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An IOT Based Smart Grid System to Monitor and Control Renewable Energy Source

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Abstract - This article gives a brief introduction of grid integration and power quality challenges associated with the integration of renewable energy sources into the grid, as well as the role of power electronic devices and flexible AC transmission networks. This project uses late patterns in power devices to coordinate wind and sunlight-based power generation. Conversations about present and future developments in solar and wind energy frameworks are initiated with the intention of preserving quality and enhancing each invention. The employment of various ways to relieve particular Power Quality problems is also recommended for consideration. The Power Electronics interface not only aids in the effective coordination of wind and solar energy frameworks, but it also has an impact on power-age framework activity, especially when renewable energy sources play a unique function in the overall framework limit.

Key Words: solar power, wind power, mseb, iot, gsm, smart grid.

1. INTRODUCTION

The Internet of Things (IoT) is a huge network of linked devices, people, and other stuff that allows data to be transported across the network without requiring direct interaction with humans or machines. Physical things are no longer isolated from the outside world and may be manipulated remotely via Internet connectivity. The International Energy Agency expects that renewable energy, particularly wind and solar photovoltaic energy will grow the quickest over the next several years. However, the global need for energy continues to increase. Using renewable energy technologies is one of the most inventive ways to reduce our environmental impact.
The latest IEA Medium-Term Renewable Market Report predicts a 13% increase in renewable energy from 2015 to 2021 compared to 2014. By 2021, renewable sources will account for around 28% of total power, up from over 23% in 2015. Everyone on the planet has access to solar energy, which can lessen reliance on transmitted energy.

Our country is presently facing major energy issues, exacerbated by transmission failures caused by old infrastructure, electricity theft, and a shortage of hydropower. The worldwide energy crisis is worsening due to the inability of energy production to meet the country's expanding energy demand.
Utility companies therefore follow the trend or practice of load-shedding in circumstances where demand exceeds total generation in order to avoid system failure or major breakdown. Many renewable energy sources are being used to alleviate the energy issue. They provide a substantial contribution to energy management techniques. From an energy management standpoint, it is difficult to connect renewable energy sources to the principal electric utility. Electric utilities must manage renewable energy sources. The problem of energy management is both vital and complex. It requires selecting from a number of sources that can deliver power to loads while minimizing costs and distribution area losses.

The planet receives enough solar radiation every 90 minutes to cover its annual energy demands.
Solar photovoltaic systems emit no greenhouse gases or other pollutants when in use. Solar PV is projected to account for around 40% of global renewable energy capacity in the future years. Finally, by examining the expansion of energy and electricity-using industries, it examines the huge potential influence that solar energy might have on our energy system in the long run. The monitoring system has a variety of applications, including solar street lights, solar cities, smart villages, micro grids, and ground-mounted solar. When the weather is favorable, solar-powered homes and communities may maximize their energy output and consumption by keeping an eye on the energy forecast.

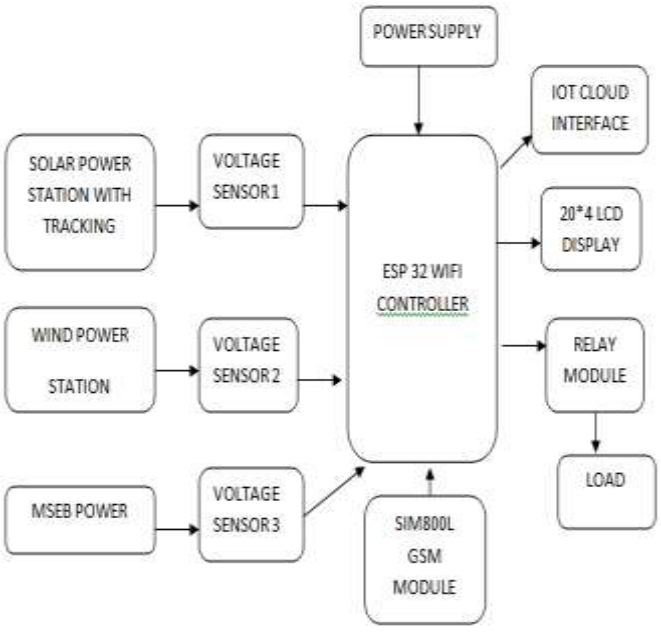

Fig -1: Block Diagram of Purposed System

2. Literature survey

Tsirmpas [1] developed a new approach for profile development in IoT environments, specifically for ambient assisted living applications. This article explains how IoT components may gather and analyse data to generate contextual information using the suggested profile creation approach.

