UTC Project Information	
Project Title	MPC-527 – Strategic Planning and Design for Electric Bus Systems
University	University of Utah
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Project Duration	September 30, 2013 to September 30, 2018
Brief Description of Research Project	Electric bus with zero-emission has been recognized as a promising alternative to diesel and compressed natural gas (CNG) bus to advance air quality and save fuel costs (Tzeng et al. 2005). The adoption of electric buses requires significant investment and needs strategic and comprehensive planning on how to deploy electric buses and associated infrastructure (e.g., charging stations). Important decisions in deploying electric buses and charging stations will include, among others, identifying appropriate driving range (battery specification) for electric buses, allocating electric buses to appropriate transit routes, and determining locations of charging stations and their corresponding capacities that can charge the electric buses in a cost and time-effective way. While previous research has investigated the system design of public infrastructure for private electric vehicles, no research currently exists investigating the system design for electric buses and associated

	infrastructure. This research fills this gap by developing and using a combination of geographic information system (GIS) and optimization methods to identify optimal deployment strategies for electric bus systems to achieve specified planning goals. As many transit agencies are testing electric buses and considering the integration of electric buses into future fleet, this research will help the transit agency evaluate the capital and operational cost, greenhouse-gas emission reduction and fuel cost saving associated with the integration of electric buses, and make informed decisions regarding strategic planning and design for electric bus systems.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	This result will provide a systematic approach to identify the optimal deployment strategies for electric bus systems to achieve specified planning goals. A comprehensive summary on existing electric buses and associated infrastructure will be provided and a report documenting the feasibility analysis on the implementation of electric buses for each bus route will be generated. In addition, a new optimization model will be developed to support the strategic planning and design of the electric bus system. This model will be incorporated into a standalone GIS software or Web GIS application to allow transit planners to modify input parameters and output scenarios. A cost-and-benefit analysis comparing electric bus with the diesel and CNG bus fleet will also be provided to the transit agencies.
Impacts/Benefits of Implementation (actual, not anticipated)	Two graduate students will be heavily involved in this research. The graduate research assistants will lead the preparation of journal publications resulting from the work, and in most cases, deliver conference presentations. The undergraduate/graduate seminar GEOG 5960/6960: Location and Transportation Modeling, is the ideal platform to introduce the concept of electric bus and the challenges and benefits associated with it. The procedures for collecting electric bus and transit data, performing feasibility analysis and evaluating the cost-and-benefits will lead to new material and possibly group project to teach the students practical skills on transportation planning.
Web Links • Reports • Project Website	https://www.ugpti.org/resources/reports/details.php?id=913