वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

"Exploiting Solar Power : Empowering Smart Buildings for a Sustainable Future"

Nitesh Mishra
Asst. Professor
Department of Electrical Engg.
Shri Krishna University, Chhatarpur (M.P.)

INTRODUCTION

A potential answer to the global problems of climate change and energy sustainability is the combination of solar energy with smart building technologies. The integration of solar energy systems into smart buildings is examined in this article, which opens up new possibilities for improved resilience, efficiency, and environmental stewardship.

THE SYNERGY OF SOLAR POWER AND SMART BUILDINGS

Smart buildings are characterized by their ability to optimize energy usage through data-driven decision-making and automation. When combined with solar power generation, these buildings become even more energy-efficient and sustainable. Solar panels installed on rooftops or facades harness abundant sunlight to generate clean electricity, reducing reliance on grid power and lowering carbon emissions.

Key Benefits of Solar-Powered Smart Buildings

RENEWABLE ENERGY GENERATION By converting sunlight into electricity, solar panels offer an abundant and renewable energy source for smart building functions.

ENERGY INDEPENDENCE Smart buildings increase resilience and stability, particularly during power outages or disturbances, by producing their own electricity and lowering reliance on conventional energy sources.

COST SAVINGS Solar power can significantly lower utility bills over the long term, as buildings rely less on grid electricity and may even generate surplus energy to sell back to the grid through net metering programs.

ENVIRONMENTAL IMPACT Solar-powered smart buildings reduce greenhouse gas emissions and contribute to a cleaner, more sustainable environment by displacing fossil fuel-based electricity generation.

INTEGRATION WITH SMART SYSTEMS Solar energy systems can be seamlessly integrated with existing smart building technologies, such as energy management systems and IoT sensors, to optimize energy usage and enhance overall efficiency.

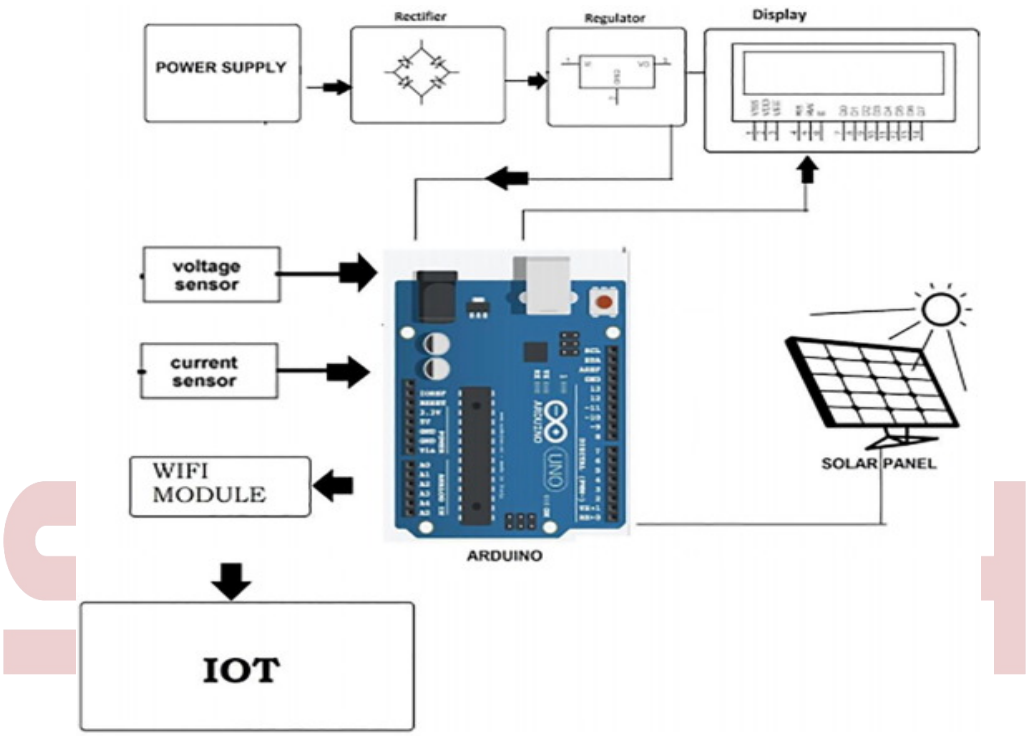

Fig 1: IOT Solar Energy Management

OVERCOMING CHALLENGES AND MAXIMIZING POTENTIAL

While there are many advantages to solar-powered smart buildings, there are also some issues that need to be resolved if their full potential is to be realized. These include the initial expenses of installing solar panels, the erratic availability of sunshine, the need for permits and regulations, and the demand for qualified individuals to design, install, and maintain solar energy systems.