Gomes [2] discussed an FPGA-based edge device for the Internet of Things. The suggested FPGA-based edge device for IoT utilises System-on-Chip (SOC) FPGA technology to offload communication stack functionalities to specialised hardware, resulting in improved system performance.

According to Jeya Padmini and Kashwan et al. [3], smart houses may use IoT to optimise power consumption and conserve energy. The research proposes an IoT-based approach for recognising human activities via image analysis. Energy management relies on real-time communication between machines.

Jinsoo Han [4] presented a SMART home energy management system that utilises zigbee and PLC. The server presents a web page with information on the home's power use and generation. The results are compared to past data to optimise power costs and use.

Jose G. de Matos [5] proposed a method for regulating the level of charge of a battery bank and decreasing voltage on its terminals by adjusting the power provided by energy sources.

Shiu Kumar [6] described a SMART house using an Android app. This article proposes a low-cost, stand-alone system based on the Android app. It communicates with a micro-web server and offers more than just switching functionality.

Mohanty, Panda, Pattnaik et al. [7] proposed using a Web of Things-based Smart Grid to remotely monitor and regulate renewable energy sources. Integrating the Web of Things with the existing power grid design offers several potential to increase energy efficiency.

Huiyong, Jingyang, and Min et al. [8] developed a smart home system using a wireless sensor network and a service robot. The author explored the integration of WSN with service robots in a smart home monitoring system.

Minh-Thanh [9] spoke on "Towards Residential Smart Grid: A Practical Design of Wireless Sensor Network and Mini-Web Server Based Low Cost Home Energy Monitoring System" at the 2013 International Conference on Advanced Technologies (ICAT) for Communications. This research outlines a feasible wireless sensor network-based energy monitoring smart home system.

3 Proposed methodology

The system relies on three energy sources: solar , wind and MSEB power, both of which are readily available. The solar cell uses a charge controller to continually charge the battery. The charge controller displays the state of the charged battery. The load is powered by a charged battery, and the system employs renewable energy sources. When solar cells cannot charge the battery (due to nighttime, overcast conditions, or rainy season), the load is powered by an MSEB source. The controller decides whether to switch between solar and MSEB. The system is configured in such a way that solar energy is used to its full potential. The controller monitors the present state of the load.

Fig -2: Hardware of Purposed System

It also schedules switching in a preset manner. The billing section is triggered by the controller only when the MSEB source is active. The acquired data will be continually updated in the cloud using the GPRS/GSM modem. The Web of Things platform offers early applications for energy understanding and control. Once the data is stored in the cloud,

The Web service allows authenticated users to obtain data from anywhere in the globe and analyze power use with only an internet connection and no data. The login screen allows users to follow the status of their application processing via IoT.
One benefit is the opportunity to monitor a home's typical power use. The user may track their energy demands and schedule power sources accordingly. Comparing consumption statistics to historical data using a graphical depiction of typical consumption. Users may plan their energy usage based on power consumption statistics.

Internet services customers can customize the switching of energy sources based on power availability.

MSEB's power consumption is billed online via the Internet of Things. WoT is used to turn off gadgets that continue to function even while we are not present at home. All functioning devices are monitored and controlled using a web page.

4. RESULT DISCUSSION:

In fig.3 we can see the text msg is received at the user end in case the shifting is occurred the given power supplies

Fig -3: Text Msg Is Received At Receiver End

These remote Internet servers provide data management and processing without the need for personal PCs. The internet-based servers may operate and monitor various sensors put at a certain site (Fig 4). The Home Automation system is made up of many smart gadgets that operate together.

Also the iot page shows the outputs of voltage of solar , wind and mseb voltage which can be monitored from anywhere in the world with proper internet connection.

Figures 5 illustrate voltage, current, power, light intensity, and temperature data taken at a certain time in the morning. Figure 11a depicts the voltage readings recorded between 8.21 and 8.28 a.m., as well as the current sensor on that specific day. Solar photovoltaic panels may generate voltages ranging from 2.50 to 2.430 volts.

Fig -4: Hardware of Purposed System

Fig -5: Hardware of Purposed System

5. CONCLUSIONS

To summaries, deploying an IoT-based smart grid system for remotely monitoring and regulating renewable energy sources provides several advantages. Real-time monitoring and analysis of energy output and consumption improves efficiency, dependability, prices, and carbon footprint. It also promotes renewable energy integration into the system. Additionally, it allows grid operators to remotely oversee and regulate.

Energy generation, storage, and distribution improve grid stability and dependability. Implementing such a system involves careful planning, design, and deployment, along with proper security measures to avoid cyber attacks and preserve user privacy. Figure 2 displays the hardware for the proposed system. IoT-based smart grid technology has significant potential to change the energy industry and promote sustainable development.

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