Technical and Economic Feasibility of Wirelessly Charged Electric Bus System in Allegheny County

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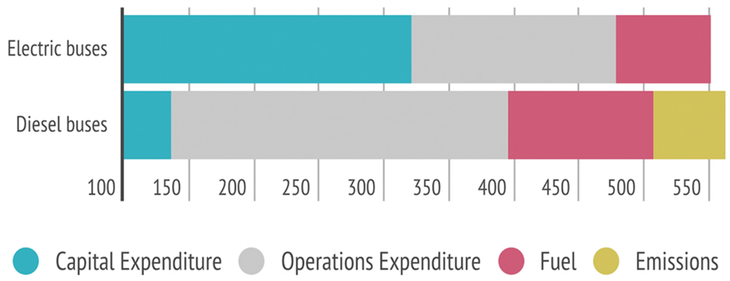
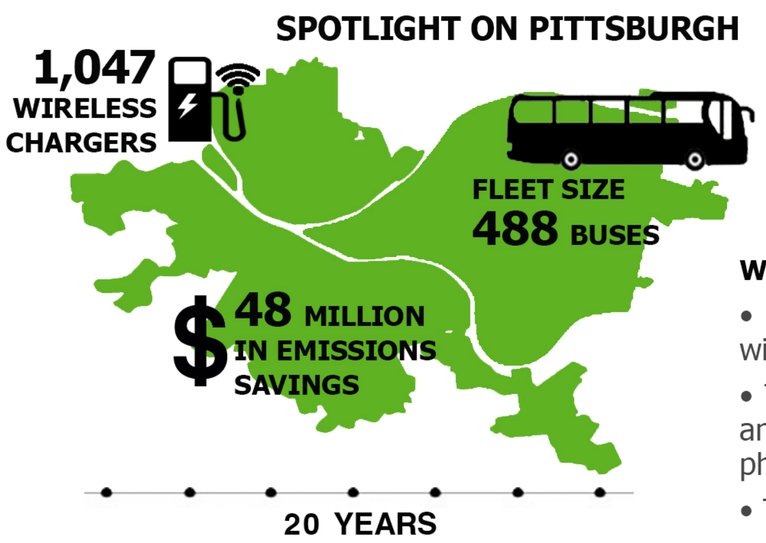
OBJECTIVE & BACKGROUND

- Electric vehicles are increasingly considered public transportation.
- The success of electric vehicles is highly dependent on making the battery cost-competitive.
- A viable way to cut down the costs is to reduce battery pack size, improve the cycle life and efficiency, thereby reducing the number of battery replacements.
- In this study, a solution to this problem is presented by leveraging the concept of wireless charging in a public bus transit system.
- The battery is charged at some of the bus stops along the route, which allows the use of smaller battery packs and reduces the overall cost.
- The objective of the case study is to assess the technical and economic feasibility of replacing the aging fleet of diesel buses in Allegheny County, PA with wirelessly charged electric buses.

