International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 07 | July - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Review on IOT Based Continuous Monitoring of Hybrid Micro Grid.

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Abstract -A micro grid is a self-sufficient energy system that serves a specific geographic area, such as a college campus, hospital, or corporate centre. With the emergence of with advancements in computer network and automation technologies, careful monitoring of micro grid characteristics is necessary. A micro grid's performance may be monitored using several approaches. This study presents an IoT-based, automated DC micro grid system. The created system monitors a DC micro grid's performance and immediately isolates loads when over or under voltage is detected. The system generates power from renewable sources like solar and wind, and monitors power supply and load voltages via Blynk or Think speak applications.

Key Words: DC Micro grid, Automation, Internet of Things (IoT), Blynk Application.

1.INTRODUCTION

In FY 2019-20, utilities in India generated 1,383.5 TWh of power and consumed 1,208 kWh per capita, indicating a rise in energy demand. These data highlight the need for renewable energy sources alongside traditional ones. Using renewable energy sources effectively is challenging in today's world. A micro grid is a smart-grid system that utilizes local, renewable power sources. Micro grids integrate scattered power, load, energy storage, and management devices into a single, controllable power supply system. Micro grids are localized power grids with independent generating and load mechanisms.
Additionally, it utilizes renewable energy sources for power generation and uses storage resources as needed. They provide several benefits, including increased energy efficiency, reduced energy consumption, and improved power supply stability. The grid's protection poses a significant problem, as it must respond to faults from both utility and renewable sources. Identifying and removing flaws is a significant issue in micro grids. The Internet of Things (IoT) is being used to secure and manage micro grids, which are becoming increasingly reliant on renewable energy sources.
The Internet of Things (IoT) enables remote network monitoring and supervision. A system is built utilizing IoT to monitor power flow in DC micro grids and safeguard them from under voltage and overvoltage.

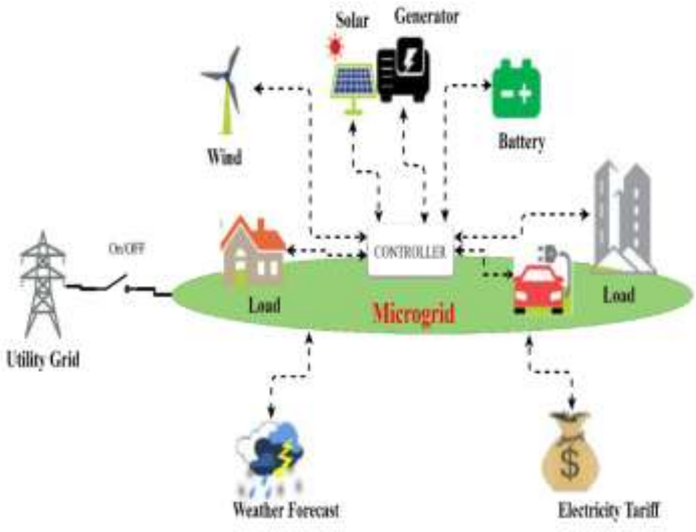

Fig-1 : Schematic diagram of DC microgrid

2. RELATED STUDY

Micro grids integrate energy generation, distribution, and storage at the consumer level, improving power system efficiency and demand control. They can operate in either grid-connected or islanded modes. DC micro grids are efficient, dependable, and cost-effective because they eliminate power quality concerns including reactive power and skin effect. Various approaches and strategies are used to automate DC micro grid.

Researchers devised a system that employs a B/S architecture for real-time monitoring and adjustment of environment factor data to address the issues of monitoring Micro grid [1]. The paper suggests employing a Supervisory Control and Data Acquisition (SCADA) system to optimize grid energy in DC micro grids with distributed energy resources and residential buildings. SCADA enables all micro grid components to communicate with the control room via wireless smart sensors, updating power settings [2]. The study's IoT-based Battery Monitoring System includes a communication route between the IED, data acquisition, cloud system, and HMI. The battery characteristics have been integrated into an embedded system that acts as an internet of things (IoT) for communication, data collecting, and cloud-based storage and processing [3].This research introduces a unique event-triggered distributed secondary control approach for a single-bus DC micro grid. The event-triggering method allows each converter to determine when to communicate signals to its neighbors. This considerably reduces the communication overhead for converters [4]. The

study proposed a mechanism for porting device driver source code between systems. The MP Lab IDE controls the functioning of PIC microcontrollers using UART and LCD interfaces. The IoT module monitors location, loads, energy consumption, micro grid, and sensor data [5].
The observed systems have a downside in that they employ LCDs for data presentation and do not display alarm messages during breakdowns. The proposed solution addresses the previously described concerns. The created system aims to monitor DC micro grids in real-time using IoT technology, assess their performance, and rectify over and under voltage problems.

