Method for Fair and Accurate Metering for Wireless Power Transfer

Technology #7514

By 2040, Electric Vehicles (EVs) are projected to consume 1,900 TW-Hrs of electricity worldwide per year. As little as a 1% error in energy metering can cost both consumers and providers $1B. With current plug-in methods, utility-type meters can be placed on the EV chargers directly but with wireless power transfer (WPT) systems, reliable energy transfer measurements can become problematic. Currently, power measurements are taken directly from the voltage and current of the transmitter (Tx) or receiver (Rx), the problem with this method is that there is no way to individually attribute losses to either side. If power is measured at the provider terminal (Tx), then losses from the transmitter are not taken into account causing an overcharge to the customer but if power is measured at the receiver terminal (Rx), receiver losses are not taken into account, thus causing an undercharge to the customer. These flaws can be overcome by measuring the transfer power in the gap in between the transmitter and receiver. The disclosed technology is a transfer power measurement (TPM) system based on the use of sensing elements that measures the magnetic field (while maintaining a minimal disturbance) in between the transmitter and receiver to measure the transfer power. TPM is analogous to gasoline fuel pump monitoring where an unbiased third party (the US Department of Agriculture’s Weights and Measures Program) entity can act as an arbitrator for calibration and inspection. A proof-of-concept experiment demonstrated power estimation errors ranging from 0.059% to 0.839% (right side of the figure below), which compares favorably with prevailing standards using only an oscilloscope and conventional probes.

Applications

- Wireless power transfer metering

Advantages

- Accuracy with transmitter/receiver loss individually articulated
- Fast, easy, and automated calibration
- Compatible with a variety of mixed loads and components
- Insensitive to any incidental electrical/physical parameters

Inventors

Al-Thaddeus Avestruz