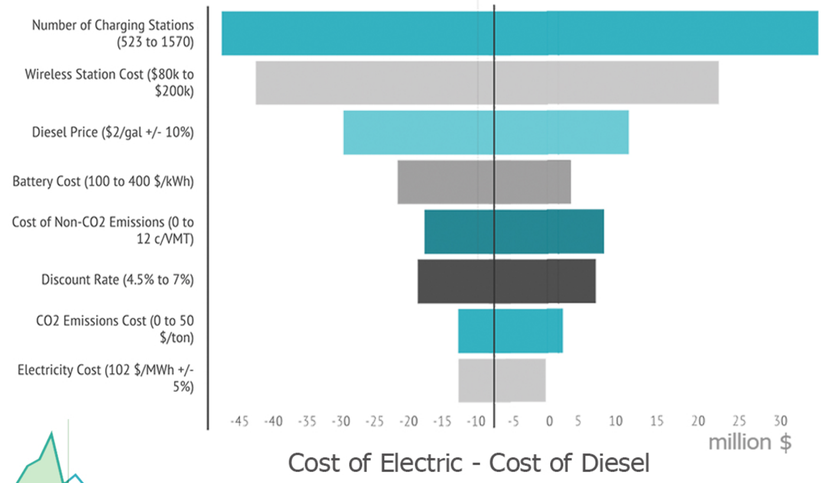
PRESENT COST BREAKDOWN

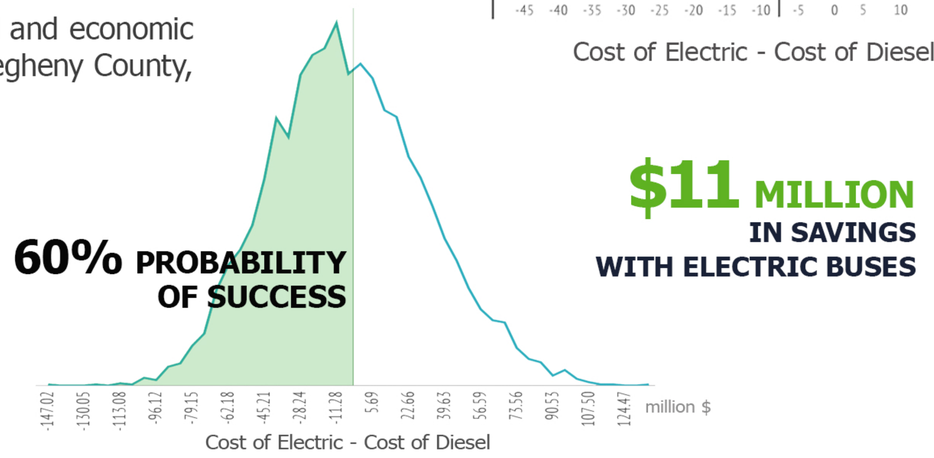


SPOTLIGHT ON PITTSBURGH



SENSITIVITY ANALYSIS





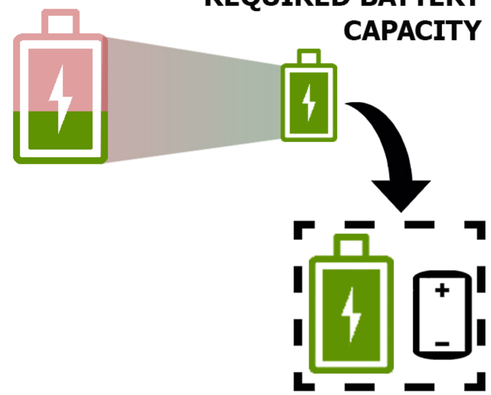
$11 MILLION
IN SAVINGS WITH ELECTRIC BUSES

UP TO 95%
CHARGING EFFICIENCY

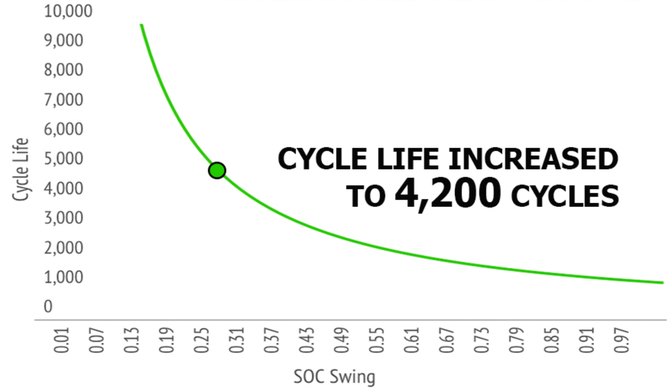
WIRELESS CHARGING TECHNOLOGY

- The principle of inductive coupling is used to charge without a wired connection.
- The magnetic field surrounding a primary coil is used to produce an electrical current in an associated secondary coil, without any physical contact between them.
- The current in the secondary coil is used to charge the battery.

50% REDUCTION IN REQUIRED BATTERY CAPACITY



(SUPERCAPACITOR + BATTERY) HYBRID PACK FOR ENHANCED PERFORMANCE



CYCLE LIFE INCREASED TO 4,200 CYCLES

CONCLUSIONS & FUTURE WORK

- Wirelessly charged eBuses are economically feasible and a more sustainable alternative to the current fleet of diesel buses.
- Savings of $11 million over the 20 year time horizon.
- Future work includes optimization of charging station locations and investigating subsidy possibilities.

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