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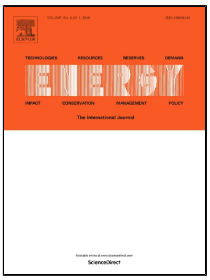

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Exploring Prospective Benefits of Electric Vehicles for Optimal Energy Conditioning in Distribution Networks

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Abstract— A potentially beneficial new opportunity is emerging around the exchange of energy between electric vehicles and the electrical energy grid, particularly as more low-carbon energy sources are connecting to the grid. Accordingly, this paper presents an optimization framework to activate the potential capabilities of electric vehicles equipped with bidirectional chargers for energy conditioning (including energy management and power quality improvement) of the future distribution networks. The proposed nonlinear optimization seeks to concurrently enhance the operation performance (using the network voltage deviation index) as well as power quality of the grid (using total harmonic distortion index). The proposed model is tested on a 33-bus distribution network to demonstrate its efficiency and performance.

Index Terms— Electric Vehicles, Energy Conditioning Management, Power Quality, Harmonic Load Flow, Non-linear Programming.

Nomenclature

Acronyms

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