

Title: Electric vehicles as a mean to reduce, energy, emissions and electricity costs

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Source: 2012 9th International Conference on the European Energy Market (EEM2012) **Book**

Series: International Conference on the European Energy Market

Published: 2012

Conference: 9th International Conference on the European Energy Market (EEM) **Location:** Florence, Italy **Date:** May 10-12, 2012

Document Type: Proceedings Paper

Language: English

Abstract: Electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs), which obtain their fuel from the grid by charging a battery, are set to be introduced into the mass market and expected to contribute to oil consumption reduction. This research is concerned with studying the potential impacts on the electric utilities of large-scale adoption of plug-in electric vehicles from the perspective of electricity demand, fossil fuels use, CO₂ emissions and energy costs. Simulations were applied to the Portuguese case study in order to analyze what would be the optimal recharge profile and EV penetration in an energy-oriented, an emissions-oriented and a cost-oriented objective. The objectives considered were: The leveling of load profiles, minimization of daily emissions and minimization of daily wholesale costs. Almost all solutions point to an off-peak recharge and a 50% reduction in daily wholesale costs can be verified from a peak recharge scenario to an off-peak recharge for a 2 million EVs in 2020. A 15% improvement in the daily total wholesale costs can be verified in the costs minimization objective when compared with the off-peak scenario result.

Author Keywords: Electric vehicles; Energy costs; Emissions

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Publisher: IEEE

Publisher Address: 345 E 47TH ST, New York, NY 10017 USA

ISSN: 2165-4077

ISBN: 978-1-4673-0832-8

Citation: CAMUS, Cristina; FARIAS, Tiago - Electric vehicles as a mean to reduce, energy, emissions and electricity costs. 2012 9th International Conference on the European Energy Market (EEM2012). ISSN 2165-4077. ISBN 978-1-4673-0832-8. (2012).