APEM journal

**Advances in Production Engineering & Management**
Volume 21 | Number 1 | March 2026 | pp 75–88
https://doi.org/10.14743/apem2026.1.562

**ISSN 1854-6250**
Journal home: apem-journal.org
Original scientific paper

# A new bilevel model for EV fast charging station location planning with dynamic traffic assignment

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**ABSTRACT**

Intelligent siting of electric vehicle (EV) fast charging stations is of great significance for the development of urban transportation. This study comprehensively considers factors related to the placement of EV fast charging stations, including differences in travel behavior between fuel vehicle travelers and EV travelers, road congestion, vehicle energy consumption, and the geographical location of charging stations. Based on these factors, an advanced bilevel programming model integrating dynamic traffic assignment (DUE) and charging station location selection is developed. Specifically, the upper level uses a genetic algorithm (GA) to solve a system optimization model aimed at minimizing total travel time while accounting for the construction and operation costs of charging stations. Corresponding to the upper-level decisions, the lower level captures the joint selection behaviors of fuel and electric vehicles and is solved by a DUE procedure combined with the method of successive averages (MSA). This lower-level model incorporates travelers' on-route fast-charging behaviors, including departure time choice, charging facility preference, and route selection. The integrated approach provides a sophisticated framework for analyzing and optimizing the interaction between charging station placement, travel time, and associated costs. An iterative dynamic traffic flow algorithm integrating EV charging queue simulation is proposed. Finally, numerical studies conducted on an illustrative network derive optimal location schemes at different EV adoption stages and analyze the complex operational characteristics of the traffic network under the coexistence of EVs and fuel vehicles.

**ARTICLE INFO**

*Keywords:*
Electric vehicles;
Fast charging station;
Bilevel programming;
Location planning;
Siting and sizing;
Dynamic user equilibrium;
Traffic assignment;
Charging queueing;
Logit-based traveler choice

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*Article history:*
Received 16 June 2025
Revised 11 March 2026
Accepted 17 March 2026



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