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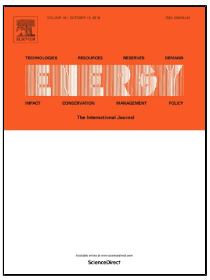

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Abstract

The rapid growth of electric vehicle (EV) penetration is promoted by fossil fuels depletion, environmental concerns, and energy efficiency initiatives. Battery charging time duration is of the main obstacles to large-scale deployment of this technology. Battery swapping station (BSS) is a new concept to handle this issue in which depleted EV batteries are replaced with a previously full charged one at a significantly less time duration. To this end, the optimum location of the EV charging among BSSs in the network in addition to the priority charging of the depleted batteries in each BSS should be determined. In this context, the present paper is to perform these tasks optimally and simultaneously. The problem is formulated as a multi-objective programming model in which three non-homogenous objectives are taken into account and solved using the NSGA II algorithm. Two cost based objectives including minimizing EV batteries charging and power loss cost along with two technical based objectives, comprising voltage profile flattening and network capacity releasing, are considered. Additionally, besides dynamic pricing scheme, a time window method to prevent interruptions in the battery charging is developed. The proposed model is implemented on 33-bus IEEE test system where the results demonstrate its functionality.

Keywords

Battery swapping station; electric vehicle charge timing; multi-objective programming; dynamic pricing; NSGA-II.