One-Way Electric Vehicle Carsharing in an Urban Area with Vehicle-To-Grid Option

Authors : Cem Isik Dogru, Salih Tekin, Kursad Derinkuyu
Abstract : Electric vehicle (EV) carsharing is an alternative method to tackle urban transportation problems. This method can be applied by several options. One of the options is the one-way carsharing, which allow an EV to be taken at a designated location and leaving it on another specified location customer desires. Although it may increase users' satisfaction, the issues, namely, demand dissatisfaction, relocation of EVs and charging schedules, must be dealt with. Also, excessive electricity has to be stored in batteries of EVs. To cope with aforementioned issues, two-step mixed integer programming (MIP) model is proposed. In first step, the integer programming model is used to determine amount of electricity to be sold to the grid in terms of time periods for extra profit. Determined amounts are provided from the batteries of EVs. Also, this step works in day-ahead electricity markets with forecast of periodical electricity prices. In second step, other MIP model optimizes daily operations of one-way carsharing: charging-discharging schedules, relocation of EVs to serve more demand and renting to maximize the profit of EV fleet owner. Due to complexity of the models, heuristic methods are introduced to attain a feasible solution and different price information scenarios are compared.
Keywords : electric vehicles, forecasting, mixed integer programming, one-way carsharing
Conference Title : ICSEIE 2019 : International Conference on Systems Engineering and Industrial Engineering
Conference Location : Dublin, Ireland
Conference Dates : December 19-20, 2019