

**Abstract 17 – Paper ID: 086****Solar Integrated Bidirectional Converter For Vehicle To Grid**S. P. Vedavalli<sup>1</sup>, Sarumathi S<sup>1</sup>, Srimathi S<sup>1</sup><sup>1</sup>Department of EEE, St. Joseph's College of Engineering, Chennai, India*Email: [srimathi.saravanan83@gmail.com](mailto:srimathi.saravanan83@gmail.com)***Abstract**

The rapid adoption of Electric Vehicles (EVs) has created new opportunities for integration into smart grids through Vehicle-to-Grid (V2G) technology. This paper presents the design and analysis of a single-phase onboard hybrid converter that supports both vehicle propulsion and bidirectional power exchange with the grid. The proposed converter efficiently operates in propulsion, charging, and discharging modes, thereby eliminating the need for multiple power conversion units. In grid-connected mode, it enables controlled energy transfer between the EV battery and the utility grid, allowing the battery to serve as a distributed energy storage system that enhances grid stability, energy reliability, and renewable power utilization. Advanced control algorithms ensure stable voltage, current, and power factor across varying operating conditions, facilitating seamless mode transitions without performance loss. The compact, integrated design enhances overall efficiency, reduces system weight and cost, and promotes the sustainability of EV systems. Simulation and performance results validate the converter's high efficiency and stability, demonstrating its potential as a practical solution for effective V2G implementation.

**Keywords:** Electric Vehicle, Smart Grid, bidirectional Converter, Distributed Energy Storage