

System Planning of Wireless Charging for Fixed-Route Shared Automated Shuttles

Ahmed A. S. Mohamed National Renewable Energy Laboratory (NREL), Golden, CO, USA.

Planning Analysis and Tool

Planning Optimization

- Search variables:
- 1. Number and locations of wireless chargers.
- 2. Charger power level.
- 3. Number of track segments (track length).
- 4. EV's battery size.
- Objective: Minimum overall system cost.
- <u>Constraints:</u>
- Charge-sustaining operation.
- C-rate limit.
- SOC limits.

WPTSim

It is a planning optimization tool that is used to define the system (vehicle and charger) key design parameters.

- Vehicle powertrain model,
- Wireless charger power model,
- Automatic search algorithm, and
- Overall system cost model



Use cases and main findings

Optimum system involves:

- Quasi-dynamic WPT systems at stops only.
- High power 80-100 kW for:

- Future operation (highspeed and efficient vehicles).

- Present-day operation (low-speed and inefficient vehicles).
- Lower power (40-50 kW) for low-speed and efficient vehicles.
- 36-52% battery reduction.
- Minimal road coverage (5meter per position).
- Cost-competitive compared to DCFC.

Hypothetical AMD Network



Greenville, SC project



NAVYA shuttles at U-M











