen is an enclosure that protects meteorological instruments against direct heat radiation and precipitation. It allows air to circulate freely around the instruments. It provides an environment to measure temperature, humidity, atmospheric pressure, and precipitation. Its white colour reflects direct solar radiation.

The Issue with Big Weather stations is that they can't be installed in remote areas, neither they are portable. A mini weather station equipped with a solar power harvesting circuit is the solution. It can be kept anywhere to get pinpoint weather data through clean energy by using a solar harvesting circuit.

2. SPECIFICATION AND DESIGN

Developing a solar power harvesting circuit will begin this project. We will be designing a charging circuit including a rechargeable battery. After that, an Arduino will be used for coding and a sensor to collect atmospheric data.

The Arduino will work in collaboration with the Sensor as well as with the solar power harvesting circuit. At Last, the whole circuit will be put into the Stevenson screen.

2.1 Solar Harvesting Circuit

The Solar Harvesting Circuit is the main source of power for the weather station. It consists of a Solar Panel which is connected to a charging board that charges a rechargeable battery attached to it. A diode is also used in between the connections.

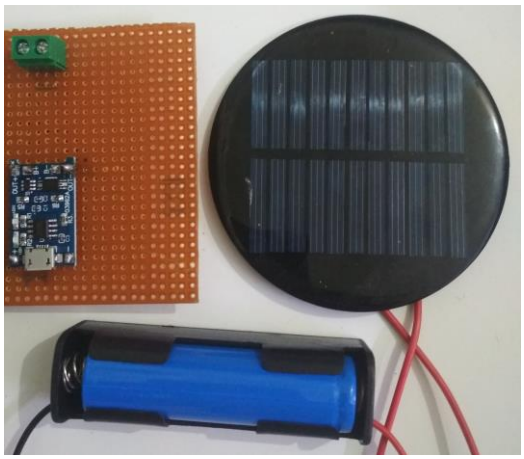

Fig -1: Solar Harvesting Circuit

2.1.1 Monocrystalline Photovoltaic Solar Panel

The Monocrystalline Photovoltaic Solar panel is the main component of the Solar harvesting circuit.

Specification:

i. Size: 57x57x1mm
ii. Weight: 20g
iii. Voltage: 5.5V
iv. Power: 6050
v. Current: 120mA

2.1.2 TP4056 Charging Board

It charges Li-Ion batteries and also protect them from Over and undercharging.

Specification:

i. Size: 25x20x6mm
ii. Weight: 3g
iii. Input Voltage: 4.5 - 5.5V
iv. Full Charge Voltage: 4.2V
v. Rated Power: 4.2W
vi. Charging Method: Linear
vii. Over-Current Protection: 3A
viii. Under-Voltage Protection: 2.5V

2.1.3 18650 Li-Ion Battery

It is a Rechargeable Li-Ion based battery. It is commonly used for small projects.
Specification:

i. Dimension: 65x18mm
ii. Weight: 41g
iii. Standard Voltage: 3.7V
iv. Minimum Capacity: 1200mAh

2.1.4 IN4007 Diode

It is a Silicon-based diode that acts as a rectifier and used in between the solar panel connection with the Charging board.
Specification:

i. Forward Voltage: 1V
ii. Peak Reverse Voltage: 1,000V
iii. Average Forward Current: 1A
iv. Maximum Power Dissipation: 3W

2.2 Data Collecting Circuit

The Data Collecting circuit is the brain of the entire project. It consists of an ESP8266 based Arduino with Wi-Fi capability and an Atmospheric Sensor. It gets its power from the solar harvesting circuit.

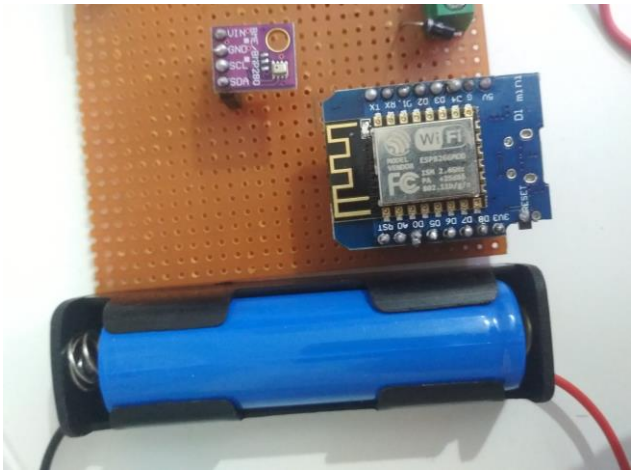

Fig -2: Data Collecting Circuit

2.2.1 WEMOS D1 Mini

It is an ESP8266 based mini Wi-Fi board with 4 MB of Flash. The code is written in it using Arduino IDE. It is connected to the Weather sensor.

Specification:

i. Digital Input / Output Pins: 11
ii. Operating Voltage: 3.3V
iii. Clock Speed: 80/160MHz
iv. Size: 34.2x25.6mm
v. Weight: 3g

2.2.2 BME280 Sensor

It is the heart of the whole circuit. It measures Basic Weather parameters like Temperature, Humidity, Altitude, and Pressure. It is directly connected to WEMOS d1 mini.

Specification:

i. Size: 15x10mm
ii. Weight: 1g
iii. Temperature Range: -40^{0}C to 85^{0}C
iv. Pressure Range: 300hPa – 1100hPa
v. Humidity Range: 0 – 100% RH
vi. Altitude Range 0- 30,000 ft

3. WORKING AND RESULT

The Solar Panel charges the rechargeable battery when kept under the sun. The WEMOS and the BME sensor get their power from the battery itself. The WEMOS is fed some code via Arduino IDE with an Authentication Key generated by Blynk App. The Signal from the WEMOS board is received by the Blynk App via Wi-Fi connection and the result is displayed on the screen of the App.

The whole Circuit is kept in a Stevenson Screen in order to ensure good accuracy in data collection.

Fig -3: Result Screen on Blynk App

4. CONCLUSION

The availability of Real-Time data of Atmospheric Parameter will benefit many people especially the farmers. For a big Weather station, sudden changes in the atmospheric conditions of a relatively small place are hard to track and present to the people on time. This project aims at solving this problem. With the portable Mini weather station, people will get live data and also be able to track small and abrupt changes in atmospheric conditions.

REFERENCES

[1] 'Stevenson Screen', Stevenson Screen. https://en.wikipedia.org/wiki/Stevenson_screen (accessed June 20, 2021).

[2] 'WEMOS', Wemos. https://www.wemos.cc/en/latest/ (accessed June 15, 2021).

[3] 'Arduino IDE', Arduino software. https://www.arduino.cc/en/software (accessed June 14, 2021).

[4] 'Blynk App', Blynk. https://blynk.io/ (accessed June 15, 2021).

[5] 'BME 280', Last Minute engineer. https://lastminuteengineers.com/bme280-arduino-tutorial/ (accessed June 14, 2021).