3. Body of Paper

A hybrid power generating system combines two renewable energy sources, such as solar and wind (DC geared motor). This improves the system's efficiency and dependability. A solar panel with a rating of 21V captures solar energy, while a hand-driven 150RPM dynamo represents wind power. When solar and wind power are insufficient, a battery backup system is employed to satisfy load demands. Each source has a voltage sensor to measure voltage at the source end. The data is transmitted to the Arduino UNO microcontroller. A current sensor is installed at the load end to monitor current entering the load. The microcontroller communicates with the Blynk server via the Node MCU, which is bidirectional and serial communicator.
Three power sources are evaluated.
The voltage sensor, after sensing the source voltage value sends the value to the Arduino. The relay unit selects the optimal voltage value based on the received values, resulting in source selection. The selected source power is routed through a buck converter to a current sensor, which measures the current and sends it to the Wi-Fi module via Arduino.
The Blynk app displays received voltage and current values.

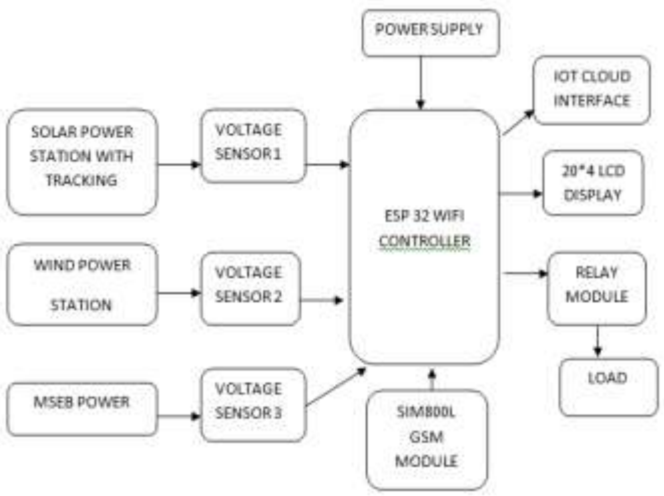

Fig -2: Block diagram of the system

The suggested system has two parts: hardware and software. The hardware includes a solar panel, DC geared motor, voltage and current sensors, Arduino UNO, ESP8266 wi-fi module, and a relay. The package includes Arduino IDE and Blynk App.

The suggested micro grid automation system includes power sources, sensors, control units, relays, and an IoT-based mobile app with a user interface. The power comes from solar and wind energy sources. The system has a backup battery for power outages. The sensor unit has voltage and current sensors. The control unit includes a microprocessor, Wi-Fi module, and relays appropriate for the application.
The voltage and current sensors use the voltage divider method to monitor voltages from all sources. The microcontroller receives these values and executes the software to make judgments. The current sensor uses the Hall effect approach to monitor load current and communicate it to the microcontroller. This information provides insight into demand. The microprocessor triggers the relays, which can move the load to alternative sources or isolate it in case of an abnormality. The mobile application provides live data on the dashboard for users to observe all processes.
A Wi-Fi module connects to a microcontroller and sends data to an IoT mobile app. The program allows users to establish thresholds and limitations.

The Blynk app allows users to specify high and low voltage limitations. Users can also choose the maximum load a source can tolerate. When a source's voltage falls below the low or high threshold, the microcontroller switches the load to a new source using relays. If there is insufficient voltage from solar or turbine, the load is transferred to battery backup.
When the power demand exceeds the capacity of one source, the load is transferred to another. During a power loss or high demand, all sources segregate the load to ensure safety.

4. CONCLUSIONS

The solution improves the performance of an existing DC micro grid. The model's hybrid power generation uses solar and wind power to generate electricity, emphasizing the need of renewable energy.

The Blynk application used in the experiment displays real-time data from the grid. It allows users to specify threshold limits for data streams and isolate loads under overvoltage and over current conditions. The Blynk app generates an alert message to warn users on the state of their micro grid. These characteristics automate the Micro grid system, eliminating the need for manual load isolation during fault conditions.
Isolating the load quickly after detecting a malfunction improves system performance and reliability. The internet of things can help identify and solve problems with DC and AC micro grids. This work's model may be modified to automate AC micro grids. Other issues in DC micro grids, like as arc faults and short circuits, can be addressed by making adjustments to the system.

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