Chapter 3
Recent Trends in Wireless Charging Technologies for Electric Mobility Systems

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ABSTRACT

Wireless charging technologies represent a transformative leap in the realm of electric mobility, promising a paradigm shift from conventional plug-in charging methods to more convenient and efficient solutions. This chapter delves into the intricacies of wireless charging, spanning its technological foundations, current state of development, and potential implications for the future of e-mobility. The evolution of wireless charging is marked by the emergence of inductive and resonant wireless charging systems, each with its unique advantages. Inductive charging utilizes electromagnetic fields generated between the coils in the charging pad and the vehicle, allowing for efficient power transfer over short distances. On the other hand, resonant wireless charging introduces resonant magnetic fields, extending the charging range and enhancing flexibility in positioning.

DOI: 10.4018/979-8-3693-5247-2.ch003

1. INTRODUCTION

Extending the discourse on wireless charging technologies involves a comprehensive exploration of their impact on various aspects of electric mobility (Ludois, 2015). This additional content will delve deeper into the challenges, opportunities, and future prospects associated with wireless charging, providing a more nuanced understanding of this transformative technology (Miller et al., 2015).

EV technology is becoming more and more common owing in relation to its reduced emissions from fuel, with the expectation of a rapid increase in the number of EVs. This surge in demand necessitates continuous enhancements to charging infrastructures, particularly in wireless technology. These infrastructures should be versatile, catering to applications in the private, business, and public domains, as well as fit for use with both home and public charging stations (Choi et al., 2015). Wireless power transmission technology, getting rid of the necessity for cables, enhances the ease of use, security, and portability of electronics. In specifically, wireless power transfer valuable when using connecting wires is difficult, dangerous, or not practical for powering electrical devices simply not possible. The availability of wireless charging as a result stations cites issues such as range anxiety, charging delay, and charger compatibility are possibly the most significant impediments to the extensive use of EVs (Li et al., 2016). The implementation of dependable and effective close-quarters infrastructures for high-power wireless charging would further assist the expanded usability of EVs. However, the implementation of infrastructure for electric vehicle wireless charging has presented many technological difficulties. Minimal coupling coefficients interference from exterior objects such as metal or anything out of alignment with the power pads, between transmitters and receivers, or living things are major barriers to the widespread use of wireless charging systems (Bosshard & Kolar 2016).The automobile sector is currently confronted with environmental difficulties; EVs offer a practical and workable solution.

Wireless vehicle charging technology is displayed in Figure 1.

Figure 1. Schematic representation of requiring processes for electric vehicles: DC charging station operation and AC charging within the electric vehicle