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Review of Building Integrated Photovoltaics System for Electric Vehicle Charging

Sanjay Khan,[a] K. Sudhakar,*[b] Mohd Hazwan Yusof,[c] and Senthilarasu Sundaram*[d]

Abstract: The transition to sustainable transportation has fueled the need for innovative electric vehicle (EV) charging solutions. Building Integrated Photovoltaics (BIPV) systems have emerged as a promising technology that combines renewable energy generation with the infra-structure of buildings. This paper comprehensively reviews the BIPV system for EV charging, focusing on its technology, application, and performance. The review identifies the gaps in the existing literature, emphasizing the need for a thorough examination of BIPV systems in the context of EV charging. A detailed review of BIPV technology and its application in EV charging is presented, covering aspects such as the generation of solar cell technology, BIPV system installation, design options and influencing factors. Furthermore, the review examines the performance of BIPV systems for EV charging, focusing on energy, economic, and environmental parameters and their comparison with previous studies. Additionally, the paper explores current trends in energy management for BIPV and EV charging, highlighting the need for effective integration and recommending strategies to optimize energy utilization. Combining BIPV with EV charging provides a promising approach to power EV chargers, enhances building energy efficiency, optimizes the building space, reduces energy losses, and decreases grid dependence. Utilizing BIPV-generated electricity for EV charging provides electricity and fuel savings, offers financial incentives, and increases the market value of the building infrastructure. It significantly lowers greenhouse gas emissions associated with grid and vehicle emissions. It creates a closed-loop circular economic system where energy is produced, consumed, and stored within the building. The paper underscores the importance of effective integration between Building Integrated Photovoltaics (BIPV) and Electric Vehicle (EV) charging, emphasizing the necessity of innovative grid technologies, energy storage solutions, and demand-response energy management strategies to overcome diverse challenges. Overall, the study contributes to the knowledge of BIPV systems for EV charging by presenting practical energy management, effectiveness and sustainability implications. It serves as a valuable resource for researchers, practitioners, and policymakers working towards sustainable transportation and energy systems.

[a] *S. Khan*
Energy Cluster Lab,
Faculty of Mechanical and Automotive Engineering Technology,
Universiti Malaysia Pahang, Aya Basar
Malaysia 26600
E-mail: khansanj@gmail.com
[b] *K. Sudhakar*
Centre for Research in Advanced Fluid & Processes (Fluid Centre) and, Automotive Engineering Centre
Universiti Malaysia Pahang, 26300, Paya Basar, Pahang, Malaysia 26600
E-mail: sudhakar@ump.edu.my
[c] *M. Hazwan Yusof*
Department of Automobile Engineering
Universiti Malaysia Pahang, 26300, Paya Basar, Pahang, Malaysia 26600
E-mail: mohdhazwan@ump.edu.my
[d] *Prof. S. Sundaram*
School of Computing, Engineering and Design Technology, Teesside University, Middlesbrough, UK TS1 3BX
Tel: +44 7759823845
E-mail: S.Sundaram@napier.ac.uk