Title: Is the electric vehicle a solution for the wind power integration in the Portuguese power system?

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Abstract: The integration of Plug-in electric vehicles in the transportation sector has a great potential to reduce oil dependency, the GHG emissions and to contribute for the integration of renewable sources into the electricity generation mix. Portugal has a high share of wind energy, and curtailment may occur, especially during the off-peak hours with high levels of hydro generation. In this context, the electric vehicles, seen as a distributed storage system, can help to reduce the potential wind curtailments and, therefore, increase the integration of wind power into the power system. In order to assess the energy and environmental benefits of this integration, a methodology based on a unit commitment and economic dispatch is adapted and implemented. From this methodology, the thermal generation costs, the CO2 emissions and the potential wind generation curtailment are computed. Simulation results show that a 10% penetration of electric vehicles in the Portuguese fleet would increase electrical load by 3% and reduce wind curtailment by only 26%. This results from the fact that the additional generation required to supply the electric vehicles is mostly thermal. The computed CO2 emissions of the EV are 92 g CO2/kWh which become closer to those of some new ICE engines.

Author Keywords: CO2 emissions; Electric vehicle; Renewables; Power systems simulation; Power generation dispatch; Power grids; Wind energy

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