CASE STUDIES

REWA SOLAR PROJECT RUMSL has developed 750 MW Rewa Solar Project and 250 MW Mandsaur Solar Park. 750 MW Rewa Solar Project which is amongst the most significant solar projects in the world, was fully commissioned on 3rd January 2020. It has since been supplying affordable and clean electricity to Madhya Pradesh Power Management Company (MPPMCL), the state-owned discom, and Delhi Metro Corporation Limited (DMRC). RUMSL

वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

is implementing 1500 MW solar parks in the state, namely, 550 MW Agar Solar Park, 500 MW Neemuch Solar Park and 450MW Shajapur Solar Park in Agar ,Neemuch and Shajapur districts of Madhya Pradesh respectively. The power from 1500 MW solar parks will be supplied via the national grid to Indian Railways in eight states and Madhya Pradesh Power Management Company.

Fig 2: Dragon Scale Solar Tiles

GOOGLE HEADQUARTERS, CALIFORNIA As part of its commitment to sustainability, Google's headquarters in Mountain View, California, have a sizable solar panel installation that provides for a sizable amount of the campus's electrical demands. We are able to harness the sun's power from various perspectives thanks to these panels and the pavilion-style rooflines. Our dragon scale solar skin will create power for a longer period of daylight hours than a flat roof, which generates its peak power at the same time of day. This will reduce our contribution to the well-known duck curve in California, which shows the daily variation between the amount of energy required and the amount of solar energy available. Approximately 40% of the energy required by Charleston East and Bay View will be produced by the approximately 7 megawatts of installed renewable electricity when it is fully operational.

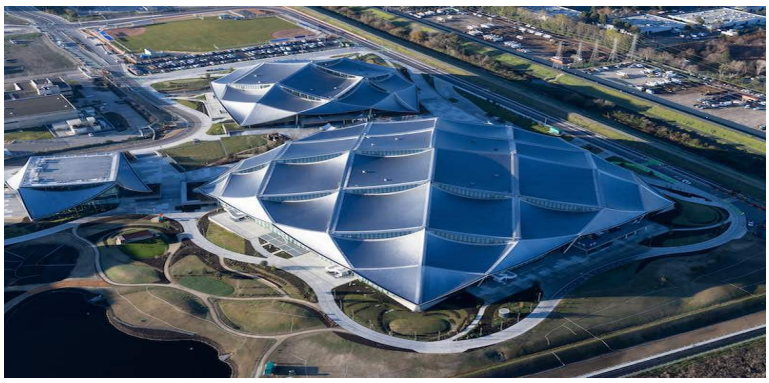

Fig 3: Dragon Scale Solar Tiles

वर्ष-1, अंक-3, अप्रैल - जून 2024 E-ISSN : 2584-2900

CONCLUSION

Solar-powered smart buildings offer a comprehensive approach to energy efficiency, resilience, and environmental stewardship, marking a paradigm shift in the design and operation of sustainable buildings. These buildings set the path for future generations to enjoy a cleaner, greener future by utilizing cutting-edge smart technologies and the power of the sun. Future cities will be greatly influenced by the incorporation of solar electricity into smart buildings, as the trend toward renewable energy continues to gain steam.

REFERENCES

1. Building Operating Management/Siemens Industry Inc. (2012) Improving Performance with Integrated Smart Buildings. Order No.: 153-BAU-053 Printed in USA©2012 Siemens Industry, Inc.
2. Ahsan, S. Javed, K., Rana, A.S. and Zeeshan, M. (2016) Design and Cost Analysis of 1 kW Photovoltaic System Based on Actual Performance in Indian Scenario. Perspectives in Science, 8, 642-644.https://doi.org/10.1016/j.pisc.2016.06.044
3. S Rehman, A Bader Maher and A Al-Moallem Said, "Cost of solar energy generated using PV panels", *Renewable and Sustainable Energy Reviews*, vol. 11, pp. 1843-57, 2007.
4. G Preethi, D Lavanya, V Sreesureya and S Boopathimanikandan, "Real-Time Monitoring and Controlling of Solar Panel Using LabVIEW", *International Journal of Scientific & Technology Research,* vol. 8, no. 08, August 2019.
5. G Preethi, D Lavanya, V Sreesureya and S Boopathimanikandan, "Real-Time Monitoring and Controlling of Solar Panel Using Lab VIEW", *International Journal of Scientific & Technology Research,* vol. 8, no. 08, August 2019.
6. Sajib Chakraborty, Mohammed Mahedi Hassan, Saurav Das and M Abdur Razzak, "A Novel MPPT based Synchronous Buck Converter for Solar Power System in Fishing Trawler", *IEEE,* 2016.