**Motivation**

- Motivation is to design a hardware system for dynamic wireless charging of an electric bus. The concept of mutually coupled coils tuned with LCC compensation tanks is to be used for wireless power transfer to a moving vehicle.
- Primary coil is to be embedded in the road and designed in a way to maintain constant current, and therefore deliver constant power to the secondary coil.
- Secondary coil is to be installed on the bottom of the vehicle and additional hardware subsystem is to be designed in order to control energy flow to the vehicle’s battery.
- LCC Resonant tanks are to be implemented both at primary and secondary sides in order to achieve higher efficiency and better power transfer capability.

**System Overview**

- Primary coil is supplied from 600V DC power supply, which is then brought to the input of a full-bridge inverter. The operating frequency of the inverter’s active switches is chosen to be 20 kHz.
- Through controlling phase shift angle of the full-bridge inverter the primary coil current is controlled.
- Power received on the secondary side is rectified through a diode bridge and brought to the input of the buck converter.
- The duty cycle of the buck’s active switch controls the power flow to the battery.
- LCC topology is chosen both for the primary and secondary sides. Parallel-compensated primary provides a large primary current, while the parallel-compensated secondary is able to supply constant current, suitable for battery charging.

**Primary Side**

- Electric panels at the roadside for primary side hardware implementation.
- The intention is to use multiple primary coils along the road. The existing hardware contains components for energizing two coils.
- Only one coil would be energized at a time to improve efficiency.
- For this purpose, two contactors are implemented in order to energize the coil successively based on the position of the vehicle.
- Vehicle detection system has been used to determine the vehicle position.

**Secondary Side**

- Through controlling the duty cycle of the buck converter the energy flow to the battery is controlled.
- The electric bus utilizes two parallel Ni-Cd battery packs, each with 100Ah capacity. Energy of each pack is 30kWh.

**Test Track**

- A quarter mile test track with 8 electric panels provides the possibility for various dynamic testing of the system.

**Indoor and Outdoor Tests**

- Both indoor and outdoor experiments have been done to obtain system characteristics. The operation of the proposed controller has been verified through outdoor tests with two primary coils and for different vehicle speeds (up to 35 mph).

**Acknowledgment**

Funding provided by USTAR, the Governor’s Office of Energy Development in Utah, and Utah State University. The Authors acknowledge research support from the Electric Vehicle and Roadway group at Utah State University.